DOE/EA-1792-S1

FINAL SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT FOR THE

UNIVERSITY OF MAINE'S DEEPWATER OFFSHORE FLOATING WIND TURBINE TESTING AND DEMONSTRATION PROJECT

Castine

US Department of Energy
Office of Energy Efficiency and Renewable Energy
Golden, Colorado

March 2013

ACRONYMS AND ABBREVIATIONS

CMP	Central Maine Power
CFR	Code of Federal Regulations
DMR	Maine Department of Marine Resources
DOE	U.S. Department of Energy
DPS	distinct population segment
EA	environmental assessment
EFH	essential fish habitat
EMAP	Environmental Monitoring and Assessment Program
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAD	fish aggregation device
MSA	Magnuson-Stevens Fishery Conservation Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NREL	National Renewable Energy Laboratory
PVC	polyvinyl chloride
ROW	right-of-way
SHPO	State Historic Preservation Office
UMaine	University of Maine
U.S.C.	United States Code
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1. INTRODUCTION

1.1 National Environmental Policy Act Requirements

The *National Environmental Policy Act* [42 United States Code (U.S.C.) 4321 *et seq.*; NEPA], the Council on Environmental Quality's NEPA regulations [40 *Code of Federal Regulations* (CFR), Parts 1500 to 1508], and the U.S. Department of Energy's (DOE's) NEPA implementing procedures (10 CFR Part 1021) require that DOE consider the potential environmental impacts of a proposed action before making a decision. The proposal to provide federal financial support is considered a federal action and, therefore, is subject to the procedural requirements of the NEPA and DOE's NEPA. To comply with NEPA, DOE has determined the need to prepare a supplemental environmental assessment (EA) to evaluate the potential impacts that could result from their Proposed Action. The provision of financial assistance for the Proposed Project is conditional upon the completion of the NEPA process whereupon a final decision would then be made by DOE.

In compliance with these regulations, this Supplemental EA:

- Examines the potential environmental impacts of the Proposed Action and the No-Action Alternative;
- Identifies unavoidable adverse environmental impacts of the Proposed Action;
- Describes the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and
- Characterizes any irreversible and irretrievable commitments of resources that would be involved should DOE decide to implement its Proposed Action.

DOE must meet these requirements before it can make a final decision to proceed with any proposed federal action that could cause adverse impacts to human health or the environment. This Supplemental EA provides DOE and other decision makers the information needed to make an informed decision about the temporary installation, operation, and eventual removal of a proposed reduced-scale wind turbine at the Castine site described below. The Supplemental EA evaluates the potential individual and cumulative impacts of the proposed project. For purposes of comparison, this Supplemental EA also evaluates the impacts that could occur if DOE did not provide funding (the No-Action Alternative) under which DOE assumes the project would not proceed.

1.2 Background

DOE is proposing to authorize the expenditure of Congressionally Directed federal funding by the University of Maine (UMaine) to deploy, test, and retrieve one small-scale floating turbine

offshore of Castine, in Hancock County, Maine, as part of UMaine's DeepCwind Consortium Research Program. DOE has previously authorized the expenditure of federal funding by UMaine to conduct similar deployment, testing, and retrieval activities at the UMaine Deepwater Offshore Wind Test Site at Monhegan Island, Maine (Monhegan test site).

UMaine originally planned to fabricate and temporarily deploy up to two, 1/3-scale turbines within the Monhegan test site. DOE completed an Environmental Assessment (DOE/EA-1792, DOE 2011) and determined a Finding of No Significant Impact regarding that project in September 2011. The EA for the Monhegan test site is incorporated by reference. UMaine has since proposed to downscale the size of the tower and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year UMaine is proposing to deploy the tower and turbine at a more sheltered nearshore location just west of Castine, Maine (Figure 1-1) (Castine site).

DOE prepared this Supplemental EA to evaluate the potential environmental impacts of providing funding to UMaine for their proposed wind turbine platform testing at Castine. In compliance with NEPA and its implementing procedures, this Supplemental EA examines the potential environmental effects of DOE's Proposed Action (authorizing UMaine to expend Congressionally Directed federal funds), UMaine's proposed project, and the No-Action Alternative (if DOE chooses not to provide financial assistance for this project). The purpose of this Supplemental EA is to inform DOE and the public of the potential environmental impacts of the proposed project and the alternatives.

DOE reviewed the DOE/EA-1792 that described the potential effects of UMaine deploying up to two 1/3-scale platforms and wind turbines at the Monhegan test site (DOE 2011), and concluded that effects to the environment from deploying a single 1/8-scale turbine in that area following deployment in Castine would be similar to or less than that described in the EA for the Monhegan test site. Therefore, UMaine's proposal to deploy the 1/8-scale turbine near Monhegan Island is not discussed in this Supplemental EA, though cumulative impacts related to both deployments and additional foreseeable activities are discussed in Chapter 4.

1.3 Purpose and Need

The DOE Office of Energy Efficiency and Renewable Energy's Wind and Water Power Program supports the development and deployment of advanced wind and water power devices, including the advancement of offshore wind technologies and floating offshore wind turbine platforms. One goal of the program is to help industry harness the renewable, emissions-free offshore wind resource to generate environmentally sustainable and cost-effective electricity. To meet this goal, DOE supports the design and development of offshore wind technologies as well as the

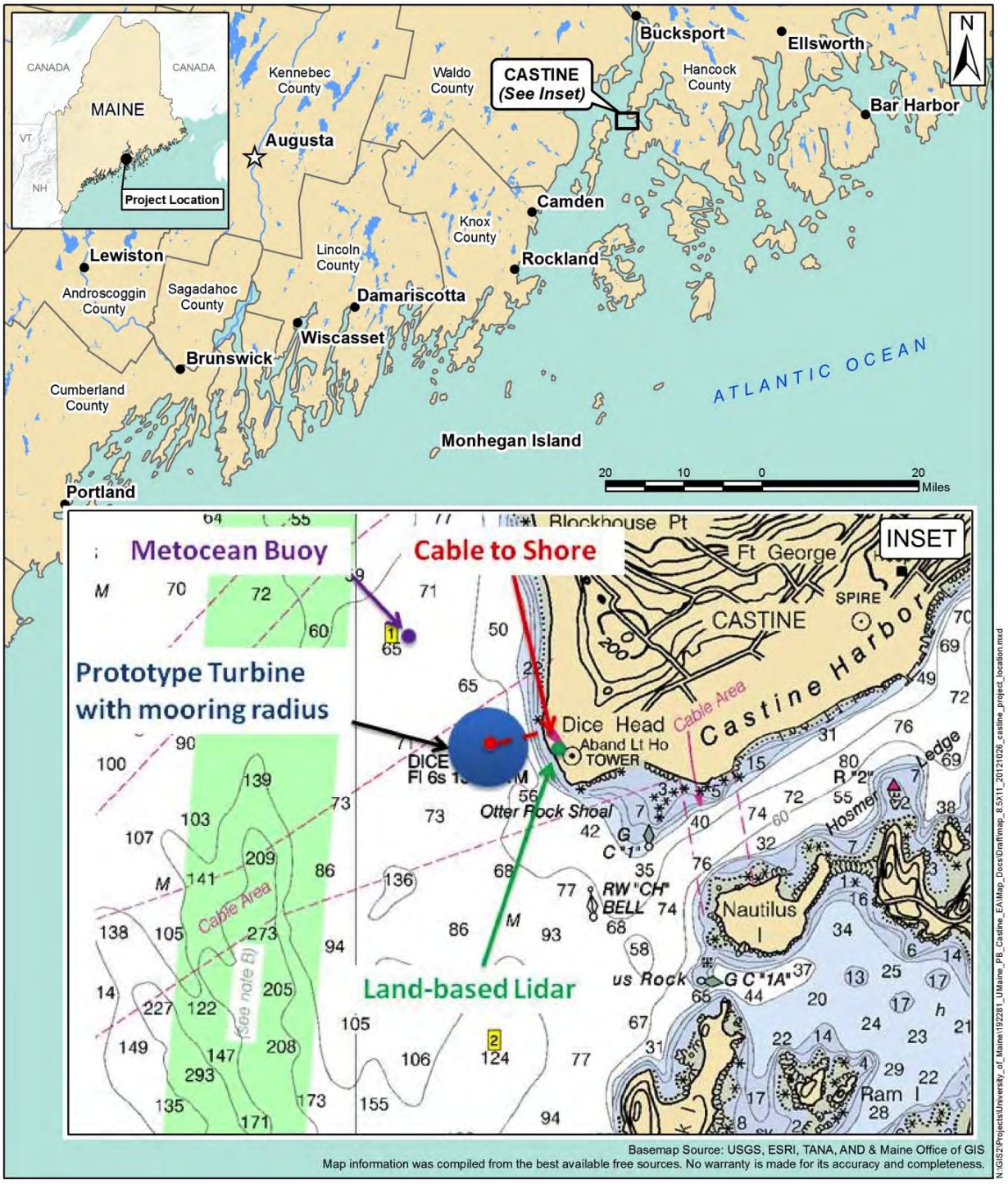


Figure 1-1. Proposed location of deployment of floating offshore wind turbine platform.

technological demonstration of those devices. UMaine is proposing to perform research on and development of a small-scale floating offshore wind turbine platform at Castine, Maine, as part of the DeepCwind Consortium Research Program. The primary objective of UMaine's testing a 1/8-scale floating wind turbine is to obtain motion and structural response data to compare and validate numerical models developed by NREL and others that predict structural loads, deflections, dynamics, and turbine power output under various meteorological and oceanographic conditions. Experimentally validated numerical models would aid in the development of floating platform technology for offshore wind energy. These models, once validated, would be used for design and optimization of floating turbines to help reduce the cost per installed kilowatt. Providing federal financial assistance to UMaine's proposed project would support the mission, vision, and goals of DOE's Wind and Water Power Program objectives to increase the development of reliable, affordable, and environmentally sustainable wind power technologies to realize the benefits of domestic renewable energy production.

1.4 Public and Agency Involvement

1.4.1 UMAINE PUBLIC INVOLVEMENT

UMaine selected the proposed project site following a comprehensive review of available information and meetings with the Castine-based Maine Maritime Academy (a research partner) and public meetings with the town of Castine. Maine Maritime Academy is leading public outreach efforts in the town of Castine, including meetings with town officials, coordinating with local stakeholder groups, and presenting at public town meetings. Maine Maritime Academy's President, Bill Brennan, made a presentation about the project at a February 22, 2012 meeting of the town's municipal officers. This meeting was open to the public and was attended by mostly year-round residents, the fishing community, and local press. President Brennan updated the town on project progress at subsequent town meetings, and Vice President Mercer of Maine Maritime Academy has been in regular communication about the project with town officials. Both Maine Maritime Academy and the town of Castine have been receptive to this project.

1.4.2 DOE AGENCY CONSULTATION AND PUBLIC INVOLVEMENT

DOE has initiated consultation with the following federal agencies and Tribal organizations regarding the potential environmental impacts associated with the proposed project (Appendix A contains consultation letters):

- Section 7 *Endangered Species Act (ESA), Marine Mammal Protection Act, Magnuson-Stevens Fishery Conservation and Management Act*
    - DOE sent a request for information to the National Marine Fisheries Service (NMFS) on October 18, 2012.

  - NMFS responded to DOE in a letter dated November 16, 2012. Information contained in this letter is discussed in Section 3.2.
  - DOE sent a letter to NMFS on January 16, 2013 stating that the proposed project *may affect, but is not likely to adversely affect* ESA-listed fish, marine mammals, and sea turtles; the project would have minimal adverse effects on Essential Fish habitat (as regulated under the Magnuson-Stevens Fishery Conservation and Management Act); and that incidental take of species protected under the Marine Mammal Protection Act is unlikely to occur.
  - NMFS concurred with DOE's conclusions in a letter dated February 20, 2013.
- Section 7 *ESA*
  - DOE sent a request for information to the U.S. Fish and Wildlife Service (USFWS) on October 18, 2012.
  - DOE sent a letter to USFWS on January 16, 2013 stating that the proposed project *may affect, but is not likely to adversely affect* the ESA-listed roseate tern and piping plover.
  - USFWS concurred with DOE's conclusions in a letter dated March 7, 2013.
- Section 106 *National Historic Preservation Act*
  - DOE sent a letter to the Maine State Historic Preservation Office (SHPO) on January 2, 2013.
  - DOE sent letters on November 2, 2012, to five Indian tribes or tribal organizations that may have historic ties to the Gulf of Maine.
  - SHPO stated in a letter dated January 2, 2013 that the project will have no adverse effect on historic properties as defined by Section 106 of the National Historic Preservation Act. The Penobscot Indian Nation and the Aroostook Band of Micmacs each responded to DOE in transmittals dated November 29, 2012. These responses are discussed in Section 3.5.

1.4.3 DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

DOE issued the Draft Supplemental EA for comment on January 10, 2013, and posted it on the DOE Golden Field Office Reading Room Website (http://www.eere.energy.gov/golden/Reading_Room.aspx) and DOE NEPA Website (http://www.energy.gov/nepa). DOE sent postcards to local stakeholders, government agencies, and tribal organizations to notify them of the availability of the Draft Supplemental EA and to announce a 15-day public comment period on contents of that document. A Notice of Availability was published in the *Bangor Daily News* and the *Castine Patriot* newspaper. DOE did not receive any comments on the Draft Supplemental EA.

2. PROPOSED ACTION AND ALTERNATIVES

2.1 DOE's Proposed Action

Under the Proposed Action, DOE would authorize UMaine to expend Congressionally Directed federal funding to temporarily deploy an offshore wind turbine test platform at the Castine site.

DOE has authorized UMaine to use a percentage of the federal funding for preliminary activities, which include preparing this Supplemental EA, conducting analyses, and agency consultations, and has approved similar deployment, testing, and retrieval activities at the Monhegan site. Such activities are associated with the Proposed Action and do not significantly impact the environment nor represent an irreversible or irretrievable commitment by DOE in advance of its conclusion of the potential environmental impacts from the proposed project.

2.2 University of Maine's Proposed Project

UMaine proposes to use DOE funding to deploy, test, and retrieve one approximately 1/8-scale wind turbine on a floating platform offshore of Castine, Maine, as part of its DeepCwind Consortium Research Program.

2.2.1 OVERVIEW

UMaine proposes to use DOE funding to deploy and retrieve one 20-kW wind turbine on a floating platform offshore of Castine, Maine. Prior to deployment at the Monhegan site (the site evaluated in the original EA – see Section 1.3), UMaine proposes to conduct initial, temporary testing of the floating system at the Castine site in an existing cable right-of-way (ROW) within state waters (Figure 1-1). The system would be deployed for about four months in spring of 2013, offshore of Dyce Head at approximately N44° 23' 07", W 68° 49' 25". Water depth in the area is approximately 100 feet. The turbine would be connected to the Central Maine Power (CMP) grid via a cable to be installed along the seabed surface from below the turbine to shore, and along the ground to an existing CMP power pole.

During the site selection process, the following parameters were considered to evaluate potential sites: suitability of metocean (wind, wave, and current) conditions to achieve representative scale environmental conditions, proximity to marine infrastructure, historical metocean data, geophysical suitability, public support, and permitting. Castine was the only site that met all of the research programs needs. The sheltered harbor is desirable because the environmental conditions at this scale closely replicate full-scale conditions at the Monhegan site, and the design can be demonstrated at the smaller scale with the same desired effect.

The turbine would measure about 41 feet from waterline to the hub, the rotor diameter would measure about 32 feet, and the total turbine height would be about 57 feet (Figure 2-1). The final dimensions of the floating platform are currently under development as part of this research effort, but would not be any larger than what is shown below.

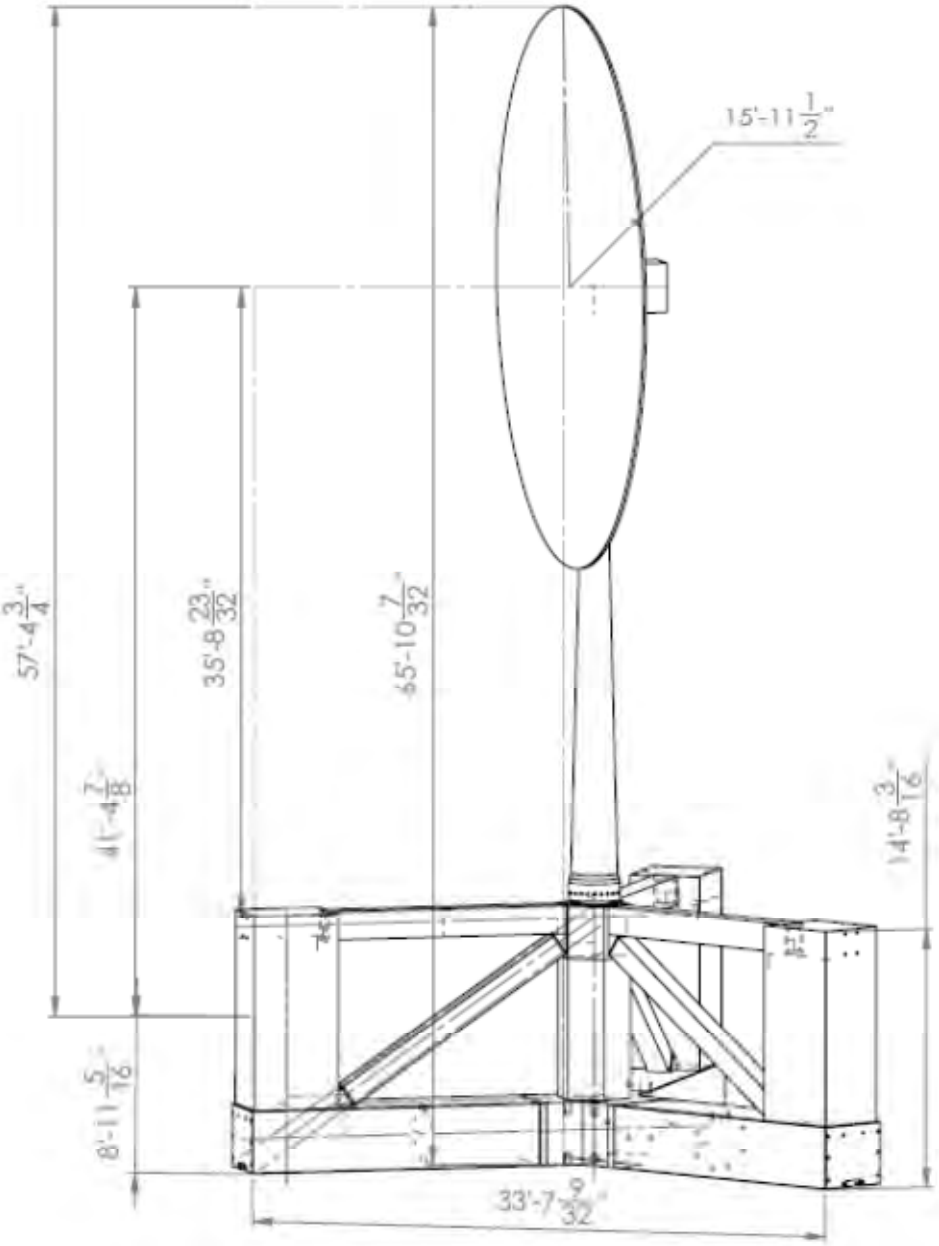


Figure 2-1. Anticipated dimensions of the proposed floating offshore wind turbine to be deployed at Castine.

The wind turbine system would be fabricated at UMaine, shipped to a coastal facility, and towed to and moored just outside of Castine Harbor in the proposed location. It would be tested in the

spring of 2013, and it would then be towed to the UMaine Deepwater Offshore Wind Test Site at Monhegan Island, Maine for part of the remainder of the year. Retrieval of the platform would occur following the deployment period. All anchors and the electrical cable would also be retrieved. Upon completion of that effort, the floating turbine platform would be towed back to the mainland, disassembled, and transported back to UMaine.

2.2.2 WIND TURBINE AND PLATFORM

UMaine proposes to deploy one 20-kW Renewegy wind turbine within the project area on a floating platform. The turbine was selected based on the needs of the testing program, including the following: power control method (variable control pitching), lead-time for receiving the turbine, costs, suitability for use on this scale platform (mass, geometry, power output), structural capacity, and the availability of design information for numerical modeling. Several turbine options were considered, and the Renewegy model ranked the highest with regard to these needs.

The proposed wind turbine is a horizontal-axis generator with a power rating of 20 kW, or 27 horsepower. Although the onboard electronics, safety system, data acquisition system, and turbine operational controls would consume some power, the excess electrical power would be transferred to the Maine power grid via a 20-kW capacity cable to shore.

The proposed foundation is a semi-submersible tri-floater structure fabricated out of pre-stressed concrete. The approximate dimensions of the turbine and floating foundation are shown in Figure 2-1.

2.2.3 MOORING AND ANCHORING SYSTEM

The mooring and anchoring system selected for the semi-submersible system is four drag embedment anchors with catenary mooring lines. The mooring lines would consist of synthetic/wire rope or chain, approximately 2-3 inches diameter. A number of shallow foundations/anchors were considered for mooring the project. A drag embedment anchor is preferred because it would minimize impact to the seafloor compared to other anchor designs, work with the bottom conditions at the proposed site, and would be easily removed at project completion. These anchors have dimensions similar to anchors used by large sailing vessels in Castine and along the Maine coast (Figure 2-2).

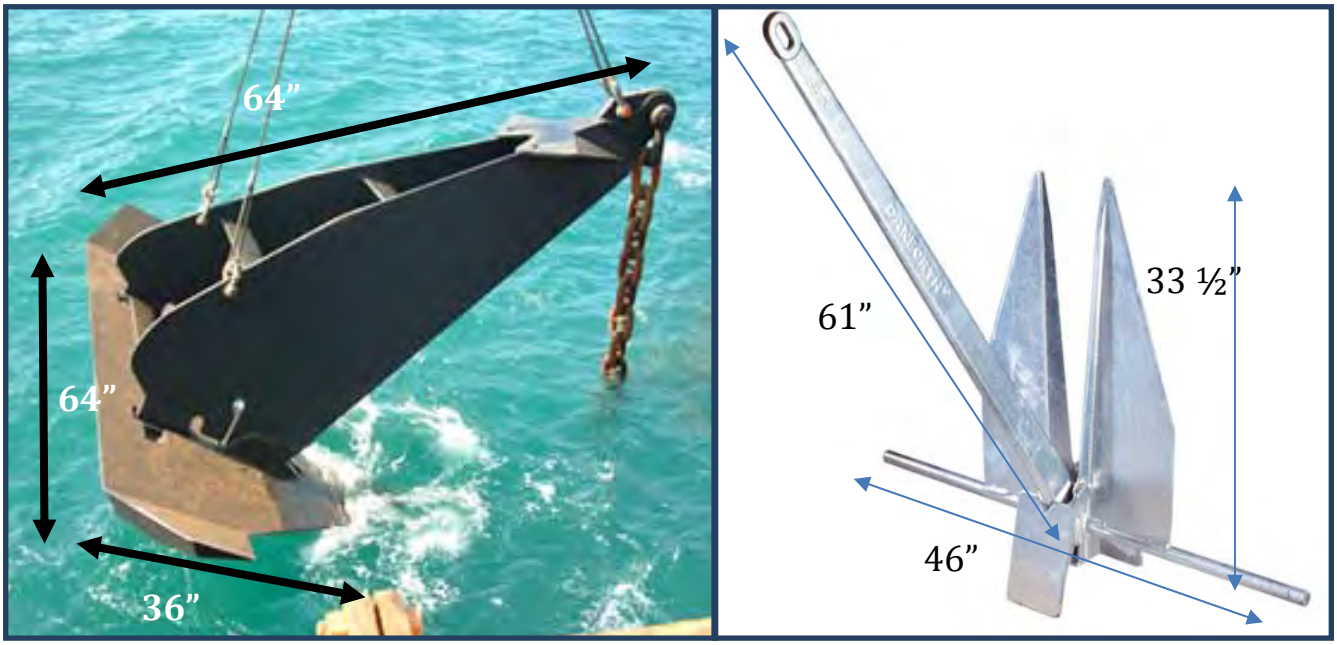


Figure 2-2. Dimensions of proposed anchor for Castine floating turbine deployment (left) and typical boat anchor for vessels up to 83 feet long (right).

Additional details of the anchors and mooring lines are shown in Table 2-1 and an elevation view drawing of the mooring lines is shown in Figure 2-3.

Table 2-1. Mooring and anchoring dimensions and description.

	Drag Embedment Anchor	Gravity Anchor
Mooring type and quantity	Catenary- 4 Lines	
Water Depth	100 ft	
Line length	Up to 1,000 ft	
Line material	Synthetic/wire rope or chain	
Anchor type and material	Steel drag embedment anchor	Concrete gravity anchor
Anchor weight	440 pounds	6,000 pounds
Anchor dimensions	36 inches x 64 inches	10 feet x 10 feet
Mooring radius (1:4 depth to horizontal radius)	Up to 600 ft	

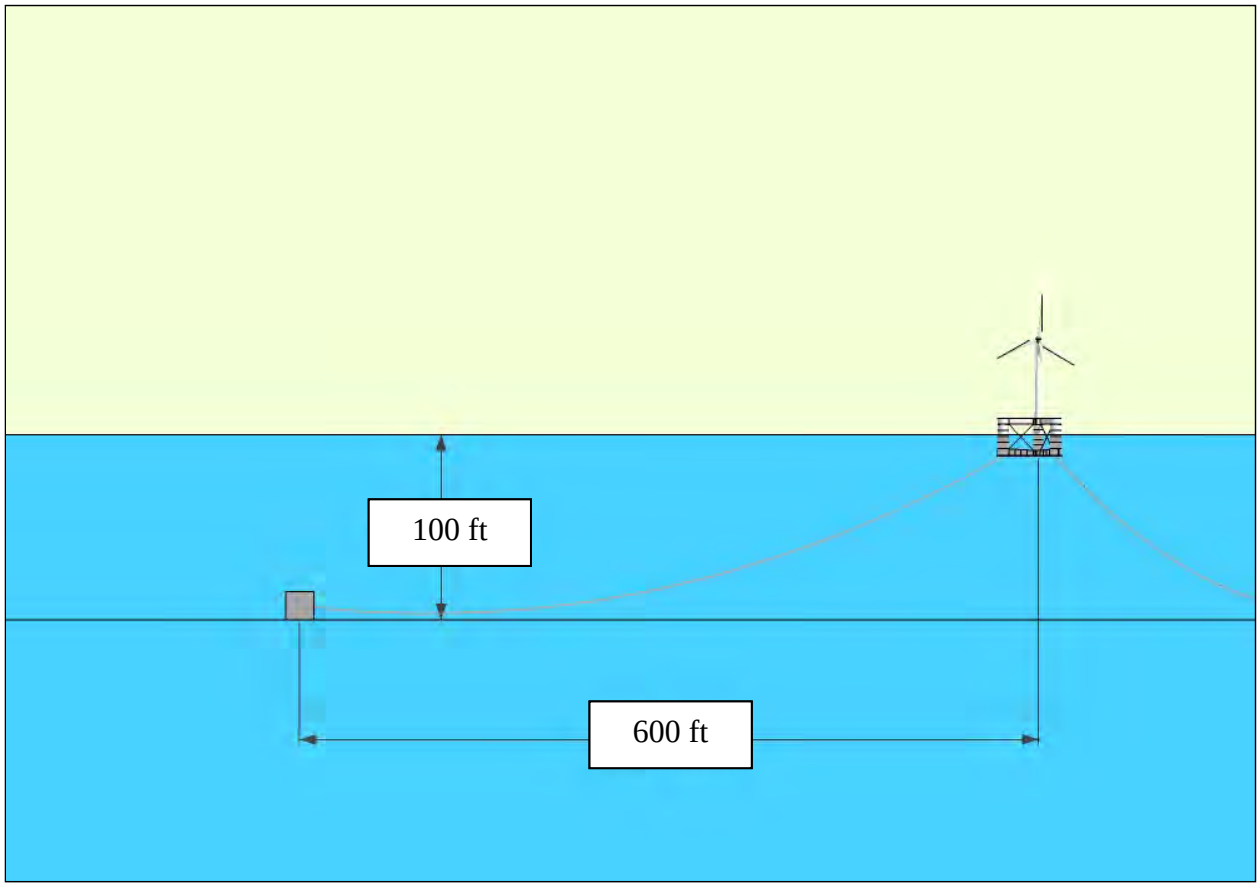


Figure 2-3. Elevation view of the proposed mooring line design (not to scale).

In the event that the drag embedment anchors prove infeasible, UMaine would use gravity anchors. These anchors would be made of concrete, weigh approximately 6,000 pounds, and have dimensions of approximately 10 ft by 10 ft by 2 ft (Figure 2-4). Each anchor would have one catenary mooring line connected to the floating turbine platform, and the anchors would be removed at the end of the deployment.

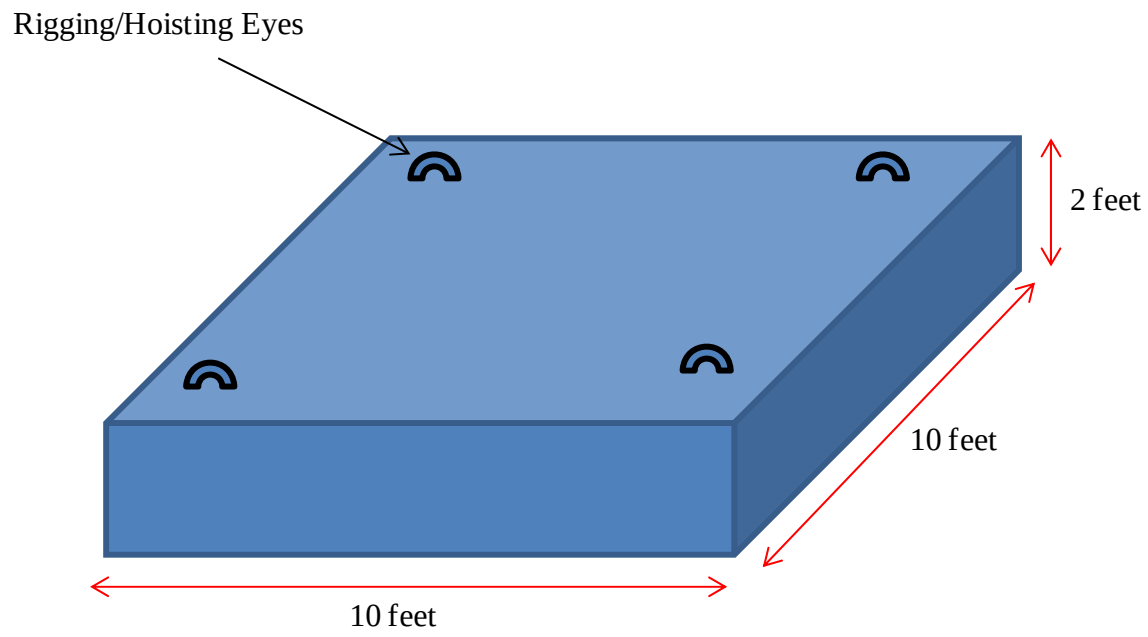


Figure 2-4. Alternative gravity anchor.

2.2.4 ELECTRICAL INTERCONNECTION

Power would be generated at the turbine at 480-V, 3-phase, and would be delivered to the CMP grid through a combination of submarine and land based cables. The cables extending from the turbine to the point of interconnection on the shore would consist of three power cables, one per phase, one grounding conductor and one communications cable. The five cables would be contained in a single cable. The cable would run underwater for about 500 to 1,000 feet to shore. From just below the low tide line the cable would extend along the ground in a protective conduit to the point of interconnection at an existing CMP power pole. The terrestrial portion of the cable would be about 300 feet long.

2.2.5 INSTALLATION

The floating offshore wind turbine system would be constructed at UMaine's Advanced Structures and Composites Center and assembled at a shipyard or similar existing coastal facility, such as Cianbro's Modular Fabrication Facility in Brewer, Maine. The platform would be towed and moored within the Castine site for the testing period.

Each of the four anchors for the floating system would be installed by positioning the anchor on the sea floor and then tensioning the mooring line using a small tug boat. During the tensioning, the flukes would penetrate the seabed, and as tension increases, the anchor would be embedded. In the event that gravity anchors are used, they would just be placed on the seabed. Following

anchor deployment, small buoys would be installed to hold the mooring lines in place. After installation of the anchor and mooring system, the floating system would be towed from the launch site to the Castine test site. It is anticipated that it would take approximately two hours to tow the floating turbine from the launch site to the final destination at Castine. Notice would be given to the Maine Marine Patrol and USCG to alert fishermen about towing operations and to advise for the removal of gear from the planned tow route. When the floating system arrives on station, it would be connected to the pre-laid mooring system.

The floating platform and its anchorages would be installed using Maine Maritime Academy's unlimited tugboat *The Pentagoet*. This tugboat is 70 feet long and 24.5 feet at the beam, and weighs 99 gross tons. It is powered by a 1,200 horsepower design engine and is staffed by a crew of three. The vessel has onboard supplemental power systems and a lifting derrick, and routinely performs offshore installations similar to what is required for the pilot prototype unit. In the event that *The Pentagoet* is not available, a vessel with similar qualities and size would be used.

The onboard management of fuels and lubricating fluids aboard all vessels would be managed in accordance with U.S. Coast Guard regulations applicable to each vessel. The requirements are dictated by vessel size and intended operations, but in each case do not permit the discharge of petroleum or hazardous substances into the environment and require a spill prevention plan and certificate of financial responsibility.

Beginning at the offshore turbine mooring anchor, the electrical cable would run along the seabed approximately 500 to 1,000 feet to the shore, just below the low tide line. The cable would be anchored to the seafloor using simple weight strands every five feet; these would be removed with the cable at the project's conclusion. At that point the cable would be contained in a Schedule 40 rigid metal conduit within the tidal zone and Schedule 80 polyvinyl chloride (PVC) from the high tide location to the CMP point of interconnection in order to meet electrical code requirements.

The 2½-inch PVC conduit would extend approximately 300 feet from the high tide line to the point of interconnection near Dyce's Head Road. The conduit would be laid on the ground and anchored a minimum of every 10 feet along that route to meet code requirements. A single strap anchor would be mounted to concrete blocks at each anchoring location, one concrete block on either side of the conduit. The conduit would be placed and anchored by hand. In select locations where the concrete blocks would not provide a suitable and safe anchorage for the conduit, such as on steep slopes, hand held power tools would be used to drill holes and set anchors in rock. ATVs may be used to transport and handle materials, but no other heavy tools or vehicles would be operated on the site. Minimal hand cutting of limbs and brush would be conducted to facilitate routing and placement of the conduit. No trees would be removed and

select trimming would be focused on the centerline of the conduit with no trimming occurring beyond three feet on either side of the conduit. In areas of uneven terrain, the conduit might be supported with wooden blocks installed on the ground beneath the conduit to keep it level. The blocks would not require anchoring and would be removed along with the conduit at the end of the project. The blocks would be three feet or less in length.

The upland interconnection equipment, consisting of a transformer, a 3-phase to single-phase converter, and an electrical metering pack, would be installed temporarily on secure footings adjacent to the CMP interconnection point. Communications equipment also would be installed there for the data being collected for analysis of the project. Requirements for the CMP component of the installation are currently being finalized by UMaine. Requirements include completion of an interconnection application, which included specific electrical characteristics of the turbine. CMP has evaluated the proposed installation for electrical stability as a generator on the grid. Further, CMP's field planning teams met with UMaine's electrical engineering firm to determine the best routing of lines from power poles to the proposed termination point. A power terminal pole may be installed at the edge of the public way and the Town of Castine property to facilitate the connection to the grid. The entire footprint of the upland equipment would be approximately 10 feet by 12 feet.

Excess dust or debris that is deposited on the ground would be managed in manner to prevent off-site migration. Areas along the route that are disturbed to bare ground would be covered with straw mulch, and standard erosion control Best Management Practices would be implemented; for example, straw mulch would be placed along areas of the route that are disturbed to bare ground to minimize erosion.

The anticipated time required for project installation would be two days to deploy the four anchors, one day to install the turbine platform, two days to install the subsea cable, and two weeks for the land-side work.

2.2.6 OPERATIONS AND MAINTENANCE

Following deployment of the platform, the focus of UMaine's proposed project would be testing the response of the turbine platform to various conditions of combined wind/wave loading. The turbine platform would carry sensor and telemetry systems that would provide data to evaluate the engineering, structural, and motion performance of the turbine platform under combined wind, wave, and environmental conditions. The comparison of the measured motions of a nearby metocean buoy (Figure 1-1) and the turbine platform would allow the response of the turbine platform to be evaluated relative to the oceanographic and meteorological conditions. The same conditions would then be simulated in the numerical models and compared as part of the model validation process.

While deployed, personnel access to the floating platform would be required for scheduled and unscheduled inspections, maintenance, and repairs. Access to this scale prototype would be via a standard size workboat from Maine Maritime Academy or other partner organization. The prototype would be equipped with a boat landing to facilitate personnel transfer and access means (e.g., Occupational Safety and Health Administration-compliant ladder) from the boat landing to the top deck. Maintenance and repair operations would require use of tools and equipment, and limited amounts of lubricants and hydraulic oils (30 ounces of brake fluid and one gallon of gear lubricant) would be within the turbine itself. For any unforeseen major repairs to the turbine or system, the platform is designed to easily re-attach to tug boats and be tugged back to port.

Environmental monitoring for birds (visual surveys and web camera observation), marine mammals (visual surveys), bats (echolocation detectors), and benthic invertebrates (remotely operated vehicle surveys and visual surveys) was initiated by UMaine in 2012 to support development of this Supplemental EA. In addition, ongoing monitoring results of fish in the project area, including acoustic detection of tagged fish and Maine Department of Marine Resources inshore fisheries surveys, were reviewed as well. These studies would continue in the area surrounding the test site during the deployment.

2.2.7 REMOVAL

The floating offshore wind turbine system would be retrieved from Castine at the end of the deployment period in late June or early July 2013. It is possible that unanticipated removal of the turbine would be necessary in the case of an extreme weather event. Therefore, the design incorporates the capability to disconnect the floating turbine system from its moorings and tow it safely to port.

The removal of the floating turbine system and its associated moorings would be completed in two stages: 1) removal of the floating turbine system and 2) removal of the catenary moorings lines and anchors. For removal of the floating turbine, the same process would be used as for the deployment, but in reverse. The mooring line would then be towed in the opposite direction to remove the anchoring and mooring system.

All electrical interconnection equipment also would be removed. Upon completion of the project, the electrical cable anchors on shore would be removed and any bolts would be cut flush with existing grade, and support blocks and conduits would be removed. Disturbed areas would again be stabilized with straw mulch. Project removal activities would take a similar amount of time as the installation activities (see Section 2.2.7).

2.3 No Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds for the temporary deployment of the wind turbine test platform. As a result, installation of the project would be delayed while UMaine sought other funding sources, or abandoned if other funding sources could not be obtained. Furthermore, research towards reductions in fossil fuel use and improvements in energy efficiency would not occur through the activity of this project, and the DOE Wind and Water Power Program's mission and goals for offshore wind advancement would be impaired.

While it is possible that the wind turbine test platform could be constructed and operated in lieu of DOE financial assistance, such a scenario would not provide for a meaningful No Action Alternative, as it would be identical to the Proposed Project. Therefore, for the purposes of this EA, the No Action Alternative is evaluated as if the Proposed Project were not built and operated.

2.4 Required Agency Permits and Approval Types

Prior to installation of the turbine, DOE and UMaine will complete and comply with all required federal and state consultations, permits, and approvals (Table 2-2). The Maine Department of Environmental Protection issued the Permit by Rule on January 11, 2013. UMaine submitted a permit application to the U.S. Army Corps of Engineers on December 18, 2012.

Table 2-2. Required permits and approvals.

Agency	Permit/Approval
Maine Department of Environmental Protection	National Resources Protection Act, Section 9 Permit By Rule Notification
U.S. Army Corps of Engineers	River and Harbors Act, Section 10 Permit
National Oceanic and Atmospheric Administration (NOAA) NMFS, USFWS	ESA, Section 7 Consultation
NMFS and USFWS	Fish and Wildlife Coordination Act
NMFS	Marine Mammal Protection Act, Consultation
NMFS	Magnuson-Stevens Fishery Conservation and Management Act, EFH Consultation
U.S. Coast Guard	Ports and Waterways Safety Act, Consultation
Maine Department of Agriculture, Conservation, and Forestry – Maine Coastal Program	Coastal Zone Management Act, Section 307(c)(3) Consultation (part of DEP permit process)
Maine State Historic Preservation Office	National Historic Preservation Act, Section 106 Consultation

2.5 Applicant-Committed Measures

If DOE decides to provide federal funding for the proposed project the following measures will be implemented by UMaine to minimize or avoid potential environmental effects.

2.5.1 BIOLOGICAL RESOURCES

- To prevent seals from using the turbine platform for resting (seal haul out), the platform has been designed to limit the horizontal surfaces, and the platform deck height will preclude haul out of seals.
- The turbine tower will not have external ladders or other structures that will allow birds to perch near the turbine blades.
- The specifications for lighting of the floating platform and turbine will be developed in compliance with USFWS lighting requirements.
- UMaine will conduct monitoring for birds, bats, marine mammals, benthic invertebrates, and fish[1]. The monitoring will complement the pre-deployment monitoring that has already been performed. Results of the monitoring will be provided to DOE and applicable resources agencies.
- NMFS marine mammal avoidance and best management procedures will be implemented in the event that a marine mammal is encountered by a construction or maintenance vessel.
- The onboard management of fuels and lubricating fluids aboard all vessels will be managed in accordance with U.S. Coast Guard regulations applicable to each vessel. The requirements are dictated by vessel size and intended operations, but in each case do not permit the discharge of petroleum or hazardous substances into the environment and require a spill prevention plan and certificate of financial responsibility.

2.5.2 OCEAN AND LAND USE

- Notice will be given to the Maine Marine Patrol and USCG to alert fishermen about towing operations and to advise for the removal of gear from the planned tow route.
- Minimal hand cutting of limbs and brush will be conducted to facilitate routing and placement of the conduit. No trees will be removed and select trimming will be focused on the centerline of the conduit with no trimming occurring beyond three feet on either side of the conduit. Excess dust or debris that is deposited on the ground will be managed in manner to prevent off-site migration. Areas along the route that are disturbed

[1] NOAA and others have tagged fish with acoustic tags, which can in turn be detected by acoustic receivers, in the Gulf of Maine since 2005 to gather information on a variety of fish distribution and movements.

to bare ground will be covered with straw mulch, and standard erosion control Best Management Practices will be implemented.

- A navigation safety plan for the project has been developed in consultation with the USCG Waterways Management division.
- The turbine will be monitored via webcam and could be shut off remotely, if necessary.
- Following completion of the project, the floating turbine platform, anchors, and the electrical cable will be retrieved. The electrical cable anchors on shore will be removed, any bolts will be cut to flush with existing grade, and support blocks and the conduit will be removed. Disturbed areas will be stabilized with straw mulch.

2.5.3 CULTURAL RESOURCES

- To minimize visual effects, the project will be sited out of view of the Village of Castine and in a previously disturbed cable ROW, and the project will be temporary and removed following completion of the testing.
- To minimize bottom effects, UMaine conducted a magnetometer survey and confirmed that there are no shipwrecks at the project site.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1 Environmental Categories Evaluated and Dismissed From Further Analysis

3.1.1 GEOPHYSICAL RESOURCES

The only effect of the project upon marine geological resources would be from temporary placement of four anchors and cable, both within a previously disturbed cable ROW. No pile driving would occur, and no blasting would be required. The drag embedment anchor to be used would minimize impact to the seafloor compared to other anchor designs, works well with the bottom conditions at the proposed site, and is easily removed at project completion. The footprint of the anchors would be small, with the anchors having similar dimensions to (though heavier than) typical anchors used by large sailing vessels in Castine Harbor and along the Maine coast (Figure 2-2). During installation, drag embedment anchors would be pulled about 50 feet in order to set them with 10 feet of penetration. It is anticipated that half of this distance would be within the substrate below the seabed surface. The actual footprint of each anchor would be at most 16 ft^2, with the four anchors therefore having a combined footprint of about 64 ft^2 and the footprint of the subsea cable and strip weights would be about 357 ft^2. In the event that gravity anchors are used, each anchor would have a footprint of 100 ft^2 for a combined footprint of 400 ft^2. The anchors and subsea cable would have a temporary effect on the thick sediment of the test area. The terrestrial portion of the cable would be laid on the ground and would not disturb geological resources.

3.1.2 WATER RESOURCES

Due to the short duration of the deployment, there would be minimal accumulation of marine organisms (i.e., biofouling) on the floating turbine platform, and therefore, antifouling paint would not be applied. The onboard management of fuels and lubricating fluids aboard vessels would be managed in accordance with U.S. Coast Guard regulations applicable to each vessel. No intentional discharge of petroleum or hazardous substances would be allowed. Installation and operation of the project is not expected to influence dissolved oxygen concentration, pH, or temperature of the surrounding water. Deployment of the anchors and the cable to shore would result in a temporary and localized increase in turbidity during deployment, as would removal.

3.1.3 ELECTROMAGNETIC FIELDS

Transmission of electricity produces electromagnetic fields (EMF). EMF consists of two components, electric and magnetic fields. Magnetic fields may create a second induced component, a weak electric field, called an induced electric field. An iE field is generated by the

flow of particles (water) or organisms through a magnetic field. Some marine animals (e.g. sharks, skates, and rays) have specialized organs and can sense EMF.

Operation of the project would result in a temporary, small, and very localized magnetic field. The Renewegy turbine has a capacity of 20 kW. Power would be generated at the turbine at 480-V, 3-phase, and would be delivered to shore through a submarine cable. The strength of electric and magnetic fields depends on the magnitude and type of current flowing, in this case, through the transmission cable. If the turbine is at full capacity, the current would be approximately 30 amperes. The shielding of the cable will eliminate electric fields, however, magnetic fields cannot be shielded. It is estimated that with the turbine generating at maximum power, the magnetic field would be 22 microtesla at 6 inches from the cable and 5 microtesla at 12 inches from the cable. In comparison, the strength of the earth's magnetic field is approximately 50 microtesla. The electrical set up for the project is less than what would be used for a normal residential service, which would have generally at least twice the current.

3.1.4 AESTHETIC RESOURCES

The floating platform would be deployed offshore and to the north of the Dyce Head. There is a lighthouse on Dyce Head, which is open to the public. The area surrounding the lighthouse has dense vegetation, including conifers and typical coastal undergrowth, which obscures any view of the ocean from the area around the lighthouse. In addition, the proposed deployment would not be visible from the end of the hiking path leading from the lighthouse to end of Dyce Head. The platform, which would be similar in size to large sail boats in the area, would be visible from a few homes to the north of the lighthouse.

The project deployment off Castine would be for only up to four months in the spring of 2013 and it would be removed before the period of the summer when peak boating and tourism/recreational activity occurs. Because the floating turbine platform is small (1/8 scale) and because it and the cable would be removed after the short-term deployment, any potential visual effects would be temporary.

3.1.5 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The small size of the floating turbine platform and short duration of deployment will minimize effects to lobstering, commercial fishing activities, tourism activities, or area businesses.

Executive Order 12898 (February 11, 1994) directs federal agencies to incorporate environmental justice considerations into the NEPA process. The purpose of this order is to ensure that low-income households, minority households, and minority businesses do not experience a disproportionate share of adverse environmental effects resulting from any given federal action. No potential adverse impacts to human health have been identified resulting from

the proposed project. Therefore, there would be no disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

3.1.6 INTENTIONAL DESTRUCTIVE ACTS

Installation and operation of a floating wind turbine platform outside of Castine Harbor does not involve the transportation, storage, or use of radioactive, explosive, or toxic materials; therefore, it is unlikely that installation or operation of the project would be viewed as a potential target by saboteurs or terrorists. The project is not located near any national defense infrastructure or in the immediate vicinity of a major inland port, container terminal, freight trains, or other significant national structure. The project is not considered to offer any targets for intentional destructive acts.

3.2 Biological Resources

This section analyzes potential project effects to the following biological resources, including threatened and endangered species:

- Invertebrates
- Fish
- Marine Mammals
- Reptiles
- Birds
- Bats
- Terrestrial Biological Resources.

3.2.1 AFFECTED ENVIRONMENT

3.2.1.1 Habitat Overview

The proposed project's test site is located in Penobscot Bay, Maine. The site contains habitat used by benthic communities (species that live on or in the sea floor), demersal species (species that live and feed near the bottom), and pelagic species (species that live and feed away from the bottom).

The substrate at the test site is primarily fine grain sediment (i.e., mud). Muddy habitats typically have lower diversity and productivity than other marine habitats, though they are important in making plankton and detritus available to higher trophic levels (Gulf of Maine Council 2005). The nearshore subtidal habitat is marked by shell hash (shells of dead shellfish) and coarser grain sediment.

The intertidal area is dominated by rockweed (*Fucus vesiculosus*). The land rises very steeply from the intertidal zone, and terrestrial habitat is typical temperate coastal scrub, dominated by coniferous trees and shrubs. No wetlands are located at the site. Figure 3-1 shows views of the terrestrial vegetation in the area where the cable will be deployed. Terrestrial resources are further discussed further in Section 3.2.1.8.

Figure 3-1. View of the property where the onshore cable would be deployed, looking toward shore (top) and inland (bottom).

3.2.1.2 Invertebrates

Penobscot Bay supports a diverse variety of marine invertebrate species. A number of studies have characterized the invertebrate population in Penobscot Bay including those conducted by the Environmental Protection Agency (EPA 2007, benthic grabs for its Environmental Monitoring and Assessment Program [EMAP]), Maine-New Hampshire Inshore Trawl Surveys

(Sherman et al. 2010), and the Gulf of Maine Research Institute (angling and dive surveys, Sherwood et al. 2012). In addition to these sources of information, in 2012 UMaine conducted a diver survey along the cable route.

EPA's EMAP survey of eastern Penobscot Bay indicates that the benthic infauna is likely comprised, in order of highest count in samples, of Nephtyidae (catworms), *Haplocytheridea setipunctata* (an ostracod – a planktonic crustacean), *Aricidea suecica*, among other polycheate species (EPA 2007). The UMaine diver survey documented that sites very close to shore were dominated by sand dollars (*Echinarachnius parma*) and starfish (*Pisaster brevispinus*). However, 400 feet offshore the habitat transitions from coarse grain shell hash to fine muds; no species were observed other than sparse tube forming polychaetes (segmented worm) (Kennedy 2012).

Although no other conspicuous signs of macroinvertebrates were observed at the site by UMaine during diver surveys, trawl surveys conducted by the Maine Department of Marine Resources (DMR, the Maine-New Hampshire Inshore Trawl Surveys) indicate that the following invertebrates are relatively common elsewhere in Penobscot Bay: blue mussel (*Mytilus edulis)*, sea scallop (*Placopecten magelanicus*), American oyster *(Crassostrea virginica)*, Northern quahog (*Mercenaria mercenaria*), softshell clam (*Mya arenaria)*, green sea urchin *(Strongylocentrotus droebachiensis)*, daggerblade grass shrimp (*Palaemonetes pugio*), northern shrimp (*Pandalus borealis*), sevenspine bay shrimp (*Crangon septemspinosa*), American lobster (*Homarus americanus*), Jonah crab (*Cancer borealis*), Atlantic rock crab (*C. irroratus*), and green crab (*Carcinus maenas)* (Sherman et al. 2010) (Sherman et al. 2010). Atlantic rock crabs, green crabs, mussels, sea urchins, sea stars, and periwinkles (*Littorina littorea*) were the dominant macroinvertebrates documented in the project vicinity during angling and dive surveys conducted by researchers from the Gulf of Maine Research Institute (Sherwood et al. 2012). Lobsters are present in the area, as demonstrated by the presence of lobster buoys throughout the area offshore Castine (Kennedy 2012).

3.2.1.3 Fish

Penobscot Bay supports a diverse variety of finfish species. The Maine-New Hampshire Inshore Trawl Survey (Sherman et al. 2010) represents the best known source for fish species composition in the area. During a survey conducted during the time of the year that the project would be deployed, 34 fish species were captured in the sampling region that includes Penobscot Bay (Table 3-1) (Sherman et al. 2010). Many of the common marine species in Table 3-1 are uncommon as far up Penobscot Bay as Castine (e.g., redfish [*Sebastes fasciatus*], Atlantic cod [*Gadus morhua*], and haddock [*Melanogrammus aeglefinus*]), whereas some of the more estuarine species may regularly enter the test site (e.g., Atlantic herring [*Clupea harengus*], winter flounder [*Pseudopleuronectes americanus*], and windowpane flounder [*Scophthalmus*

aquosus]). This was demonstrated by the Gulf of Maine Research Institute during sampling in 2010, when sampling indicated that marine fish were relatively less common at the test site than at sites closer to the open ocean (Sherwood et al. 2012).

Table 3-1. Summary of fish species most commonly captured in the Maine-New Hampshire Inshore Trawl Survey in or near Penobscot Bay, May 2010.

Common Name	Scientific Name	Number Sampled
Atlantic herring	*Clupea harengus*	51
Alewife	*Alosa pseudoharengus*	47
Silver hake	*Merluccius bilinearis*	44
American plaice	*Hippoglossoides platessoides*	38
Winter flounder	*Pseudopleuronectes americanus*	34
Longhorn sculpin	*Myoxocephalus octodecemspinosus*	27
Windowpane flounder	*Scophthalmus aquosus*	25
Blueback herring	*Alosa aestivalis*	22
Red hake	*Urophycis chuss*	20
White hake	*Urophycis tenuis*	18
Witch flounder	*Glyptocephalus cynoglossus*	18
Rainbow Smelt	*Osmerus mordax*	16
Redfish	*Sebastes fasciatus*	13
Haddock	*Melanogrammus aeglefinus*	12
Pollock	*Pollachius virens*	9
American shad	*Alosa sapidissima*	8
Atlantic cod	*Gadus morhua*	7
Fourbeard rockling	*Enchelyopus cimbrius*	7

Less than 10 individuals of 20 other fish species also were captured, as were 20 shrimp (*Pandalus* sp.), a macroinvertebrate. Source: Sherman et al. 2010

Three fish species, all anadromous, listed under the ESA have the potential to occur in the project area:

- Atlantic salmon (*Salmo salar*) Gulf of Maine Distinct Population Segment are federally endangered;
- Shortnose sturgeon (*Acipenser brevirostrum*) are federally endangered; and
- Atlantic sturgeon (*A. oxyrinchus oxyrinchus*) are listed as federally threatened for the Gulf of Maine Distinct Population Segment (DPS) and federally endangered for the New York Bight DPS[2].

[2] NMFS (2012) estimated that 1% of Atlantic sturgeon in the Penobscot River are New York Bight origin, based on a mixed stock analysis conducted in the Bay of Fundy, Canada that concluded that 1% of Atlantic sturgeon in the Bay of Fundy were New York Bight origin.

The project site is not located within designated critical habitat for the Atlantic salmon Gulf of Maine Distinct Population Segment, and no other critical habitat designated by NMFS occurs in Maine (letter from NMFS to DOE dated November 16, 2012). No state-listed fish species occur in the project area.

NOAA Fisheries, U.S. Geological Survey, and UMaine have been deploying and maintaining an array of acoustic receivers in the Penobscot River since 2005, as well as throughout the Gulf of Maine, to gather information on a variety of tagged fish distribution and movement. There is a detection buoy located near the test site, and it is part of an array of seven detection buoys that extends across eastern Penobscot Bay off of Dyce Head (Zydlewski 2012). Species they typically detect are Atlantic salmon (smolts), Atlantic sturgeon, spiny dogfish (*Squalus acanthias*), striped bass (*Morone saxatilis*), and shortnose sturgeon (Zydlewski et al 2011). Between 200 and 400 Atlantic salmon, 15 and 25 Atlantic sturgeon, and 25 and 40 shortnose sturgeon were tagged each of the last three years in the Penobscot River system and available for detection at the Dice Head array (Zydlewski 2012). This array would be in operation during the project deployment and would allow for monitoring of the presence of tagged species.

Under the Magnuson-Stevens Fishery Conservation Act of 1998 (16 U.S.C. 1801 et seq.; MSA) the waters of Penobscot Bay that include the project area have been designated as essential fish habitat (EFH) for 16 federally managed fish species (Table 3-2). EFH is broadly defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (1996 Amendments (PL 104-267) to the MSA). EFH for the species listed in Table 3-2 varies by species and life stage, and includes all portions of the water column as well as substrate types, such as soft bottom, hard bottom, or various mixtures of hard and soft (NOAA 2012).

Table 3-2. Marine species and life stages for which Essential Fish Habitat occurs in the portion of Penobscot Bay that includes Castine.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic salmon *(Salmo salar)*			X	X
Atlantic cod *(Gadus morhua)*		X	X	X
pollock *(Pollachius virens)*			X	
whiting *(Merluccius bilinearis)*			X	X
red hake *(Urophycis chuss)*			X	X
white hake *(Urophycis tenuis)*			X	X
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
yellowtail flounder *(Limanda ferruginea)*	X	X		
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*	X	X	X	X

Species	Eggs	Larvae	Juveniles	Adults
ocean pout *(Macrozoarces americanus)*	X	X	X	X
Atlantic sea scallop *(Placopecten magellanicus)*	X	X	X	X
Atlantic sea herring *(Clupea harengus)*		X	X	X
bluefish *(Pomatomus saltatrix)*			X	X
Atlantic mackerel *(Scomber scombrus)*			X	X
bluefin tuna *(Thunnus thynnus)*				X

Source: NOAA 2012.

In a letter to DOE dated November 16, 2012, NMFS stated that the waters in the vicinity of Castine support populations of diadromous species including blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), rainbow smelt (*Osmerus mordax*), striped bass, American eel (*Anguilla rostrata*), and American shad (*Alosa sapidissima*). NMFS noted that diadromous fish serve as prey for a number of federally-managed species and several species are considered a component of EFH pursuant to the MSA.

3.2.1.4 Marine Mammals

The Gulf of Maine is host to numerous marine mammals including large and small whale species, and three species of seals. Five ESA-listed whales that have the potential to occur in the Gulf of Maine are North Atlantic right (*Eubalaena glacialis*), fin (*Balaenoptera physalus*), humpback (*Megaptera novaeangliae*), sei (*B. borealis*), and sperm (*Physeter macrocephalus*) whales. None of these species were observed during the 17 boat-based visual surveys UMaine conducted from March through June 2012 in the project vicinity (Kennedy 2012). Right whales are present year-round in the Gulf of Maine, but sightings are uncommon in nearshore waters (Letter from NMFS to DOE dated November 16, 2012). Humpback whales are typically seen in waters off the coast, and fin, sei, and sperm whales are typically found in deeper offshore waters and are not likely to occur in the action area (Letter from NMFS to DOE dated November 16, 2012). The project is not located within any critical habitat of whale species (Letter from NMFS to DOE dated November 16, 2012).

During the 2012 boat-based visual surveys, UMaine observers counted 66 harbor seal (*Phoca vitulina)*, one grey seal (*Halichoerus grypus*), and 34 harbor porpoise (*Phocoena phocoena*). Individuals of these three marine mammal species combined, were found at a density of 0.38 animals/km^2 (Kennedy 2012). In addition to these species, in a letter to DOE dated November 16, 2012, NMFS stated that minke whale (*B. acutorostrata*) Atlantic white-sided dolphin (*Lagernorhynchus acutus*), common dolphin (*Delphinus delphis*), short- and long-finned pilot whales (*Globicephala macrohynchus* and *G. melas*), and Kogia (pygmy sperm whale, *Kogia breviceps*) are also found in Maine coastal waters.

3.2.1.5 Reptiles

All sea turtles are protected under the ESA. Although sea turtle sightings are uncommon in the Gulf of Maine, leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), and Atlantic Ridley (Kemp's Ridley) (*Lepidochelys kempi*) sea turtles are known to occur there. The leatherback and Atlantic Ridley are endangered and the loggerhead is threatened under the ESA. The proposed project is not located within any critical habitat for marine turtles, and no turtles were observed during the boat-based visual surveys in the Castine Test Site vicinity over 17 weeks from March through June 2012 (Kennedy 2012).

3.2.1.6 Birds

Castine lies on the west side of the Blue Hill peninsula and on the northwest bank of the Bagaduce River, which is a 12-mile stretch of flowing tidal water that converges into Penobscot Bay. The BioDiversity Research Institute has created a Ranking of Bird Use map that categorizes areas from High to Low bird use. Near Castine and in the area surveyed in this report, bird use rates as "low" (BioDiversity Research Institute, 2012).

During UMaine's 17 boat-based surveys from March through June of 2012, a total of 1,009 birds, representing 33 identified species, were recorded, with the three most abundant species being common eider (*Somateria mollissima*, 38%), herring gull (*Larus argentatus*, 20%), and common loon (*Gavia immer*, 9%) (Kennedy 2012). A list of the most common bird species observed is presented in Table 3-3.

Table 3-3. Most common bird species observed offshore of Castine.

Common name	Scientific name	Total number	No. of observations
Common eider	*Somateria mollissima*	379	28
Herring gull	*Larus argentatus*	206	154
Common loon	*Gavia immer*	95	75
Black guillemot	*Cepphus grylle*	57	48
Ring-billed gull	*Larus delawarensis*	41	29
Double-crested cormorant	*Phalacrocorax auritus*	39	26
Unidentified duck species		35	12
Red-throated loon*	*Gavia stellata*	18	13
American crow	*Corvus brachyrhynchos*	17	11
Turkey vulture	*Cathartes aura*	16	3
Red-breasted merganser	*Mergus serrator*	13	3

*25 species other species were also observed in lesser numbers. Asterisk indicates Bird of Conservation Concern-species. Source: Kennedy 2012.

There are two ESA-listed birds that have the potential to occur in the project area, federally endangered roseate tern (*Sterna dougallii)* and federally threatened piping plover (*Charadrius melodus*). One unidentified tern (*Sterna* sp.) and no piping plovers were observed during the UMaine field surveys (Kennedy 2012).

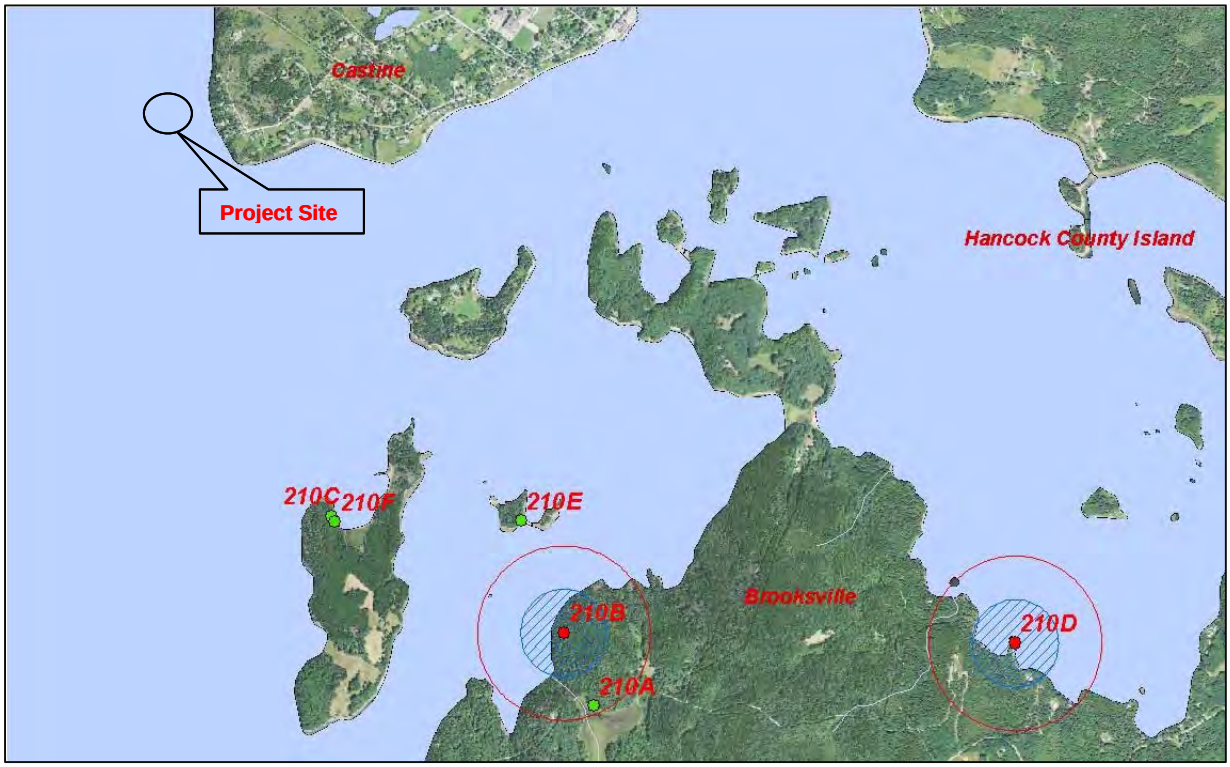
Bird species listed under the Maine ESA are listed in Table 3-4 and also include roseate tern and piping plover, which are both listed as state endangered. Regarding the unidentified tern that was documented during the UMaine survey, Maine lists two additional species of terns in the genus Sterna: least tern (*S. antillarum*), which is listed as state endangered and Arctic tern (*S. paradisaea*), which is listed as state threatened. Two other state listed bird species were observed during the UMaine field surveys: two razorbills (*Alca torda*, state threatened) and one peregrine falcon (*Falco peregrines*, state endangered) were seen (Kennedy 2012).

Table 3-4. Bird species listed under the Maine Endangered Species Act.

Common name	Scientific name
Maine Endangered Species	
American Pipit*	*Anthus rubescens*
Black Tern	*Chlidonias niger*
Golden Eagle	*Aquila chrysaetos*
Grasshopper Sparrow	*Ammodramus savannarum*
Least Bittern	*Lxobrychus exilis*
Least Tern	*Sterna antillarum*
Peregrine Falcon*	*Falco peregrinus*
Piping Plover	*Charadrius melodus*
Roseate Tern	*Sterna dougallii*
Sedge Wren	*Cistothorus platensis*
Maine Threatened Species	
Arctic Tern	*Sterna paradisaea*
Atlantic Puffin	*Fratercula arctica*
Barrow's Goldeneye	*Bucephala islandica*
Black-crowned Night Heron	*Nycticorax nycticorax*
Common Moorhen	*Gallinula chloropus*
Great Cormorant*	*Phalacrocorax carbo*
Harlequin Duck	*Histrionicus histrionicus*
Razorbill	*Alca torda*
Short-eared Owl*	*Asio flammeus*
Upland Sandpiper	*Bartramia longicauda*

*Breeding population only
Source: MDIFW 2012.

The USFWS created a list of species requiring special conservation action and awareness: the Birds of Conservation Concern 2008 (USFWS 2008). Species of Conservation Concern counted in the project area included 18 red-throated loons (*Gavia stellata*), three bald eagles (*Hailaeetus leucocephalus*), one peregrine falcon (*Falco peregrines*), two razorbills (*Alca torda*), and one unidentified tern. The most recent bald eagle nest sites close to the test site are approximately 2.5 miles south of the test site on Brooks Island (Figure 3-2).



Map courtesy of C.Todd (Maine Department of Inland Fisheries and Wildlife). Source: Kennedy 2012.

Figure 3-2. Locations of most recent bald eagle nest sites in project vicinity (210B and 210D).

3.2.1.7 Bats

Eight species of bats occur in Maine, based upon their normal geographical range. These are the little brown bat (*Myotis lucifugus*), northern long-eared bat, (*M. septentrionalis*), eastern small-footed bat (*M. leibii*), silver-haired bat (*Lasionycteris noctivagans*), tri-colored bat (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), and hoary bat (*Lasiurus cinereus*) (DeGraaf and Yamasaki 2001). The red bat, hoary bat, and silver-haired bat are migratory in the region, while the other species seek hibernacula in natural and man-made structures, including buildings, tree cavities, caves, and rock crevasses (UMaine 2011). None of these species is listed under the ESA.

Bats become active in early spring after emerging from hibernation. To understand the composition of the bat assemblage during the later period of the deployment, surveys were conducted from the tower of the Dyce Head Lighthouse in Castine, the nearest feasible monitoring location to the site at which the test turbine is to be deployed. An acoustic detector was deployed on the tower of the Dyce Head Lighthouse on May 22, 2012, and operated nightly through July 10, 2012. A total of 797 bat call sequences were recorded during this period. Between 0 and 107 call sequences were recorded per night, with an overall activity level of 15.9 call sequences per detector-night. Bats were detected during 42 out of 50 surveyed nights (84 percent). Of the 797 recorded call sequences, 422 (53 percent) were identified to species or guild. Call fragments that were too short to be identified were classified as either high frequency or low frequency "unknown" (Stantec 2012). Results by species are as follows:

- 235 calls - big brown bat/silver-haired bat guild, including the big brown bat and silver-haired bat;
- 153 calls - *Myotis* genus;
- 19 calls - eastern red bats;
- 15 calls - hoary bats;
- 228 calls – high frequency unknown (likely includes eastern red bats, tri-colored bats, and *Myotis* species); and
- 147 call – low frequency unknown (likely includes big brown, silver-haired, and hoary bats) (Stantec 2012).

3.2.1.8 Terrestrial Biological Resources

The terrestrial portion of the project area from the tidal habitat to the point of electrical interconnection is typical temperate coastal scrub habitat dominated by coniferous trees and shrubs. Above the intertidal zone, the terrestrial habitat rises steeply, transitioning to a combination of trees (i.e., firs, spruces, larch, juniper, and birch were all noted at the site) and shrubs (primarily *Rosa rugosa*, staghorn sumac [*Rhus hirta*], and similar undergrowth common to coastal temperate Maine) (Figure 3-1). There are no hardwoods in the area, and it is therefore likely that this area is a transitional forest, not a mature forest. The cable would be laid along the ground for 300 feet and cross one residential property, for which landowner permission has been granted and an agreement is in place.

Common terrestrial fauna that could be expected to occur in the project area includes white tail deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), red squirrel (*Tamiasciurus hudsonicus*), striped skunk (*Mephitis mephitis*), long-tail weasel (*Mustela frenata*), bats (see Section 3.2.1.7), eastern garter snake (*Thamnophis sirtalis*), black capped chickadee (*Poecile atricapillus*), American crow (*Corvus brachyrhynchos*), and blue jay (*Cyanocitta cristata*).

3.2.2 ENVIRONMENTAL IMPACTS RELATED TO BIOLOGICAL RESOURCES

The marine components of the project may have the following potential effects on biological resources:

- Alteration of habitat;
  - direct effects on marine life from deployment on and removal from the seabed of the anchors and subsea cable and
  - changes to the marine community composition at the deployment site (e.g., use patterns, attraction, aversion);
- Above-water collision of birds and bats; and
- Underwater collision and entanglement – marine mammals.

In this section these potential effects on marine life, as well as potential effects on terrestrial biological resources, are evaluated as follows:

- Invertebrates
- Fish
- Marine Mammals
- Reptiles
- Birds
- Bats
- Terrestrial Biological Resources
- Threatened and Endangered Species.

The potential effects of noise are discussed in Section 3.3.

3.2.2.1 Invertebrates

Some benthos would be disturbed during the deployment of the four anchors and the subsea cable on the seabed, and during their removal from the seabed. Specifically, the placement of anchors and the cable could cover or injure slow-moving or immobile benthic organisms, such as bivalves, sand dollars, and worms directly beneath the anchors and cable. Removal of the anchors and cable could also potentially harm slow-moving or immobile benthic organisms. UMaine plans to use drag embedment anchors because this anchor type minimizes impacts to the seafloor compared to other anchor designs, works with the bottom conditions at the proposed site, and is easily removed at project completion. During installation, drag embedment anchors would be pulled about 50 feet in order to set them with 10 feet of penetration. It is anticipated that half of this distance would be within the substrate below the seabed surface. This would cause disruption to the seabed, potentially killing slow-moving or immobile benthic organisms,

though any effect would be very minor considering the scale of and effect of commercial fishing bottom dragging operations. The actual footprint of project components resting on the seabed would consist of the four anchors (combined footprint of 64 ft^2 at most) and the subsea cable and strip weights (combined footprint of about 357 ft^2). In the event that gravity anchors are used instead of drag embedment anchors, each anchor would have a footprint of 100 ft^2 for a combined footprint of 400 ft^2. Mobile invertebrates would likely move away from the immediate vicinity of the project during deployment and removal activities. The area of the seabed that would be disturbed or covered by the anchors or subsea cable would be small for this 1/8-scale test turbine, and because the turbine would be deployed less than four months, any effects would be temporary.

3.2.2.2 Fish

Fish would likely move away from the immediate vicinity of the project during deployment and removal activities. It is anticipated that due to the small scale of the project and the short duration of deployment and removal activities there would be minimal disturbance to fish caused by deployment and removal of project components.

The presence of floating turbine platforms in the water column may result in altered use of the area by fish and a resulting change in the marine community composition in the following ways:

- Artificial reef effect[3] - The anchors, mooring lines, below-water portions of the turbine platform, and subsea cable could provide habitat for biofouling organisms and structure-oriented fish.
- Fish aggregation device (FAD) effect – Fish are also known to aggregate around floating objects (Nelson 2003), which is often called a FAD effect.
- Avoidance of the project area by resident and migratory species – For commercial-scale offshore wind projects, concerns have been raised that resident or migratory species might avoid wind farms.

These potential effects were discussed in detail in DOE's EA for the Monhegan Project (DOE 2011). The degree to which the project would affect use of the area by marine life would be minimized, and would not affect populations of species that use the area, because of:

- The small spatial scale of the project (revised to be even smaller – only one 1/8-scale platform, associated moorings, and a subsea cable deployed on the surface of the seabed);
- The deployment of the project in an existing subsea cable ROW;

[3] An artificial reef is a human-made underwater structure, typically built for the purpose of promoting marine life in areas of generally featureless bottom.

- The short duration of installation activities - the short period of time required for deployment and removal minimizes the potential avoidance of the area of marine species; and
- The short duration of the project - biofouling organisms would have only four months to grow before the platform would be removed, which minimizes the artificial reef effect of the platform.

As discussed in Section 3.2.1, there are a number of federally managed fish species with EFH in waters off of Castine (Table 3-2). Habitat types that represent EFH include all portions of the water column or substrate types, such as soft bottom, hard bottom, and various mixtures of hard and soft (NOAA 2012). The footprint of the anchors and cable might slightly decrease available bottom foraging habitat and areas considered to be EFH. However, the maximum area covered by the anchors (combined area of about 64 ft^2 for drag embedment anchors, 400 ft^2 if gravity anchors are used) and the 2½-inch subsea cable and associated strip weights (footprint of about 357 ft^2) would be very small and the type of habitat to be disturbed is very prevalent along the Maine coast. Placement of anchors and the subsea cable in areas of soft bottom substrate would likely result in a temporary and localized increase in turbidity during deployment and removal; with only four anchors to be deployed, this effect would be small scale and short term. As discussed above, mobile species such as fish, would likely avoid the immediate deployment area during project installation activities. Project deployment activities for the marine components of the project are expected to total five days (two days to deploy the four anchors, one day to deploy the floating turbine platform, and two days to deploy the subsea cable). Project removal activities would take a similar amount of time. Therefore, any shift in habitat use by marine or diadromous species during installation or removal activities would be small scale and temporary.

3.2.2.3 Marine Mammals

During surveys in the project vicinity, 66 harbor seals, one gray seal, and 34 harbor porpoise were observed. No large whales were observed (Kennedy 2012). Harbor seals, gray seals, and harbor porpoise would likely avoid the immediate vicinity of the project during deployment and removal activities. A slight increase in vessel traffic associated with the project installation and maintenance would be negligible for this small scale and temporary project. While the potential for a vessel and marine mammal interaction is unlikely, NMFS marine mammal avoidance procedures, in compliance with the Marine Mammal Protection Act, would be implemented in the event that a marine mammal is encountered by a service vessel. The small scale of the project and the short duration of deployment and removal activities are expected to minimize any disturbance to marine mammals caused by deployment and removal of the project.

The presence of floating turbine platforms in the water column and floating above the water may result in temporary altered use by marine life. For example, seals are known to haul out on

nearly any accessible floating platform. UMaine is implementing design measures to prevent seal haul out (the platform deck will be raised several feet above the water level). As discussed in the previous section, because of the small size and temporary nature of the project, it is not expected that it would change the habitat or the marine community in the deployment area in other ways (e.g. artificial reef effect, FAD effect, avoidance of the project area by resident and migratory species).

The remainder of this section evaluates the potential that marine mammals may become entangled, or collide, with the project mooring lines. Marine mammals in the Gulf of Maine are exposed to a variety of anthropogenic structures in the water column, including moored navigation aids and oceanographic buoys, anchored and moving ships, and lobster buoys. Moored vessels are common in harbors, such as Castine Harbor, and other locations along the Maine coast. During the UMaine biological surveys, researchers documented densities of lobster buoys as high as 9.9 buoys/km^2 in the project vicinity (Kennedy 2012).

Marine mammals have evolved to avoid colliding with natural features as well as to avoid predators. For example, many toothed whales have a well-developed ability to echolocate and avoid structures in the water (Akamatsu et al. 2005). In a study of finless porpoise (*Neophocaena phocaenoides*), Akamatsu et al. (2005) found that this species inspected ahead a distance of up to 250 feet and swam less than 65 feet without using sonar. Researchers concluded that the distance inspected was sufficient to provide awareness of any risk ahead (Akamatsu et al. 2005). Seals have well-adapted underwater vision (Schusterman and Balliet 1970) and use their vibrissae to detect changes in pressure or vibrations in the water (Dehnhardt et al. 2001; Mills and Renouf 1986). Because of the acute sensory capabilities of toothed whales (echolocation) and the small size and maneuverability of seals, it is expected that the marine mammal species that occur in the project area would be able to detect and avoid underwater moorings.

There is generally more uncertainty regarding the ability of baleen whales, which do not use sonar, to avoid mooring lines. However, whale collisions with moored ships and buoys are uncommon. Also, large whales are not expected to occur in the project area, which is located in upper Penobscot Bay relatively close to shore.

In addition, the mass/buoyancy of the platform and mass of the anchors is expected to create substantial tension in the mooring lines. These factors would prevent the formation of loops around a passing whale. The potential for heavy mooring gear combined with relatively taut mooring lines to entangle whales has been shown to be negligible (Wursig and Gaily 2002).

In the event that the turbine is removed from the moorings for some reason (e.g., severe weather), the synthetic/wire rope or chain mooring lines would be connected to a light mooring

rope and dropped to the bottom of the seafloor. The mooring rope would be connected to a floating mooring ball so that the steel portions of the mooring line can be later retrieved and re-connected to the platform. With the synthetic/wire rope or chain on the seafloor, the mooring lines would not be an entanglement hazard. The light mooring ropes would be similar to lobster pot lines which are very common in the area and along the Maine coast.

In addition, it is unlikely that large whales would encounter the project because of the small size of the project relative to surrounding open ocean area of Penobscot Bay, the fact that the platform would be temporarily deployed for up to only four months, and that large whale presence at the project area is unlikely.

3.2.2.4 Reptiles

Potential effects to the three sea turtle species that may occur off of Maine, which are listed under the ESA, are discussed in Section 3.2.2.8.

3.2.2.5 Birds

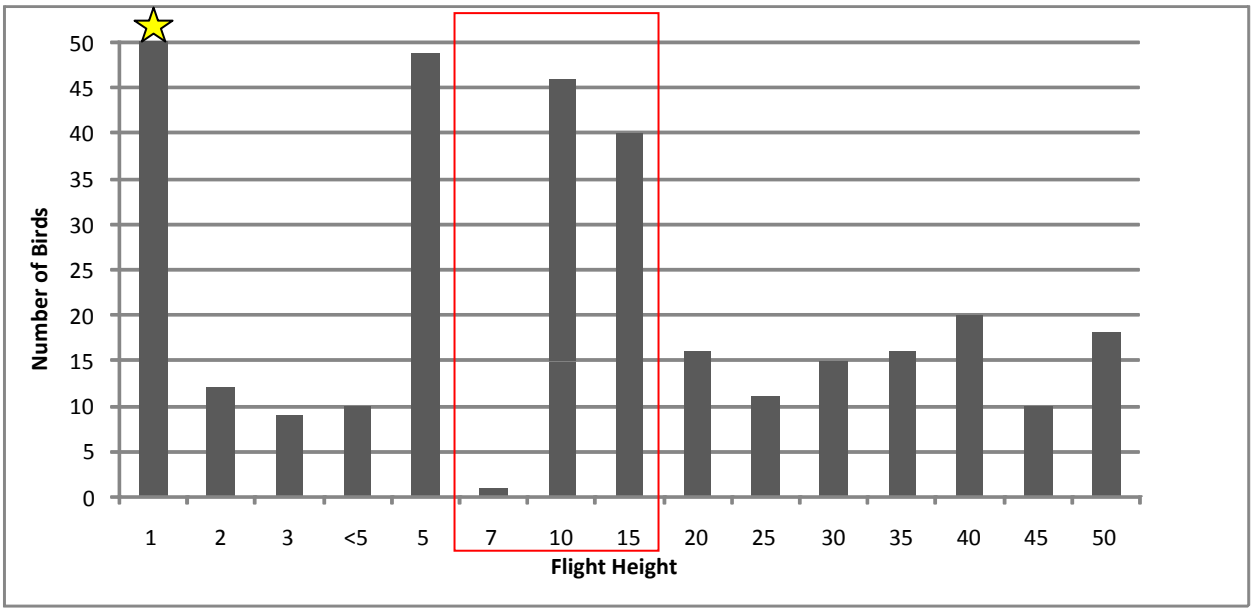
The presence of a turbine platform floating above the water may result in temporary altered use of the area for seabirds by providing a place to roost. UMaine would implement measures to minimize bird attraction and roosting. For example, the turbine would not have external ladders or other structures that would allow birds to perch near the turbine blades.

The operation of the proposed project would introduce static and moving above-water components at the site, potentially within the flyway of birds. During project operation, migrating and foraging birds could be at risk of colliding with the turbine. As described below, the probability of birds being killed or injured by the 1/8-scale turbine is low.

While varying with location, the national average of collision-related mortality for birds at land-based commercial wind farms is less than three birds per commercial-scale turbine (i.e., larger than about 1 megawatt) per year (Erickson et al. 2001). The Castine turbine would be lit at night with a flashing sequence for the purposes of navigational safety. Some bird species such as petrels and migrating songbirds can be attracted to light during nighttime and diurnal conditions with poor visibility (UMaine 2011), which could put such species at a higher risk of collision with the turbine.

The proposed turbine would have a rotor sweep zone ranging from approximately 25 feet to 57 feet above the water surface (actual rotor diameter of 31.5 feet). Of the 456 flying birds observed during the 17 surveys UMaine conducted between March through the end of June 2012, the majority flew at or under 16.4 feet (5 meters) and 40% flew at 3.2 feet (1 meter) high.

Approximately 19% flew between heights of the rotor sweep zone (Figure 3-3). Herring gulls, ring-billed gulls (*Larus delawarensis*), and common loons were the most common species to be flying in the height range of the rotor (Kennedy 2012).



The yellow star represents a total of 183 birds at one meter high. The red box shows the approximate height range of the turbine rotor. Source: Kennedy 2012.

Figure 3-3. Flight heights for bird species observed during UMaine 2012 visual surveys.

Some birds might collide with the turbine and be killed or injured during the four-month deployment. However, the rotor swept area would be 779 feet^2, which is much smaller than the 1/3 scale turbines evaluated at the Monhegan site, which had a rotor swept area of 6,165 feet^2, almost 8 times larger. The relatively small rotor diameter of the Castine 1/8-scale turbine, and the temporary nature of the deployment, would minimize collision risk for birds. During the period of deployment, boat based visual surveys of birds would be performed on site weekly and a web camera would be deployed on the unit to monitor bird strikes. Visual observation methods will replicate the pre-deployment monitoring.

3.2.2.6 Bats

As with birds, the operation of the proposed project would introduce static and moving above-water components at the site, potentially within the flyway of bats. During project operation, bats could be at risk of colliding with the turbine. As described below, the probability of bats being killed or injured by the 1/8-scale turbine is low.

Bat fatalities at wind energy facilities appear to be highest along forested ridgetops in the eastern U.S. and lowest in relatively open landscapes in the midwestern and western states (Kunz et al. 2007). A consistent theme in most of the mortality monitoring studies conducted at utility-scale wind farms has been the predominance of migratory, tree-roosting species among the fatalities. Of them, nearly 75 percent were tree-roosting, eastern red bats, hoary bats, and tree cavity-dwelling silver-haired bats (Kunz et al. 2007).

The results of the bat surveys conducted during the summer of 2012, demonstrated that bats are present at the Dyce Head Lighthouse, and it is expected that these bats may occasionally fly over the water or cross the mouth of the Penobscot River to forage at nearby islands or to access land on the opposite side of the bay (Stantec 2012). The surveys could not identify the height at which the bats were flying (Stantec 2012), and it is expected that bats thus flying over the water could be exposed to the turbine.

Some bats might collide with the turbine and be killed or injured during the four-month deployment. However, the relatively small rotor diameter of the Castine 1/8-scale turbine, and the temporary nature of the deployment, would minimize collision risk for bats. In addition, because the proposed project is not located near a forested ridgeline and is instead located about 500 to 1,000 feet from the shore in open water, the probability of bat fatalities at the test site is very low.

3.2.2.7 Terrestrial Biological Resources

For the terrestrial portion of the project, the cable, contained in a conduit, would be laid on and anchored to the ground for up 300 feet from the high tide line to the interconnect point. Some trimming of vegetation might be needed along the centerline of the conduit path, but no trimming would occur beyond three feet of that path. Deployment of the terrestrial portion of the project is expected to take two weeks. Following the approximately four-month (or less) deployment of the floating turbine platform, the cable would be removed. Because of the very small footprint of the shore component of the project, the design of the project so as to minimize terrestrial disturbance, and the short duration and subsequent removal of the project, the project effects to the terrestrial environment would be minimal and temporary.

3.2.2.8 Threatened and Endangered Species

For the larger floating wind turbine platforms proposed for deployment at the Monhegan test site and evaluated in the September 2011 DOE EA, NMFS in a letter dated February 22, 2011, concurred with DOE that the project may affect, but would not likely adversely affect ESA-listed fish, marine mammals, and sea turtles or EFH under the Magnuson-Stevens Fishery Conservation and Management Act. NMFS also concurred that impacts to protected marine

mammals are unlikely to occur. In a letter dated August 18, 2011, USFWS concurred with DOE that the project effects are likely to be insignificant and discountable and would not likely adversely affect the ESA-listed roseate tern and piping plover (DOE 2011). As described below, the effects of temporarily deploying a single 1/8-scale platform and turbine at the Castine site would have similar or less effects than those identified for testing at the Monhegan site.

Three ESA-listed fish species, Atlantic salmon, shortnose sturgeon, and Atlantic sturgeon, have the potential to occur in the project area. All three species were detected at the Dice Head acoustic detection array during monitoring from 2009 to 2011. Movements through the array were seasonal with Atlantic salmon movements focused in May, Atlantic sturgeon movements throughout the year but focused in May and October, and shortnose sturgeon movements occurring from May to July (Zydlewski 2012). These three species use the project area as a migration corridor. This part of Penobscot Bay is very expansive and quite deep, and the project would not obstruct these species as they swim into and out of the Penobscot River and estuary. The small size of this research project relative to the surrounding marine habitat, the short nature of the deployment, the limited time these migratory fishes would be in the project site, and the overall lack of potential mechanism for effect to fish, all minimize the risk of effect to these three species.

Five ESA-listed whales that have the potential to occur in waters offshore of Maine are North Atlantic right, fin, humpback, sei, and sperm whales. None of these species were observed during the 17 boat-based visual surveys (Kennedy 2012), nor are they expected to occur near shore in the upper Penobscot Bay where the project is located. The likelihood of exposure of ESA-listed whales to the proposed project is extremely small, given that ESA-listed whales are uncommon in the project area, the small size of the project relative to the surrounding Penobscot Bay, and the fact that the platform would be temporarily deployed for up to only four months. In addition, the mass/buoyancy of the platform and mass of the anchors is expected to create substantial tension in the mooring lines, which would prevent the formation of loops around a passing animal. In the event that the turbine is removed from the moorings for some reason (e.g., severe weather), the synthetic/wire rope or chain mooring lines would be connected to a light mooring rope and dropped to the bottom of the seafloor. The mooring rope would be connected to a floating mooring ball so that the steel portions of the mooring line can be later retrieved and re-connected to the platform. With the synthetic/wire rope or chain on the seafloor, the mooring lines would not be an entanglement hazard. The light mooring ropes would be similar to lobster pot lines which are very common in the area and along the Maine coast.

There are three ESA-listed sea turtles with the potential to occur in the Gulf of Maine: Atlantic Ridley, loggerhead, and leatherback sea turtles. Sea turtle sightings in the Gulf of Maine are rare, and these species are very unlikely to occur near shore in upper Penobscot Bay where the project is located. The likelihood of exposure of sea turtles to the proposed project is extremely

small given that sea turtles are uncommon in the project area, the small size of the project relative to the surrounding Penobscot Bay, and the fact that the platform would be temporarily deployed for up to only four months. Also, the substantial tension in the mooring lines would prevent the formation of loops that could entangle a passing animal. No other potential effects on sea turtles are anticipated.

There are two ESA-listed birds and a number of state-listed birds that have the potential to occur in the project area. Of these, only one unidentified tern (*Sterna* sp.), two razorbills, and one peregrine falcon were observed during the UMaine field surveys (Kennedy 2012)[4]. Because the proposed project would be small scale and have a short operational duration, there is a minimal likelihood that listed species would be harmed by the turbine rotor.

3.2.3 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, DOE would not fund the proposed project, installation and operation of the 1/8-scale floating wind turbine would not occur, and there would be no impacts to biological resources. Baseline conditions, as described in Section 3.2.1, would remain unchanged.

3.3 Noise and Vibration

3.3.1 AFFECTED ENVIRONMENT

Existing noise levels in the project area are expected to be typical of a near-shore/estuarine setting having relatively high boat traffic because of its proximity to Castine Harbor. In the marine/estuarine environment, a variety of natural and anthropogenic sources create ambient noise, both intermittent and continuous. Sources of ambient noise include waves, wind, bubbles and spray, marine life, seismic events, commercial and recreational vessel traffic, and thermal noise from random agitation of water molecules (Bradley and Stern 2008; Richardson et al. 1995). Ambient noise pressure spectral densities can range from about 35 to 80 decibels (referenced to one micropascal squared per hertz [re 1 $\mu Pa^2/Hz$]) for usual marine traffic (10 to 1,000 hertz), and 20 to 80 decibels (re 1 $\mu Pa^2/Hz$) for breaking waves and associated spray and bubbles (100 to 25,000 hertz; Richardson et al. 1995).

During the boat-based visual survey at the Castine project site, observation of boat traffic occurred during 17 surveys from April to June 2012. A total of 13 boats were observed while

[4] Roseate tern is federally and state endangered, least tern is state endangered, and Arctic tern is state threatened. Razorbill is state threatened and peregrine falcon is state endangered.

surveys were performed. Six of the boats were various types of sailing vessels, four were assorted private motorized boats, and the remaining three were fishing vessels for lobster or fish.

The Port of Searsport is located northwest, across Penobscot Bay from Castine, and the Penobscot River ports of Bucksport and Bangor are located north of Castine, up the Penobscot River. NOAA navigation charts identify two Recommended Vessel Routes that run the length of Penobscot Bay, and the edge of the nearest route is located approximately 3,000 feet west of the proposed deployment location.

In the open ocean setting, the primary noise sources tend to be commercial shipping and wind and wave action on the sea surface (Richardson et al. 1995). Noise sources are expected to be similar at the project site, though upper Penobscot Bay, being more sheltered than the open ocean, would not have as much wind and wave action compared to the open ocean. Anthropogenic sources of noise in the project area would include fishing and recreational boats originating from Castine Harbor and elsewhere, as well as periodic traffic of larger ships and barges associated with the ports to the north of Castine.

3.3.2 ENVIRONMENTAL IMPACTS RELATED TO NOISE AND VIBRATION

The installation, operation, and removal of the floating wind turbine and subsea cable would result in a temporary increase in underwater noise created from service vessels and equipment, similar to vessels commonly used throughout the coast, and may temporarily cause marine life to avoid the project area. The Renewegy 20 kW turbine creates noise levels of about 50 dB at 120 feet (Renewegy 2012). For comparison, a 2-person conversation is about 47 dB (Bradley and Stearn 2008). At 500 to 1,000 feet, noise from operation of the wind turbine would decrease to a level that would likely not be detectable or would be barely audible to people on shore, close to the project (i.e. Dyce Head). In addition, during windy periods, turbine noise would be dampened by ambient noise (e.g., wind and waves) and during calm periods, the turbine would spin less or not all, resulting in less or no noise.

The predominant source of noise during project installation, maintenance, and removal would be the service vessels' propellers (MMS 2007). As discussed in Section 2.2.7, the pilot prototype unit and its anchorages would be installed using Maine Maritime Academy's unlimited tugboat *The Pentagoet*, or a similar vessel. *The Pentagoet* is 70 feet long and is powered by a 1,200 HP design engine. It is expected that the peak underwater sound intensity, generated by a tug fully underway, would be no greater than 130 to 160 decibels (re 1 μPa) over a frequency range of 20 hertz to 10 kilohertz (Richardson et al. 1995). The tug or smaller research vessels should be fully underway only when traveling to and from the test site. It is expected that most of the time during project activities the sound intensity would be much lower.

During project installation, maintenance, and removal, it is expected that the above-water sounds from the support vessels and equipment would not be transmitted into the water at a higher level than natural environmental noise from wind and wave action. The Federal Regulatory Commission, in its environmental assessment for the Makah Bay Wave Energy Project in Washington, concluded that above-water sounds from support vessels and equipment would be largely damped by ambient ocean noise on all but the calmest of days (FERC 2007).

UMaine expects installation of the marine components of the project would take a total of about five days (two days to deploy the four anchors, one day to deploy the turbine platform, and two days to install the subsea cable). Project removal activities would take a similar amount of time. Underwater noise associated with the installation, maintenance, and removal activities might cause some fish, marine mammals, birds, and other marine life to avoid the project area; however, this would be short term, with behavior returning to normal after the service vessels leave the site.

Noise created during project operation would be from the mechanical motion of the internal turbine components as well as the aerodynamic interaction of the rotor blades with the surrounding air. Sound levels underwater resulting from turbine noise transferred through the sea surface are expected to be substantially lower than the sound source levels, due to the reflective nature of the sea surface (Jones et al. 2010). Acoustic emissions underwater, due to vibrations of the turbine and platform structure, are expected to be low frequency and low amplitude, and are strongly dependent on turbine and platform configuration and dynamic loads (Jones et al. 2010). Because of the low level of noise created by a Renewegy 20 kW turbine, the temporary nature of the deployment, and because only a small amount of sound can transfer through the sea surface from above, underwater noise levels resulting from turbine operation are expected to be very low.

Threatened and Endangered Species

Noise associated with project installation, maintenance, and removal activities might cause threatened and endangered fish, whales, birds, and sea turtles to avoid project service vessels, as they might avoid any vessels commonly used along the coast. Any avoidance of service vessels associated with the temporary project would be infrequent and short term with behavior returning to normal after the service vessels leave the site. Effects of project noise would be minimized because of the small scale and temporary nature of the turbine, the low likelihood that listed species would be exposed to the project, the low level of turbine noise to begin with, and because only a small amount of sound is expected to result from transfer of above-water sound through the sea surface.

3.3.3 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, DOE would not fund the proposed project, installation and operation of the 1/8-scale floating wind turbine would not occur, and there would be no change in noise conditions in the project area. Baseline conditions, as described in Section 3.2.1, would remain the same.

3.4 Ocean and Land Use

3.4.1 AFFECTED ENVIRONMENT

3.4.1.1 Commercial Fishing

Commercial fisheries play an important role in Maine's economy. Commercial fish and shellfish species of value include American lobster, Atlantic herring, Atlantic salmon (aquaculture), and soft shell clam. In 2011, Maine's commercial fishing industry landed approximately 50 million pounds of fish in Hancock County and approximately 2.5 million pounds of fish in Waldo County, which includes the east and west sides of Penobscot Bay, respectively (DMR 2012b).

Currently, the largest commercial fishery in Penobscot Bay, and Maine in general, is for American lobster. Statewide, lobster accounts for 36% of the live catch by weight and 77% by commercial value as of 2011 (DMR 2012b). UMaine's surveys demonstrated that the area around Castine, including the project area, is targeted by lobster fishermen (Kennedy 2012).

Small pelagic fish are caught using both mid-water trawls and weirs and include such species as herring, menhaden, and sand eels. Of these, Atlantic herring is Maine's most valuable pelagic fishery, with nearly 29,000 tons landed in 2009. While the last cannery in the region closed in April 2010, Atlantic herring remains a critical industry and is the primary bait used by the lobster fishery (UMaine 2011). Herring landings statewide over the last decade ranged from 28,898 to 57,912 tons and were valued from $4.6 to $10.7 million. The NOAA Estuarine Living Marine Resources Program compiled information on the distribution and abundance of all life stages of Atlantic herring in estuaries in New England (Jury et al. 1994). Compared to Mid-Atlantic estuaries, adults and juveniles were 'highly abundant' in the northernmost estuaries (Passamaquoddy Bay through Penobscot Bay). Larvae were 'highly abundant' from Englishman-Machias Bays through the Sheepscot River (Jury et al. 1994), an area which includes Penobscot Bay.

The groundfish fishery, or "Northeast multispecies fishery" is managed by the New England Fishery Management Council and NMFS, is primarily an offshore industry (UMaine 2011), and is not applicable to upper Penobscot Bay. With the exception of Atlantic herring, commercial

landings in Maine of species represented commonly in the Maine-New Hampshire Trawl Surveys in the region that includes Penobscot Bay, are mostly very low compared to historical records in the Gulf of Maine and many have trended downward over the decade of the 2000s (DMR 2010).

3.4.1.2 Recreation

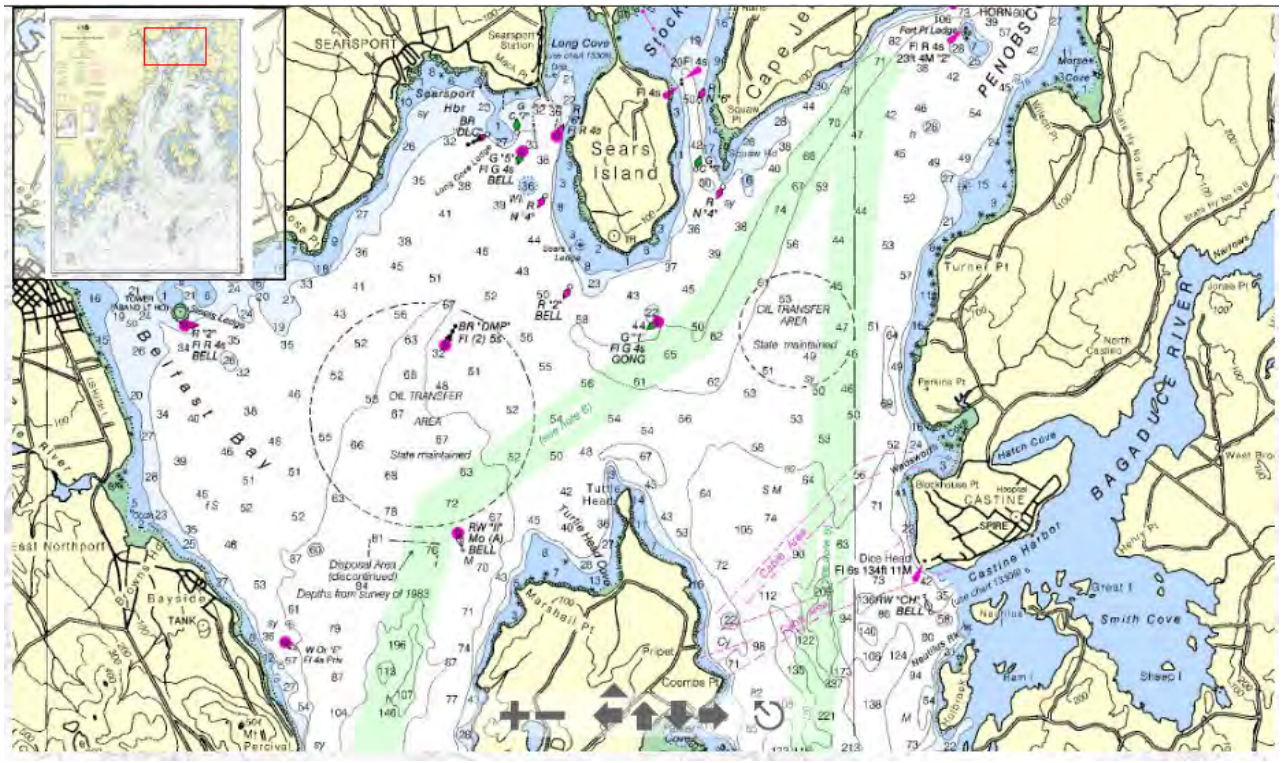
Within Hancock County, which includes the east side of Penobscot Bay, there are six for-hire boats, and within Waldo County, which includes the west side of Penobscot Bay, there are two for-hire boats (DMR 2012a). A number of recreational boating opportunities are available in Castine, including kayaking, boat tours, and sailing (e.g., Castine Yacht Club)(Town of Castine 2012b). The Maine Windjammer Association represents a fleet of 13 traditional Maine tall ships, ranging in size from 46 to 132 feet that offer windjammer cruises out of Rockland, Rockport, and Camden, all located on the west side of lower Penobscot Bay (Maine Windjammer Association 2012). Each summer, lobster boat races are held at Rockland. Additionally, the Gulf of Maine Ocean Racing Association promotes yacht racing in the ocean waters in the Gulf of Maine, including Penobscot Bay (Gulf of Maine Ocean Racing Association 2012). Maine Maritime Academy (2012) also offers a variety of sailing and boating opportunities to its students.

Maine coastal towns are valued for their unique aesthetic character and nautical history. Visitors from around the nation and from other parts of Maine are drawn to the Blue Hill peninsula, which includes Castine, by the scenic natural beauty and historical resource, such as Dyce Head Lighthouse, established in 1828. The grounds are open to the public daily until sunset.

3.4.1.3 Navigation

There are three major ports in Maine: Portland, Searsport, and Eastport. Of these, Castine is closest to Searsport (approximately 6.5 miles to the northwest of the test site). Currently, Maine's three cargo ports handle over 1.5 million tons of dry cargo collectively and roughly 125 million barrels of petroleum products have been handled by Portland and Searsport. In 2007, 33 percent of dry cargo was handled in the Penobscot ports (Searsport, Bucksport, and Bangor) (Maine Dept. of Transportation 2012a). In addition to large-scale commercial shipping, many of Maine's harbors have short-distance freight activity to transport goods and services. Figure 3-4 shows the location of major shipping lanes (Recommended Vessel Routes) in Penobscot Bay.

There are two ferry routes in Penobscot Bay: Lincolnville to Ilsesboro and Rockland to Vinalhaven/North Haven (Maine Dept. of Transportation 2012b). These ferry routes are approximately nine and 18 miles, respectively, southwest of the test site.



Source: http://www.charts.noaa.gov/OnLineViewer/13302.shtml

Figure 3-4. NOAA chart (13302) showing Recommended Vessel Routes (green shade) in upper Penobscot Bay.

3.4.1.4 Land Use

As previously mentioned, the terrestrial portion of the project would occur on Dyce Head, north of the light house, in an area dominated by spruce forest and scrub/shrub undergrowth. There are no wetlands. The cable would be laid along the ground across about 300 feet and cross one residential property, from which landowner permission has been granted. The cable would connect to a CMP pole next to the property's driveway.

3.4.2 ENVIRONMENTAL IMPACTS RELATED TO OCEAN AND LAND USE

This section evaluates the potential project effects to the following:

- Ocean use
  - Commercial fishing,
  - Recreation, and
  - Navigation
- Land Use

3.4.2.1 Commercial Fishing

When deployed, a navigation safety zone would be established extending around the turbine platform to a distance of approximately 100 feet beyond the anchors. The moorings have a radius of 600 feet, so the navigation safety zone would have a radius of 700 feet, centered on the turbine. This corresponds to an area of approximately 35 acres in which commercial fishing and other public access would be prohibited for the period during which the project is deployed. A navigation safety zone would also extend along the cable. Access would be permitted over the cable safety zone, but anchoring and deploying lobster traps would be prohibited. The development of the Navigational Safety Plan is discussed further in Section 3.4.2.3.

As mentioned, lobstering is prevalent in Penobscot Bay and the project area, as it is along the entire Maine coast. During deployment and removal operations, notice would be given to the Maine Marine Patrol and the USCG to alert fishermen about towing operations and to advise for the removal of gear from the planned tow route.

With the exception of the exclusion zone around the floating platform, lobstering and commercial fishing are expected to otherwise continue in this area. Given the relatively small size of the area covered by the navigation safety zone and the short duration during which the zone would be in effect, the project is anticipated to only minimally reduce or limit lobstering or commercial fishing activities.

3.4.2.2 Recreation

Recreational fishermen are expected to continue fishing activities in the greater Castine/eastern Penobscot Bay area with the only change being that they would not be able to enter the 35-acre turbine exclusion area or anchor along the cable route. Any boat that is approaching the turbine platform would have to alter their course by a maximum of 700 feet, and the test site is not expected to affect recreational boaters or cruising vessels approaching or leaving Castine Harbor or navigating through Penobscot Bay. The relatively small area of the navigation safety zone in comparison to the rest of Penobscot Bay and the short duration of the turbine deployment would unlikely reduce the recreational fishing, recreational boating and cruising, and other recreation activity that occurs in the area.

3.4.2.3 Navigation

The nearest ports to the project are Searsport, located northwest across Penobscot Bay from Castine, and the Penobscot River ports of Bucksport and Bangor. There are two Recommended Vessel Routes that run the length of Penobscot Bay and the edge of the nearest route is located approximately 3,000 feet west of the proposed deployment location.

Staff of Maine Maritime Academy, which is a partner with UMaine for this project, have developed a navigation safety plan for the project with the USCG Waterways Management division in Boston. In order to prevent vessels from getting hung up on project moorings, a "Navigation Safety Zone" would be established along the cable and within a 700-foot radius around the floating turbine platform. This designation would prohibit all mariners from entering the turbine platform zone, or anchoring along the cable route, for up to four months during which the turbine is deployed. This zone around the turbine would prevent vessels from dragging, anchoring, or fishing within the radius of the anchors and mooring lines.

The turbine would have two lights on the tower, at a height of 20 feet above the water, one on each side of the tower structure. Each light would be a 360°, white flashing light, flashing two short followed by one long flash every four seconds (Morse letter "U"), and visible for at least six miles. The turbine also would have a red Federal Aviation Administration light.

The turbine tower would be clearly labeled (e.g., DCW-1). The label would be large enough and high enough to be readily identifiable to a small vessel nearby. The label would be painted in a contrasting color, retro-reflective material, of a letter size not less than three feet high. The USCG would produce a Local Notice To Mariners warning mariners of the location of the project.

The Navigation Safety Plan, as summarized above, and the small and temporary nature of the project, minimizes the chance of boat collisions with the project.

3.4.2.4 Land Use

For the terrestrial portion of the project, the cable, contained in a conduit, would be laid on and anchored to the ground for up to 300 feet from the high tide line to the interconnect point. Following the approximately four-month project deployment, the cable would be removed.

The cable would cross one private residential property, from which landowner permission has been granted. It would not cross any other properties, and there are no other land use types in the proposed cable pathway. The terrestrial habitat consists of a combination of trees and shrubs. The footprint of the shore component of the project would be small, the cable and other components would be designed and located to minimize terrestrial disturbance (i.e., laying the cable in a conduit on the ground, and not burying it or suspending it from poles), and those components would be deployed for a short duration and removed at the end of the project.

3.4.3 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, DOE would not fund the proposed project, installation and operation of the 1/8-scale floating wind turbines would not occur, and there would be no potential impacts to commercial fishing, navigation, and recreation in the project area. Baseline conditions, as described in Section 3.6.1, would remain unchanged.

3.5 Cultural Resources

3.5.1 AFFECTED ENVIRONMENT

More than 100 historic markers occur in Castine (Town of Castine 2012a), a town characterized by its 18th century Greek revival and federal architecture (National Historic Register 2012). The National Historic Register (2012) lists three historic or archeological districts and four historic properties in Castine:

- Castine Historic District (Figure 3-5, encompasses all of the below sites except for Off-the-Neck Historic District),
- Pentagoet Archeological District,
- Off-the-Neck Historic District,
- Fort George,
- *Bowdoin* (schooner),
- Cate House, and
- John Perkins House.

The Castine Historic District (Figure 3-5) was added to the National Register of Historic Places in 1973. The Pentagoet Archeological District is the site of a trading post built by the French during the 17th century located on the shore of Castine Harbor (National Historic Landmarks Program 2012). The Off-the Neck Historic District is located north of the Castine peninsula, facing the Bagaduce River, and contains a number of dwellings, many in the Federal style of architecture (Downeast and Acadia 2012). Fort George is an earthworks fort built by the British in 1779 during the American Revolutionary War. It has been partially restored as a state memorial. The *Bowdoin* is a historic ship built in 1921 for Arctic exploration and owned by Maine Maritime Academy. Cate House and Perkins House both located in the Village of Castine, are historic colonial residences (National Historic Register 2012). Also, Dyce Head Lighthouse is listed in the inventory of historic light stations and is included in the Castine Historical District. These sites are evaluated in the following environmental impacts section to determine whether they are in the Area of Potential Effects.

Shipwrecks represent an important component of the nautical history of Maine. Perhaps the most well-known shipwrecks in Penobscot Bay were associated with the Penobscot Expedition, an American Revolutionary era expedition to prevent the construction of Fort George. The closest of the known Penobscot Expedition shipwrecks to the proposed test site is that of the privateer *Defence* (Riess and Daniel 1997), which is located in Stockton Harbor, 5.5 miles to the northwest. Other shipwrecks in Penobscot Bay are mostly early 20th century shipwrecks located on ledges in southern Penobscot Bay around North Haven, Vinalhaven, and Islesboro (US Naval Shipwreck Database accessed 2012).

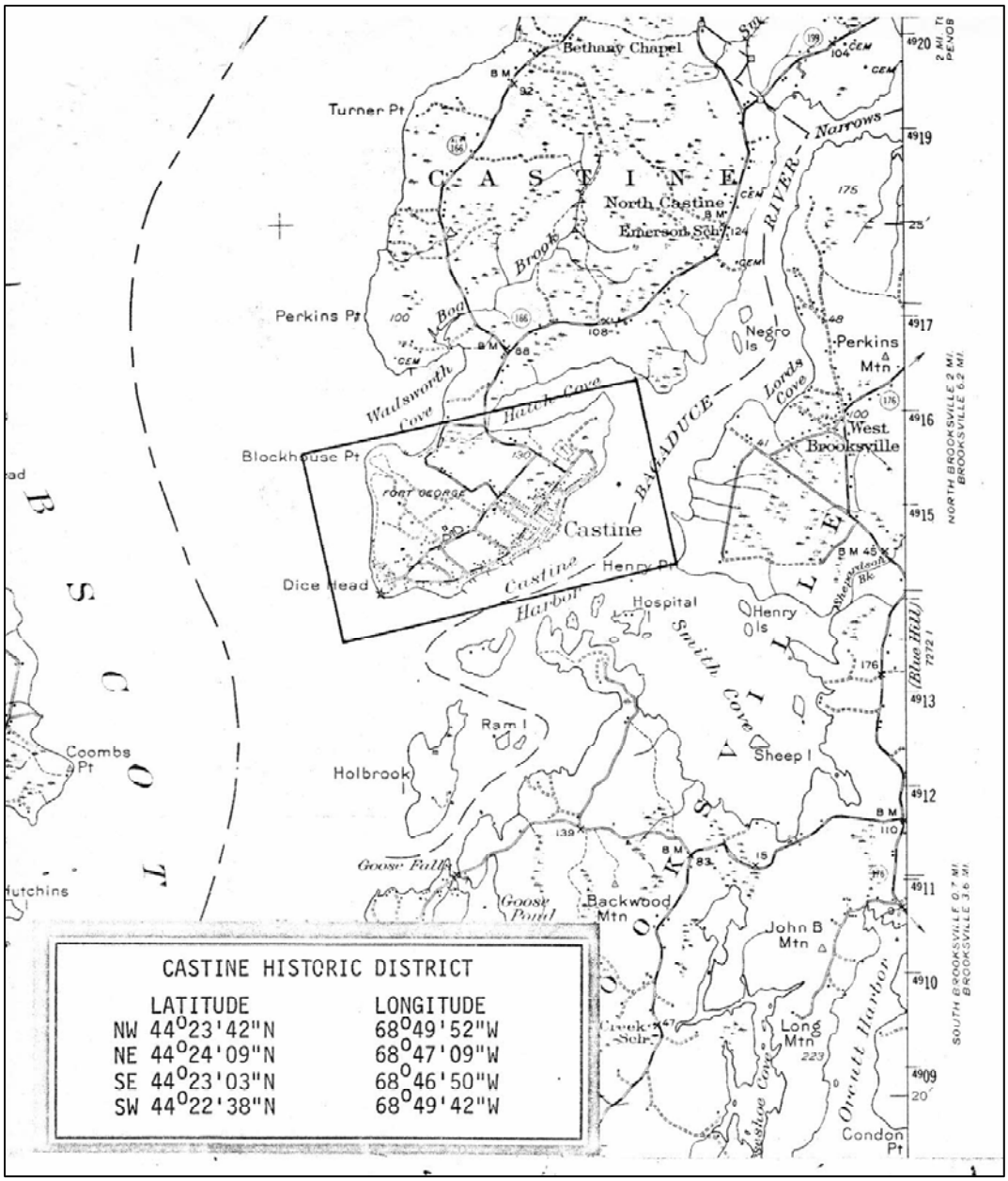


Figure 3-5. Castine Historic District (rectangle).

3.5.2 ENVIRONMENTAL IMPACTS RELATED TO CULTURAL RESOURCES

The Penobscot Indian Nation and the Aroostook Band of Micmacs, both in transmittals dated November 29, 2012, indicated that the project did not affect any sites of tribal significance. To comply with obligations under Section 106 of the National Historic Preservation Act, DOE has defined the area of potential effects to historic properties based on two components. First, the area of the seabed that would be directly disturbed by deployment of anchors is included to account for the potential direct effects of the project on shipwrecks. During installation, drag embedment anchors would be pulled about 50 feet in order to set them with 10 feet of penetration. It is anticipated that half of this distance would be within the substrate below the seabed surface. The actual footprint of each anchor would be at most 16 ft^2, with the four anchors therefore having a combined footprint of about 64 ft^2 and the footprint of the subsea cable and strip weights would be about 357 ft^2. In the event that gravity anchors are used, each anchor would have a footprint of 100 ft^2 for a combined footprint of 400 ft^2. Second, the area of the Castine peninsula from which the platform and turbine could be visible is included to address indirect impacts from a change in the viewshed from historic properties; the Castine Historic District as shown in Figure 3-5 has an area of three square miles.

The turbine platform would be located in a previously disturbed cable ROW to minimize the risk of disturbing shipwrecks or other underwater cultural resources. No known shipwrecks have occurred in the project area and no signs of shipwrecks were observed during UMaine's diver surveys conducted in 2012 within the proposed project site. As directed by the Maine SHPO, UMaine staff consulted with Dr. Warren Riess, a marine archaeology professor at UMaine, to further evaluate whether any Penobscot Expedition shipwrecks or other related historic resource concerns could be located in the project area (Pers. comm. R. Reed, Maine SHPO with D. Brady, UMaine, October 18, 2012). In correspondence with SHPO staff, Dr. Reiss stated "…that all of the known and assumed locations of the Penobscot Expedition vessel remains are well north of the proposed site, the only exception is the privateer *Defence*, which is miles west of Castine" (Pers. comm. Dr. W. Reiss, UMaine with R. Reed, Maine SHPO, October 19, 2012). Dr. Riess oversaw a magnetometer survey conducted at the proposed project site on December 10, 2012, and survey results confirmed that there are no shipwrecks at the site. SHPO stated in a letter dated January 2, 2013 that the project will have no adverse effect on historic properties as defined by Section 106 of the National Historic Preservation Act.

UMaine would locate the turbine off of the western shore of the Castine peninsula in part to minimize its visibility from historic properties. As such, it would not be visible from the Off-the-Neck Historic District or most occupied areas on the peninsula, including much of the Village of Castine, such as where the Cate and Perkins houses and the Pentagoet Archeological District are located and the schooner Bowdoin is docked. The closest historic property to the

proposed turbine location is the Dyce Head lighthouse, which is accessible to the public. The turbine would not be visible from that lighthouse (Figure 3-6) or from some other areas on the west side of the peninsula because of the steep shoreline and dense vegetation there. However, the turbine might be visible from some areas along the western portion of the Castine Historic District and from some of the higher points on the peninsula, such as where Fort George is located. There likely are some properties in the areas where the turbine could be viewed that are eligible for listing under the National Register of Historic Places. Because the 1/8-scale turbine would have a maximum height of 57 feet above the waterline, it would appear small from any location within the Castine Historic District or elsewhere on the peninsula, and would not dominate or otherwise substantially change the view from historic properties. In addition, because the turbine would be deployed for less than four months, any change in the view from an historic property would be temporary.

Figure 3-6. View from the base of Dyce Head Lighthouse toward the shore.

Based on this analysis, DOE has concluded in the Section 106 consultation letter to the Maine SHPO that there would be no direct adverse impacts to underwater historic properties from deployment and retrieval of the floating platform or indirect adverse impacts to the viewshed from historic properties on the Castine peninsula. SHPO concluded the same in their letter dated January 2, 2013.

3.5.3 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, DOE would not fund the proposed project, installation and operation of the 1/8-scale floating wind turbine would not occur. Therefore, no potential impacts to cultural resources would occur. Baseline conditions, as described in Section 3.5.1, would remain unchanged.

3.6 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources is defined as the loss of future options. The term applies primarily to the effects of use of nonrenewable resources such as minerals or cultural resources. It could also apply to the loss of an experience as an indirect effect of a "permanent" change in the nature or character of the land. An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of production foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production.

Irreversible commitments of resources would result from resources being consumed during construction of the project, including fossil fuels and construction materials, which would be committed for the less than one year-life of the project. Non-renewable fossil fuels would be lost through the use of gasoline and diesel-powered construction equipment during deployment and removal of one small-scale floating wind turbine, project operations, and monitoring efforts.

The 700-foot radius navigation safety zone around the turbine corresponds to an area of approximately 35 acres for which commercial fishing and other public access would be prohibited for the period during which the project components are deployed. In addition, anchoring or setting lobster pots would not be permitted along the cable route for the four-month project deployment. While there may be some resulting catch of lobster and fish foregone, fish and lobsters would still be able to be caught when they move outside the exclusion area.

The proposed project would not have other irreversible or irretrievable impacts because the project is short term and temporary; removal of the turbine after the second year of testing would restore the site for alternative uses, including all current uses. No loss of future ocean use options would occur.

3.7 The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term use of the environment, as the term is used in this document, is that used during the life of the project, whereas long-term productivity refers to the period of time after the project has been decommissioned and the equipment removed. As the proposed project would be temporary, there would not be a change in ocean use. The short-term use of the site for the proposed project would not affect the long-term productivity of the test site area.

4.0 CUMULATIVE IMPACTS

Cumulative impacts are those potential environmental impacts that result "from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Because of the small scale and temporary nature of the proposed project, any negative effects on existing human use of the area would be negligible and temporary.

Following testing of the proposed turbine at Castine for up to four months, UMaine is planning to move the turbine to the Monhegan site for additional testing. It is expected that the turbine would be tested for less than one month at the Monhegan site in 2013. In addition, UMaine may conduct testing at the Monhegan site the following year as well.

In October 2011, Statoil filed an Unsolicited Lease Application with the Bureau of Ocean Energy Management to develop a 12-MW pilot project, consisting of four 3-MW floating turbines in federal waters about 12 nautical miles southeast of Boothbay Harbor. Statoil is currently investigating the feasibility of the project with the State of Maine. Initially, Statoil planned to install the project in 2016.

UMaine is also beginning work on engineering and planning for the possible installation of a pilot floating offshore wind farm with two 6-MW direct-drive turbines on concrete semi-submersible foundations at the Monhegan test site. Pending required approvals by the Department of Energy and other regulatory agencies, the target date for deployment would be 2016.

During the four months that the 1/8–scale turbine would be deployed at Castine, combined with the subsequent deployment for up to one month at Monhegan, the proposed project might cumulatively add to the risk of foraging and migrating bird and bats colliding with man-made structures in the area. Birds and bats are known to collide with numerous man-made structures such as vehicles, buildings and windows, power lines, communication towers, and wind turbines. It is estimated that from 100 million to over 1 billion birds are killed annually in the U.S. due to collisions with manmade structures (Erickson et al. 2001).

The proposed future deployments by Statoil and UMaine in 2016 would occur at least three years after the Castine deployment has been removed. As discussed in this Supplemental EA, effects of the proposed project at the Castine site would be short term and would end with the removal of the project after four months or less of operation. Thus, the proposed deployment at Castine would not cumulatively contribute to other future effects of those projects.

5.0 REFERENCES

Akamatsu, T., D. Wang, K. Wang, and Y. Naito. 2005. Biosonar behaviour of free-ranging porpoises. *Proc. R. Soc. B* (2005) 272, 797–801. doi:10.1098/rspb.2004.3024. Published online 22 April 2005.

Biodiversity Research Institute. 2012. Birds, Bats, and Coastal Windfarm Development in Coastal Maine: Preliminary Ranking of Bird Use. Biodiversity Research Institute. [Online] URL: http://www.briloon.org/oae/the-science-of-bri/tracking-wildlife/birds-bats-costal-windfarm-development (Accessed July 29, 2012).

Bradley, D.L. and R. Stern. 2008. Underwater Sound and the Marine Mammal Acoustic Environment, A Guide to Fundamental Principles. Prepared for the U.S. Marine Mammal Commission. [Online] URL: http://www.mmc.gov/reports/workshop/pdf/sound_bklet.pdf (Accessed July 2008).

DeGraaf, R.M. and M. Yamasaki. 2001. New England Wildlife; Habitat, Natural History, and Distribution. University Press of New England, Hanover, NH. 482p. *cited in* Stantec 2012.

Dehnhardt, G., B. Mauck, W. Hanke and H. Bleckmann. 2001. Hydrodynamic Trail-Following in Harbor Seals (*Phoca vitulina*). *Science*. 293(5527): 102-104.

Downeast and Acadia. 2012. Castine Historic District. [Online] URL: http://www.downeastacadia.com/highlights/history/historic_districts/castine_historic_district/. Accessed November 2012.

Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, K.J. Sernka and R.E. Good. 2001. *Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States*. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyo., for the National Wind Coordinating Committee, Washington, D.C.

Federal Energy Regulatory Commission (FERC). 2007. *Environmental Assessment for Hydropower License. Makah Bay Offshore Wave Energy Pilot Project*. FERC Project No. 12751-000. May 21, 2007.

Gulf of Maine Council 2005. *Workshop Proceedings of Marine Habitats in the Gulf of Maine: Assessing Human Impacts and Developing Management Strategies*. 2005. Organized by the Gulf of Maine Council on the Marine Environment's Habitat Conservation

Subcommittee and The Nature Conservancy. Walpole, Maine. September 21–22, 2005. [Online] URL: http://www.gulfofmaine.org/council/publications/marine-habitat-workshop-proceedings.pdf.

Gulf of Maine Ocean Racing Association. 2012. Race Schedule. [Online] URL: http://www.gmora.org/shopcontent.asp?type=2012. Race Schedule (Accessed October 2012).

Jones, M., P. Ramuhalli, and M. Watkins. 2010. *Characterization of acoustic noise propagation from offshore wind turbines – white paper*. Pacific Northwest National Laboratory, Richland, WA. Unpublished.

Jury, S.H., J.D. Field, S.L. Stone, D.M. Nelson, and M.E. Monaco. 1994. Distribution and abundance of fishes and invertebrates in North Atlantic estuaries. ELMR Rep. No. 13, NOAA/NOS /Strategic Environmental Assessments Division, Silver Spring, MD. 221 p.

Kennedy, L. 2012. Visual Observations for Birds, Turtles, and Marine Mammals at the University of Maine Test Site near Castine, Maine. Prepared by Lubird Kennedy Environmental Services for the University of Maine's Advanced Structures and Composites Center. September, 2012.

Kunz, T.H., E. Arnett, W. Erickson, A. Hoar, G. Johnson, R. Larkin, M.D. Strickland, R. Thresher and M. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. *Font Ecol Environ* 5 (6): 315-324. [Online] URL: http://www.migrate.ou.edu/products/Kunz_etal1_07.pdf

Maine Department of Marine Resources (DMR). 2012a. Maine's Saltwater For-Hire Fleet Listing. [Online] URL: http://www.maine.gov/dmr/recreational/forhirefleet/index.htm (Accessed October 2012).

Maine Department of Marine Resources (DMR). 2012b. Most Recent Maine Commercial Landings. [Online] URL: http://www.maine.gov/dmr/commercialfishing/recentlandings.htm.

Maine Department of Marine Resources (DMR). 2010. Historical Maine Fisheries Landings Data. [Online] URL: http://www.maine.gov/dmr/commercialfishing/historicaldata.htm. (Accessed October 2012).

Maine Department of Transportation (MDOT). 2012a. Office of Freight and Business Services. Cargo Ports. [Online] URL: http://www.maine.gov/mdot/ofbs/cargo.htm. (Accessed October 2012).

Maine Department of Transportation (MDOT). 2012b. Maine State Ferry Service. [Online] URL: http://www.maine.gov/mdot/msfs/ (Accessed October 2012).

Maine Maritime Academy. 2012. Online [URL]: http://www.mainemaritime.edu/ (Accessed October 2012).

Maine Windjammer Association. 2012. About MWA. [Online] URL: http://www.sailmainecoast.com/fleetfacts.htm (Accessed October 2012).

Mills, F.H.J. and D. Renouf. 1986. Determination of the vibration sensitivity of harbour seal *Phoca vitulina* (L.) vibrissae. *Journal of Experimental Marine Biology and Ecology*. Volume 100, Issues 1-3, pp 3-9. September 1986.

Minerals Management Service (MMS). 2007. *Draft Programmatic EIS for alternative energy development and production and alternative use of facilities on the Outer Continental Shelf*. U.S. Department of the Interior. March 2007.

National Historic Landmarks Program. 2012. Pentagoet Archeological District. [Online] URL: http://tps.cr.nps.gov/nhl/detail.cfm?ResourceId=2148&ResourceType=. Accessed November 2012.

National Marine Fisheries Service (NMFS). 2012. Biological Opinion, Construction of new powerhouses at the Orono (2710) and Stillwater (2712) Projects; Fish passage improvements at the Orono, Stillwater and Milford (2534) Projects; Species Protection Plan for the Orono, Stillwater, Milford, West Enfield (2600) and Medway (2666) Projects. F~RJ2012/01568. August 31, 2012. [Online] URL: http://www.nero.noaa.gov/prot_res/section7/FERC-signedBOs/Black-BearHydroBO.pdf

National Oceanic and Atmospheric Administration (NOAA). 2012. Guide to Essential Fish Habitat Designations in the Northeastern United States. [Online] URL: http://www.nero.noaa.gov/hcd/index2a.htm. (Accessed October 2012).

National Register of Historic Places. 2012. Maine – Hancock County. [Online] URL: http://www.nationalregisterofhistoricplaces.com/me/Hancock/state.html. Accessed November 2012.

Nelson, P.A. 2003. Marine fish assemblages associated with fish aggregating devices (FADs): Effects of fish removal, FAD size, fouling communities, and prior recruits. *Fishery Bulletin*. 101: 835-850.

Renewegy. 2012. Archive for the 'Renewegy Blog' Category. [Online] URL: http://renewegy.com/category/blog/ (Accessed October 2012).

Richardson, W.J.; Greene, Jr., C.R.; Malme, C.I.; and Thomson, D.H. 1995. *Marine Mammals and Noise*. Academic Press, London.

Riess, W. and G. Daniel. 1997. Evaluation of preservation efforts for the Revolutionary War privateer *Defence*. International Journal of Nautical Archaeology 26: 330-338.

Schusterman, R.J. and R.F. Balliet. 1970. Visual Acuity of the Harbour Seal and the Steller Sea Lion Under Water. *Nature*. Vol. 226, No. 5245, pp. 563-564, 1970.

Sherman, S.A., Stepanek, K.L., King, C., Gowen, A.M., Tetrault, R., Michael, R., and Ekert, R. 2010. Annual Report on the Maine-New Hampshire Inshore Trawl Survey. Submitted to the NOAA Fisheries Northeast Region Cooperative Research Partners Program.

Sherwood, G. K. Wilson, J. Grabowski and T. Willis. 2012. Penobscot River Restoration: Monitoring Marine-Freshwater Food Web Linkages Using Stable Isotopes, Phase One sample collection and trial analysis. A final report to The Nature Conservancy.

Stantec Consulting Services, Inc (Stantec). 2012. Acoustic Bat Survey Report Dice Head Lighthouse Castine, Maine. Prepared for DeepCWind, University of Maine Darling Marine Center. August 2012.

Town of Castine. 2012a. [Online] URL: http://www.castine.me.us/index.html. Accessed November 2012.

Town of Castine. 2012b. Businesses. [Online] URL: http://www.castine.me.us/pages/business/business.html (Accessed October 2012).

U.S. Department of Energy (DOE). 2011. Final Environmental Assessment for University of Maine's Deepwater offshore Floating Wind Turbine Testing and Demonstration Project, Gulf of Maine. DOE, Office of Energy Efficiency and Renewable Energy, Golden Field Office. September 2011. Available online at: http://www.eere.energy.gov/golden/NEPA_FEA_FONSI.aspx.

U.S. Environmental Protection Agency (USEPA). 2007. Environmental Monitoring and Assessment Program (EMAP) Storage and Retrieval (STORET) Data Warehouse. 1998-2006. [Online] URL: http://www.epa.gov/storet/. (Accessed October 2012)

U.S. Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online] URL: http://www.fws.gov/migratorybirds/. (Accessed October 2012)

University of Maine (UMaine). 2011. *Draft Report on Existing Marine Resources and Draft Fish and Wildlife Monitoring Plan*. University of Maine Deepwater Offshore Wind Test Site. Unpublished. March 2011.

Wursig, B. and G.A. Gaily. 2002. Marine mammals and aquaculture: conflicts and potential resolutions. In Stickney, R.R. and J.P. McVay (Eds.) *Responsible Marine Aquaculture*. CAP International Press, New York, pp. 45-59.

Zydlewski, G.B. 2012. Dice Head Acoustic Receiver Array Detections 2009-2011. Data collected by: University of Maine, School of Marine Sciences and School of Biology and Ecology; NOAA Fisheries Maine Field Station, NEFSC; and USGS Maine Cooperative Fish and Wildlife Research Unit.

Zydlewski, G.B., Kinnison, M.T. , Dionne, P.E. , Zydlewski, J., Wippelhauser, G.S. 2011. Understanding habitat connectivity for shortnose sturgeon: the importance of small coastal rivers. *Journal of Applied Ichthyology* 47(Suppl. 1): 1-4.

APPENDIX A
CONSULTATION LETTERS

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

October 18, 2012

Mr. Mike Johnson
Marine Habitat Resource Specialist
National Marine Fisheries Service, Northeast Region
55 Great Republic Drive
Gloucester, MA 01930

Dear Mr. Johnson:

Subject: Request for Information - University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine

The U.S. Department of Energy (DOE) is proposing to award federal funding to the University of Maine to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. In September 2011 DOE completed an Environmental Assessment (EA) evaluating the potential effects of the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. In a letter dated August 6, 2011, your agency concurred with DOE's conclusions that (1) the proposed action is not likely to adversely affect any threatened or endangered species under your jurisdiction and (2) that adverse effects to essential fish habitat would be minimal. Your agency also stated in that letter that you did not anticipate any impacts to marine mammals from the proposed action.

The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine for initial testing (see attached figure). The University proposes to deploy a Renewegy wind turbine with a power rating of 20 kilowatts onto a floating platform. The platform would be located in an existing cableway in water that is 40 to 70 feet deep. The turbine would measure about 41 feet high from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be about 57 feet. The platform would be moored with drag embedment anchors and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable to be temporarily installed about 500 to 1,000 feet along the seabed to shore.

The platform would be deployed around March/April through July/August 2013, and its performance would be monitored to study the design prior to deployment in the open ocean at Monhegan Island. During the deployment at Castine, the University would use sensors and telemetry systems to be installed on the platform to evaluate how it performs under varying wind and wave conditions. Environmental monitoring for birds, bats, marine mammals, benthic invertebrates, and fish also would occur. Prior to DOE's involvement with the proposed Castine site test, the University conducted pre-deployment environmental monitoring and data collection for birds, bats, marine mammals, benthic invertebrates, and fish.

DOE understands that the University has reached out to you recently regarding their pre-deployment environmental monitoring for the Castine deployment. DOE requests that NMFS provide any information relevant to our federal obligations that relates to the referenced project (e.g., Endangered Species Act [ESA], Magnuson-Stevens Fishery Conservation and Management Act, Fish and Wildlife Coordination Act, and Marine Mammal Protection Act). Specifically, DOE requests a list of species listed under the ESA and proposed and designated critical habitat that may occur within or near the project site. DOE also requests that NMFS confirm the list of 17 federally managed fish species and respective life stages for which Essential Fish Habitat occurs in waters off of Castine, as presented in Table 1, which was developed from review of NMFS' *Guide to Essential Fish Habitat Designations in the Northeastern United States*.

Table 1 – Marine Species and Life Stages for which Essential Fish Habitat Occurs in Waters off of Castine

Species	Eggs	Larvae	Juveniles	Adults
Atlantic salmon *(Salmo salar)*			X	X
Atlantic cod *(Gadus morhua)*		X	X	X
pollock *(Pollachius virens)*			X	
whiting *(Merluccius bilinearis)*			X	X
red hake *(Urophycis chuss)*			X	X
white hake *(Urophycis tenuis)*			X	X
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
yellowtail flounder *(Limanda ferruginea)*	X	X		
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*	X	X	X	X

ocean pout *(Macrozoarces americanus)*	X	X	X	X
Atlantic sea scallop *(Placopecten magellanicus)*	X	X	X	X
Atlantic sea herring *(Clupea harengus)*		X	X	X
monkfish *(Lophius americanus)*				
bluefish *(Pomatomus saltatrix)*			X	X
Atlantic mackerel *(Scomber scombrus)*			X	X
bluefin tuna *(Thunnus thynnus)*				X

Source: NOAA. 2012. Guide to Essential Fish Habitat Designations in the Northeastern United States: http://www.nero.noaa.gov/hcd/STATES4/nmaine.htm. (Accessed October 2012)

DOE is in the process of developing a Supplemental EA to cover these new activities proposed at the Castine site. We will notify you when the Draft of that Supplemental EA is available for your review.

DOE looks forward to working collaboratively with NMFS regarding trust resources as they relate to this project. If you have any questions, please contact me at 720-356-1322 or via email at Laura.Margason@go.doe.gov.

Sincerely,

Laura Margason

Laura Margason
NEPA Document Manager

Attachment (map)

cc:

David Bean, National Marine Fisheries Service
Michelle Magliocca, National Marine Fisheries Service

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

October 18, 2012

Mr. Mark McCollough
Field Supervisor
U.S. Fish & Wildlife Service
17 Godfey Drive, Suite 2
Orono, ME 04473

Dear Mr. McCollough:

Subject: Request for Information - University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine

The U.S. Department of Energy (DOE) is proposing to award federal funding to the University of Maine to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. In September 2011 DOE completed an Environmental Assessment (EA) evaluating the potential effects of the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. In a letter dated August 18, 2011, your office concurred with DOE's conclusion that that proposed action may affect, but is unlikely to adversely affect, terrestrial threatened or endangered species.

The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine (see attached figure). The University proposes to deploy on a floating platform a Renewegy wind turbine with a power rating of 20 kilowatts. The platform would be located in an existing cableway in water that is 40 to 70 feet deep. The turbine would measure about 41 feet from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be up to about 57 feet, similar in size to a large sailboat. The platform would be moored with drag embedment anchors, which are similar to sailboat anchors, and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable to be temporarily installed about 500 to 1,000 feet along the seabed to shore. From just below the low tide line the cable would extend approximately 500 feet along the ground in a protective conduit to the point of interconnection at an existing power pole. The conduit would be removed at the end of the project.

The platform would be deployed from about March or April through to July 2013, and its performance would be monitored to study the design prior to deployment in the open ocean at Monhegan Island. During the deployment at Castine, the University would use sensors and telemetry systems to be installed on the platform to evaluate how it performs under varying wind and wave conditions. Environmental monitoring for birds, bats, marine mammals, benthic invertebrates, and fish also would occur. The University has already conducted pre-deployment environmental monitoring and existing data collection for birds, bats, marine mammals, benthic invertebrates, and fish for this site.

DOE understands that the University has reached out to you recently regarding pre-deployment environmental monitoring for the Castine deployment and for the 20kw turbine erection on the University of Maine campus for instrumentation prior to Castine deployment. DOE requests that USFWS provide any information relevant to our federal obligations that relates to the referenced project (e.g., Endangered Species Act [ESA]). Specifically, DOE requests a list of species listed under the ESA and proposed and designated critical habitat that may occur within or near the project site.

DOE is in the process of developing a Supplemental EA to cover these new activities off of Castine. We will notify you when the Draft of that Supplemental EA is available for your review.

The DOE looks forward to working collaboratively with the USFWS regarding trust resources as they relate to this project. If you have any questions, please contact me at 720-356-1322 or via my email at Laura.Margason@go.doe.gov.

Sincerely,

Laura Margason

Laura Margason
NEPA Document Manager

Attachment (map)

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 2, 2012

Chief Richard Getchell
Aroostook Band of Micmacs
7 Northern Road
Presque Isle, ME 04769

Subject: **University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine**

To Chief Richard Getchell:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the University of Maine (UMaine) to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. The objective of this project is to validate coupled aeroelastic/hydrodynamic computer models developed by the National Renewable Energy Laboratory and others for floating offshore wind turbines.

In September 2011 DOE completed an Environmental Assessment (EA) evaluating the potential effects of the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine (see attached figure).

The University proposes to deploy a 20 kilowatt power rated Renewegy wind turbine onto a moored floating platform. The platform would be located in an existing cableway in water that is 40 to 70 feet deep. The turbine would measure about 41 feet from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be up to about 57 feet. The platform would be moored with drag embedment anchors, which are similar to sailboat anchors, and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable to be temporarily installed about 500 to 1,000 feet along the seabed to shore. From just below the low tide line the cable would extend approximately 500 feet along the ground in a protective conduit to the point of interconnection at an existing power pole. The conduit would be removed at the end of the project.

The platform would be deployed for about four to five months, starting in the spring of 2013, and its performance would be monitored to study the design prior to deployment in the open ocean at Monhegan Island. During the deployment at Castine, the University would use sensors and telemetry systems installed on the platform to evaluate how it performs under varying wind and wave conditions. Environmental monitoring for birds, bats, marine mammals, benthic invertebrates, and fish would also take place post deployment. The University has already conducted pre-deployment environmental monitoring and data collection for birds, bats, marine mammals, benthic invertebrates, and fish for this site to assist in determining affects to these

resources.

A Supplemental Environmental Assessment (EA) is currently being prepared for the proposed Castine site project by the Department's Golden Field Office to meet the requirements of the *National Environmental Policy Act*. DOE will include correspondence with your tribe in an appendix to the EA. The draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room: http://www.eere.energy.gov/golden/NEPA_DEA.aspx. You will receive a notice of availability once the draft EA is posted. Please contact DOE if you would like to receive a hardcopy of the document.

Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Section 800.2(c)(5), DOE is requesting information your tribe may have on properties of traditional religious and cultural significance within the vicinity of the proposed deployment near Castine Harbor and any comments or concerns you have on the potential for this proposed project to affect those properties. This information is being requested to aid in the preparation of that Environmental Assessment and to comply with the National Historic Preservation Act. If you have any such information, require additional information, have any questions or comments about that project or would like DOE to initiate formal consultation, please contact Ms. Laura Margason the Golden Field Office as soon as possible at the following:

Ms. Laura Margason
U.S. Department of Energy
1617 Cole Boulevard
Golden, Colorado

Email: laura.margason@go.doe.gov

Thank you in advance for your consideration.

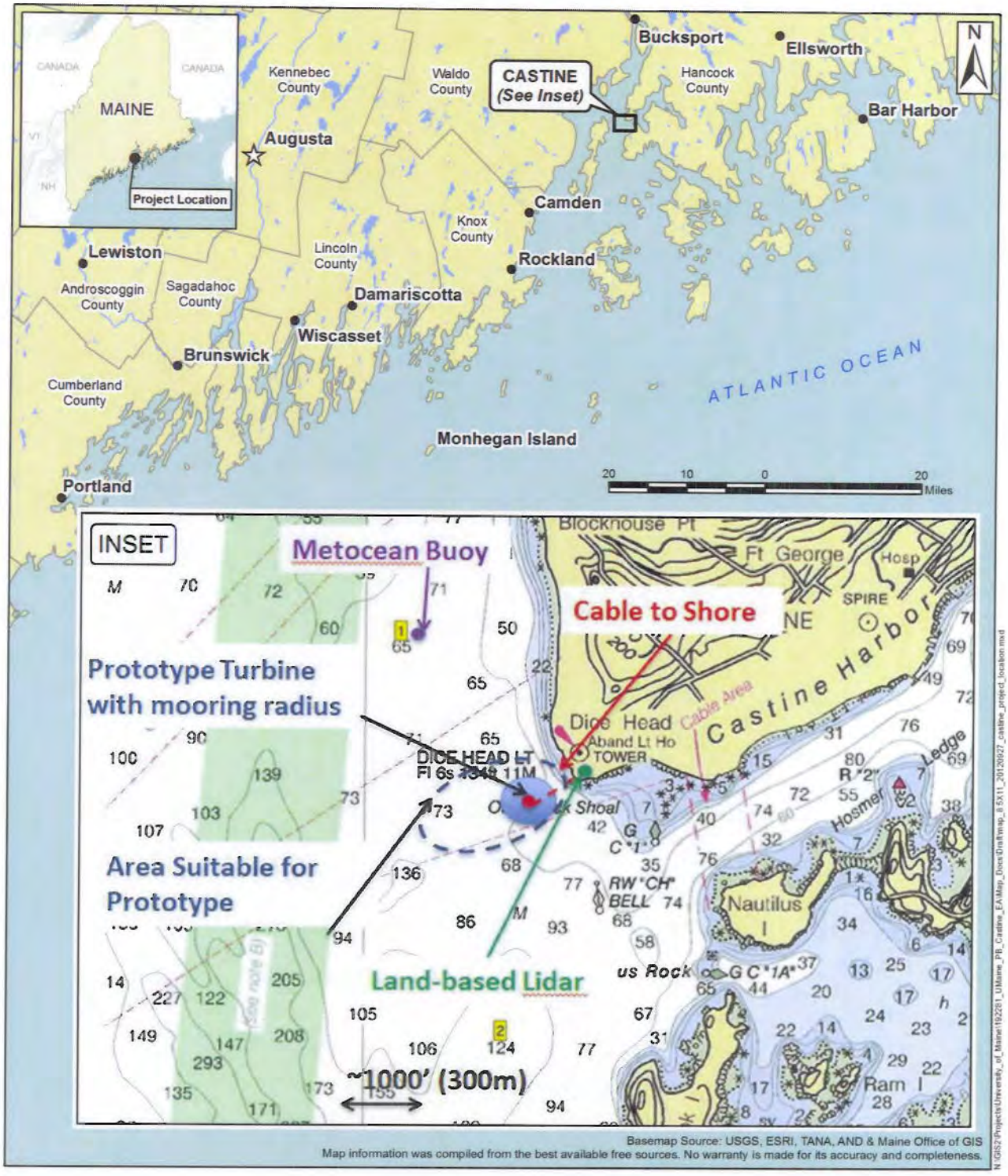
Sincerely,

Laura Margason

Laura Margason
DOE NEPA Document Manager

Attached: Project Location Map

Project Location of University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine



Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 2, 2012

Chief Brenda Commander
Houlton Band of Maliseet Indians
88 Bell Road
Littleton, ME 04730

Subject: **University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine**

To Chief Brenda Commander:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the University of Maine (UMaine) to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. The objective of this project is to validate coupled aeroelastic/hydrodynamic computer models developed by the National Renewable Energy Laboratory and others for floating offshore wind turbines.

In September 2011 DOE completed an Environmental Assessment (EA) evaluating the potential effects of the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine (see attached figure).

The University proposes to deploy a 20 kilowatt power rated Renewegy wind turbine onto a moored floating platform. The platform would be located in an existing cableway in water that is 40 to 70 feet deep. The turbine would measure about 41 feet from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be up to about 57 feet. The platform would be moored with drag embedment anchors, which are similar to sailboat anchors, and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable to be temporarily installed about 500 to 1,000 feet along the seabed to shore. From just below the low tide line the cable would extend approximately 500 feet along the ground in a protective conduit to the point of interconnection at an existing power pole. The conduit would be removed at the end of the project.

The platform would be deployed for about four to five months, starting in the spring of 2013, and its performance would be monitored to study the design prior to deployment in the open ocean at Monhegan Island. During the deployment at Castine, the University would use sensors and telemetry systems installed on the platform to evaluate how it performs under varying wind and wave conditions. Environmental monitoring for birds, bats, marine mammals, benthic invertebrates, and fish would also take place post deployment. The University has already conducted pre-deployment environmental monitoring and data collection for birds, bats, marine mammals, benthic invertebrates, and fish for this site to assist in determining affects to these

resources.

A Supplemental Environmental Assessment (EA) is currently being prepared for the proposed Castine site project by the Department's Golden Field Office to meet the requirements of the *National Environmental Policy Act*. DOE will include correspondence with your tribe in an appendix to the EA. The draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room: http://www.eere.energy.gov/golden/NEPA_DEA.aspx. You will receive a notice of availability once the draft EA is posted. Please contact DOE if you would like to receive a hardcopy of the document.

Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Section 800.2(c)(5), DOE is requesting information your tribe may have on properties of traditional religious and cultural significance within the vicinity of the proposed deployment near Castine Harbor and any comments or concerns you have on the potential for this proposed project to affect those properties. This information is being requested to aid in the preparation of that Environmental Assessment and to comply with the National Historic Preservation Act. If you have any such information, require additional information, have any questions or comments about that project or would like DOE to initiate formal consultation, please contact Ms. Laura Margason the Golden Field Office as soon as possible at the following:

Ms. Laura Margason
U.S. Department of Energy
1617 Cole Boulevard
Golden, Colorado

Email: laura.margason@go.doe.gov

Thank you in advance for your consideration.

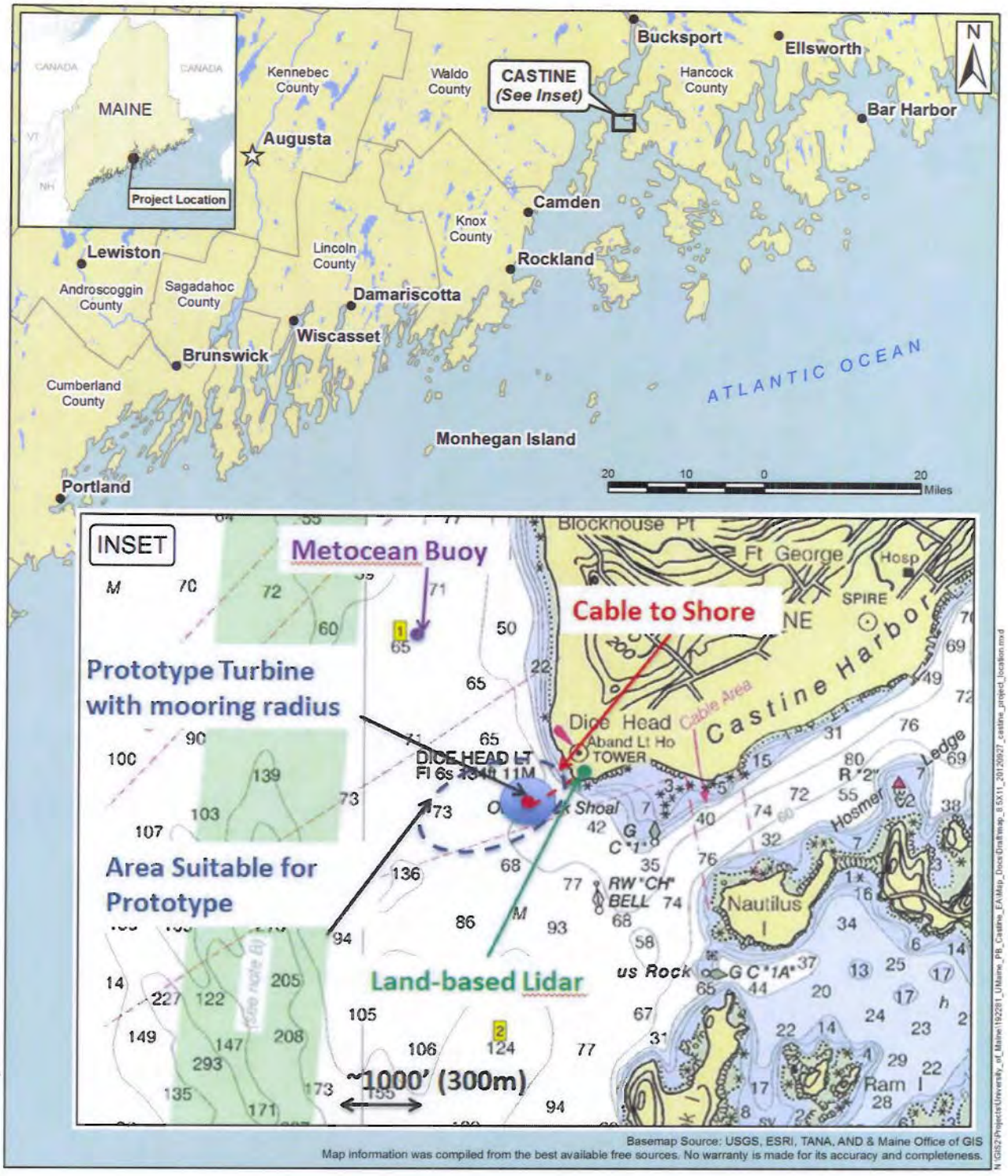
Sincerely,

Laura Margason

Laura Margason
DOE NEPA Document Manager

Attached: Project Location Map

Project Location of University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine



Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 2, 2012

Governor Reuben Clatyon Cleaves
Passamaquoddy Tribe
Pleasant Point Reservation
P.O. Box 343
Perry, ME 04667

Subject: **University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine**

To Governor Reuben Clatyon Cleaves:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the University of Maine (UMaine) to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. The objective of this project is to validate coupled aeroelastic/hydrodynamic computer models developed by the National Renewable Energy Laboratory and others for floating offshore wind turbines.

In September 2011 DOE completed an Environmental Assessment (EA) evaluating the potential effects of the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine (see attached figure).

The University proposes to deploy a 20 kilowatt power rated Renewegy wind turbine onto a moored floating platform. The platform would be located in an existing cableway in water that is 40 to 70 feet deep. The turbine would measure about 41 feet from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be up to about 57 feet. The platform would be moored with drag embedment anchors, which are similar to sailboat anchors, and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable to be temporarily installed about 500 to 1,000 feet along the seabed to shore. From just below the low tide line the cable would extend approximately 500 feet along the ground in a protective conduit to the point of interconnection at an existing power pole. The conduit would be removed at the end of the project.

The platform would be deployed for about four to five months, starting in the spring of 2013, and its performance would be monitored to study the design prior to deployment in the open ocean at Monhegan Island. During the deployment at Castine, the University would use sensors and telemetry systems installed on the platform to evaluate how it performs under varying wind and wave conditions. Environmental monitoring for birds, bats, marine mammals, benthic invertebrates, and fish would also take place post deployment. The University has already conducted pre-deployment environmental monitoring and data collection for birds, bats, marine

mammals, benthic invertebrates, and fish for this site to assist in determining affects to these resources.

A Supplemental Environmental Assessment (EA) is currently being prepared for the proposed Castine site project by the Department's Golden Field Office to meet the requirements of the *National Environmental Policy Act*. DOE will include correspondence with your tribe in an appendix to the EA. The draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room: http://www.eere.energy.gov/golden/NEPA_DEA.aspx. You will receive a notice of availability once the draft EA is posted. Please contact DOE if you would like to receive a hardcopy of the document.

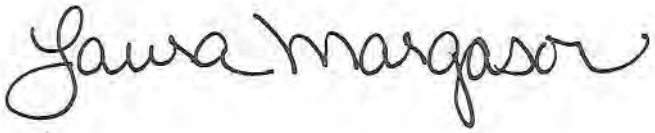
Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Section 800.2(c)(5), DOE is requesting information your tribe may have on properties of traditional religious and cultural significance within the vicinity of the proposed deployment near Castine Harbor and any comments or concerns you have on the potential for this proposed project to affect those properties. This information is being requested to aid in the preparation of that Environmental Assessment and to comply with the National Historic Preservation Act. If you have any such information, require additional information, have any questions or comments about that project or would like DOE to initiate formal consultation, please contact Ms. Laura Margason the Golden Field Office as soon as possible at the following:

Ms. Laura Margason
U.S. Department of Energy
1617 Cole Boulevard
Golden, Colorado

Email: laura.margason@go.doe.gov

Thank you in advance for your consideration.

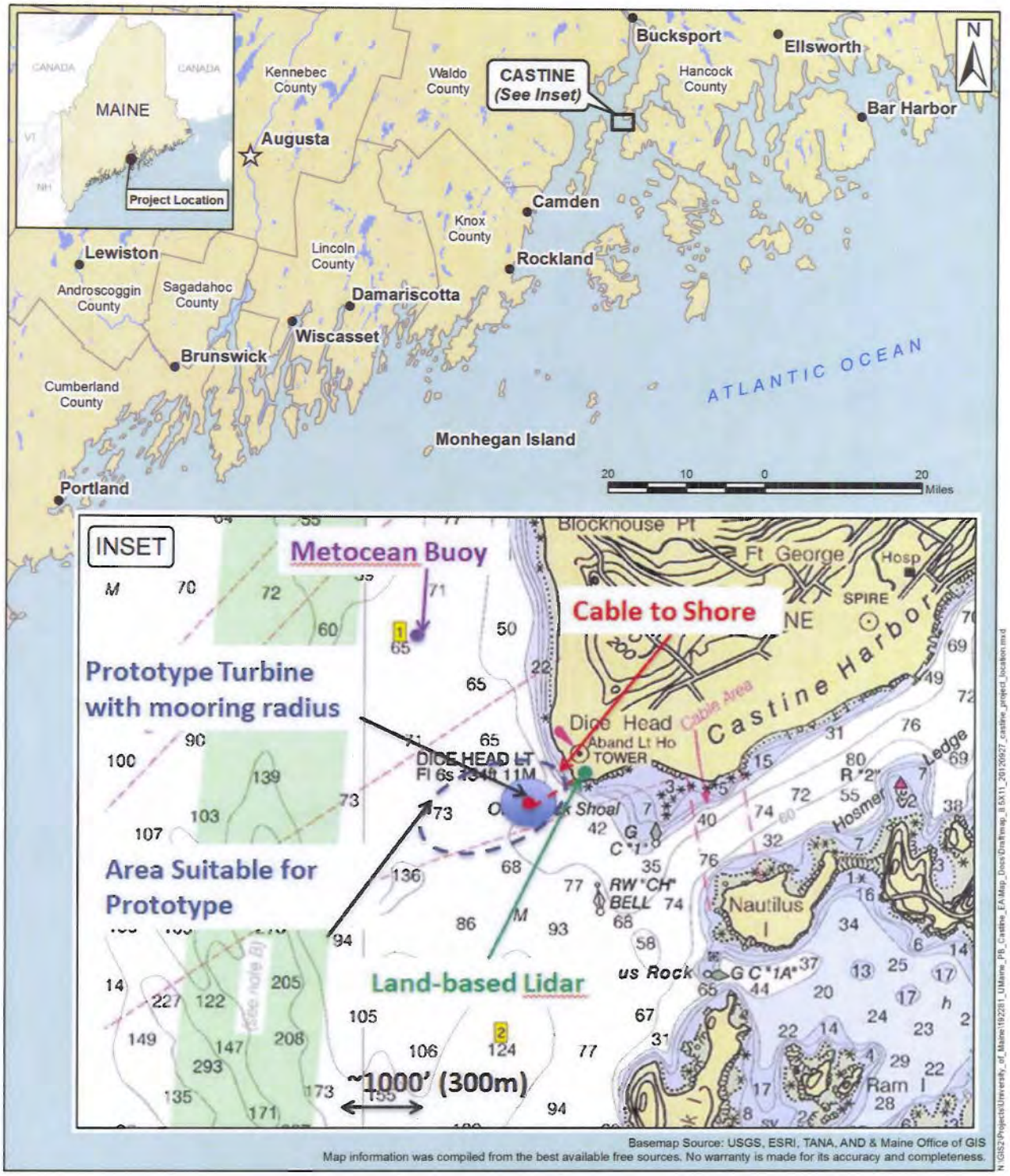
Sincerely,



Laura Margason
DOE NEPA Document Manager

Attached: Project Location Map

Project Location of University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine



Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 2, 2012

Chief Kirk Francis
Penobscot Indian Nation
12 Wabanaki Way
Indian Island, ME 04468

Subject: **University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine**

To Chief Kirk Francis:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the University of Maine (UMaine) to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. The objective of this project is to validate coupled aeroelastic/hydrodynamic computer models developed by the National Renewable Energy Laboratory and others for floating offshore wind turbines.

In September 2011 DOE completed an Environmental Assessment (EA) evaluating the potential effects of the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine (see attached figure).

The University proposes to deploy a 20 kilowatt power rated Renewegy wind turbine onto a moored floating platform. The platform would be located in an existing cableway in water that is 40 to 70 feet deep. The turbine would measure about 41 feet from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be up to about 57 feet. The platform would be moored with drag embedment anchors, which are similar to sailboat anchors, and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable to be temporarily installed about 500 to 1,000 feet along the seabed to shore. From just below the low tide line the cable would extend approximately 500 feet along the ground in a protective conduit to the point of interconnection at an existing power pole. The conduit would be removed at the end of the project.

The platform would be deployed for about four to five months, starting in the spring of 2013, and its performance would be monitored to study the design prior to deployment in the open ocean at Monhegan Island. During the deployment at Castine, the University would use sensors and telemetry systems installed on the platform to evaluate how it performs under varying wind and wave conditions. Environmental monitoring for birds, bats, marine mammals, benthic invertebrates, and fish would also take place post deployment. The University has already conducted pre-deployment environmental monitoring and data collection for birds, bats, marine mammals, benthic invertebrates, and fish for this site to assist in determining affects to these

resources.

A Supplemental Environmental Assessment (EA) is currently being prepared for the proposed Castine site project by the Department's Golden Field Office to meet the requirements of the *National Environmental Policy Act*. DOE will include correspondence with your tribe in an appendix to the EA. The draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room: http://www.eere.energy.gov/golden/NEPA_DEA.aspx. You will receive a notice of availability once the draft EA is posted. Please contact DOE if you would like to receive a hardcopy of the document.

Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Section 800.2(c)(5), DOE is requesting information your tribe may have on properties of traditional religious and cultural significance within the vicinity of the proposed deployment near Castine Harbor and any comments or concerns you have on the potential for this proposed project to affect those properties. This information is being requested to aid in the preparation of that Environmental Assessment and to comply with the National Historic Preservation Act. If you have any such information, require additional information, have any questions or comments about that project or would like DOE to initiate formal consultation, please contact Ms. Laura Margason the Golden Field Office as soon as possible at the following:

Ms. Laura Margason
U.S. Department of Energy
1617 Cole Boulevard
Golden, Colorado

Email: laura.margason@go.doe.gov

Thank you in advance for your consideration.

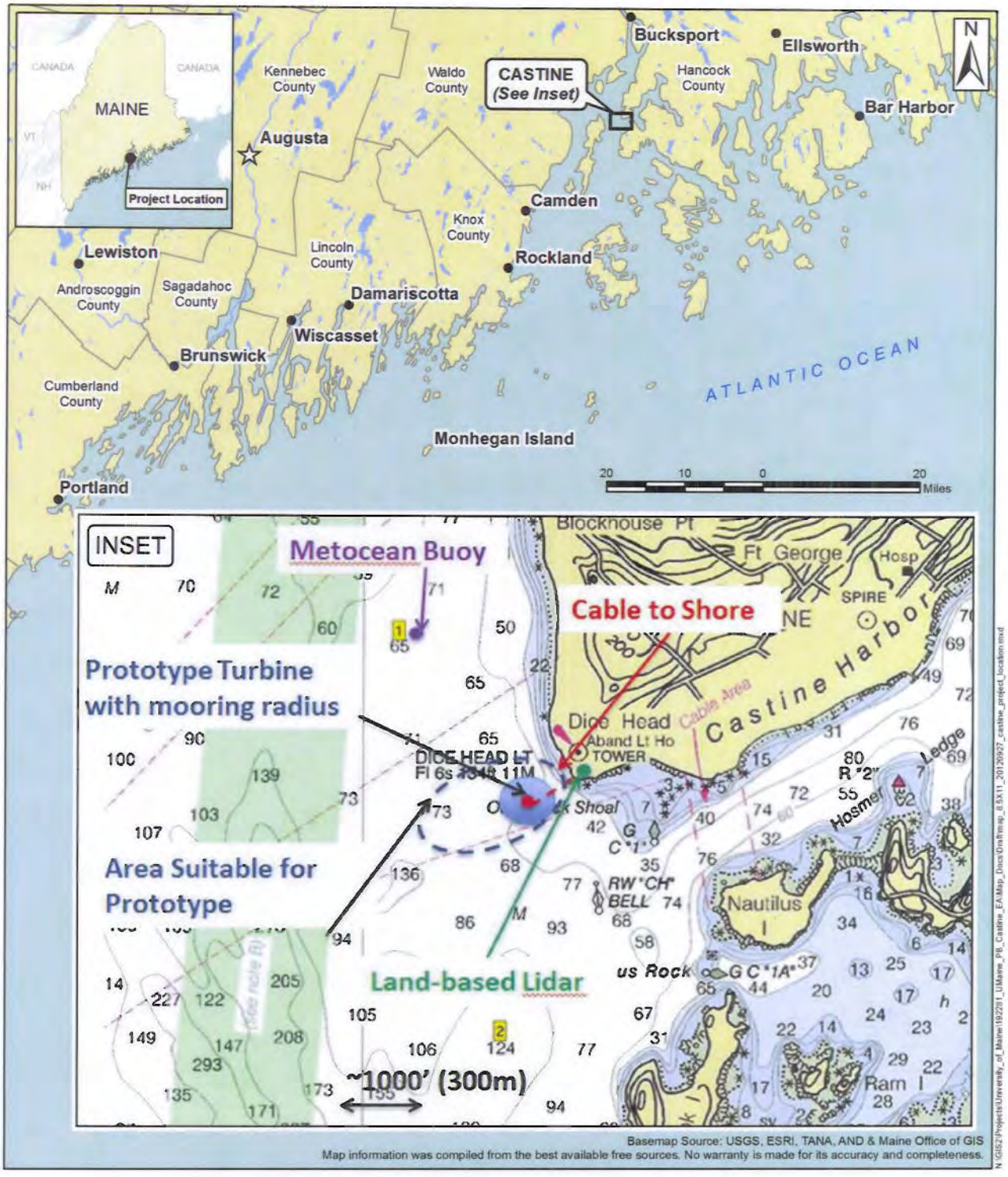
Sincerely,

Laura Margason

Laura Margason
DOE NEPA Document Manager

Attached: Project Location Map

Project Location of University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine



Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 2, 2012

Chief Joseph Socobasin
Passamaquoddy Tribe
Indian Township
P.O. Box 301
Princeton, ME 04668

Subject: **University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine**

To Chief Joseph Socobasin:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the University of Maine (UMaine) to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. The objective of this project is to validate coupled aeroelastic/hydrodynamic computer models developed by the National Renewable Energy Laboratory and others for floating offshore wind turbines.

In September 2011 DOE completed an Environmental Assessment (EA) evaluating the potential effects of the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale. Because of this change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine (see attached figure).

The University proposes to deploy a 20 kilowatt power rated Renewegy wind turbine onto a moored floating platform. The platform would be located in an existing cableway in water that is 40 to 70 feet deep. The turbine would measure about 41 feet from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be up to about 57 feet. The platform would be moored with drag embedment anchors, which are similar to sailboat anchors, and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable to be temporarily installed about 500 to 1,000 feet along the seabed to shore. From just below the low tide line the cable would extend approximately 500 feet along the ground in a protective conduit to the point of interconnection at an existing power pole. The conduit would be removed at the end of the project.

The platform would be deployed for about four to five months, starting in the spring of 2013, and its performance would be monitored to study the design prior to deployment in the open ocean at Monhegan Island. During the deployment at Castine, the University would use sensors and telemetry systems installed on the platform to evaluate how it performs under varying wind and wave conditions. Environmental monitoring for birds, bats, marine mammals, benthic invertebrates, and fish would also take place post deployment. The University has already conducted pre-deployment environmental monitoring and data collection for birds, bats, marine

mammals, benthic invertebrates, and fish for this site to assist in determining affects to these resources.

A Supplemental Environmental Assessment (EA) is currently being prepared for the proposed Castine site project by the Department's Golden Field Office to meet the requirements of the *National Environmental Policy Act*. DOE will include correspondence with your tribe in an appendix to the EA. The draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room: http://www.eere.energy.gov/golden/NEPA_DEA.aspx. You will receive a notice of availability once the draft EA is posted. Please contact DOE if you would like to receive a hardcopy of the document.

Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Section 800.2(c)(5), DOE is requesting information your tribe may have on properties of traditional religious and cultural significance within the vicinity of the proposed deployment near Castine Harbor and any comments or concerns you have on the potential for this proposed project to affect those properties. This information is being requested to aid in the preparation of that Environmental Assessment and to comply with the National Historic Preservation Act. If you have any such information, require additional information, have any questions or comments about that project or would like DOE to initiate formal consultation, please contact Ms. Laura Margason the Golden Field Office as soon as possible at the following:

Ms. Laura Margason
U.S. Department of Energy
1617 Cole Boulevard
Golden, Colorado

Email: laura.margason@go.doe.gov

Thank you in advance for your consideration.

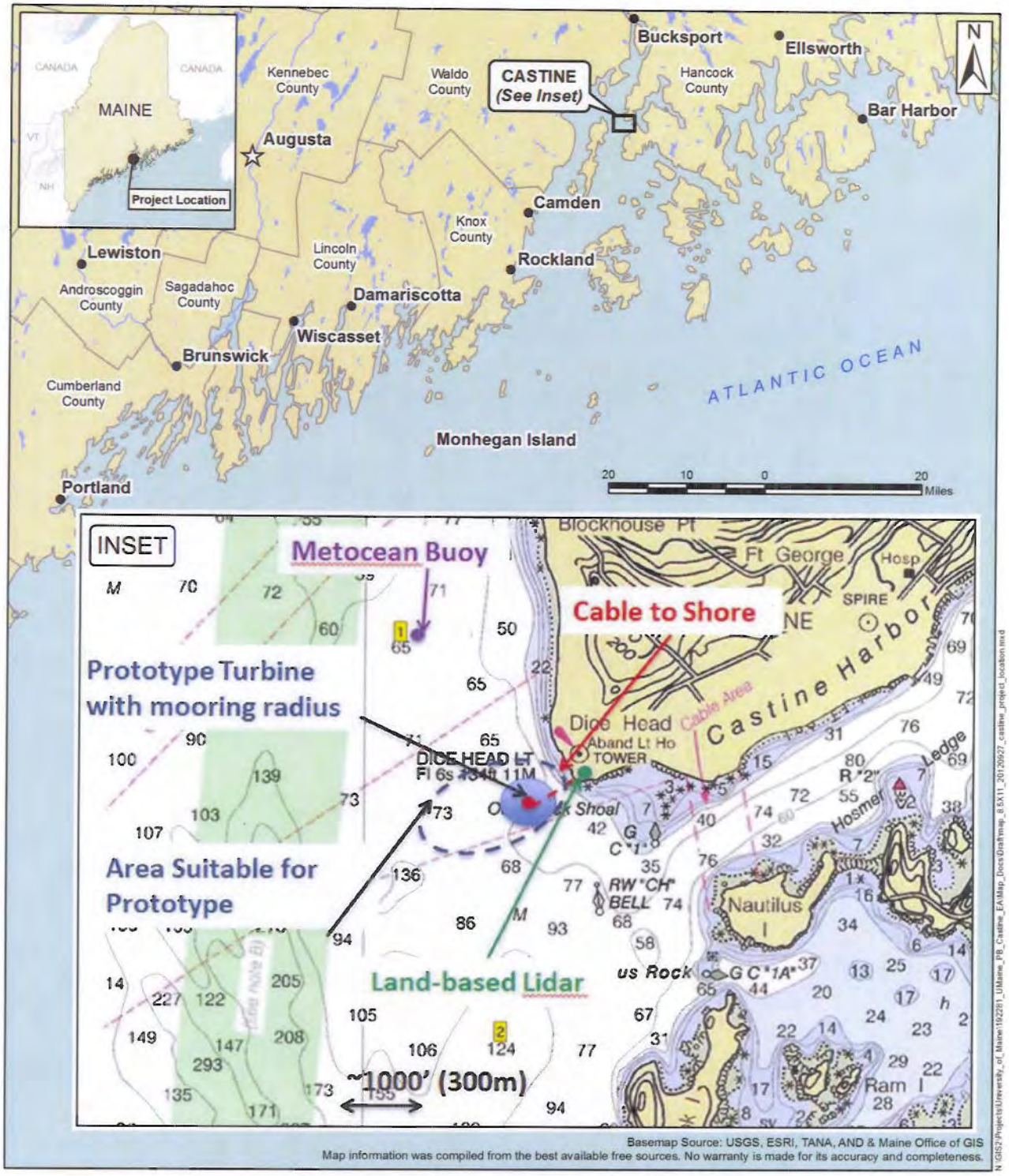
Sincerely,

Laura Margason

Laura Margason
DOE NEPA Document Manager

Attached: Project Location Map

Project Location of University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

NOV 16 2012

Laura Margason
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

RE: University of Maine Interim Offshore Wind Test Site Castine, Maine

Dear Ms. Margason,

Your October 18, 2012, letter, requests updated information on NOAA trust resources near the University of Maine's proposed interim offshore wind test site off Castine Harbor in Maine. Below, we provide updated Essential Fish Habitat (EFH), Endangered Species Act (ESA), and Marine Mammal Protection Act (MMPA) information.

NMFS listed ESA species
Several species of fish listed under our jurisdiction occur in the Gulf of Maine and the project area. The Federally endangered Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon (*Salmo salar*) occurs in the action area. The GOM DPS includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. Included in the DPS are all associated conservation hatchery populations used to supplement these natural populations. Currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH). This project is located within the range of the GOM DPS of Atlantic salmon.

Federally endangered shortnose sturgeon (*Acipenser brevirostrum*) occur in the action area. Additionally, endangered New York Bight (NYB) and threatened Gulf of Maine (GOM) Distinct Population Segments (DPSs) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) occur in the action area. Most Atlantic sturgeon in the action area are likely to be GOM DPS origin. However, some Atlantic sturgeon occurring in the action area are of Canadian origin (and therefore, not listed under the ESA) and a small portion of Atlantic sturgeon occurring in the action area are likely to be NYB origin. Sub-adult and adult Atlantic and shortnose sturgeon are most likely to be present in the action area during warmer months while participating in coastal migrations and while foraging.

Several species of listed whales and sea turtles occur seasonally in the waters off of Maine. North Atlantic right whales *(Eubalaena glacialis)* are present in the Gulf of Maine year-round, however, sightings are uncommon in nearshore waters such as Castine Harbor. Humpback

whales *(Megaptera novaeangliae)* feed during the spring, summer, and fall over a range that encompasses the eastern coast of the United States, including waters off the coast of Maine. Fin *(Balaenoptera physalus),* sei *(Balaenoptera borealis)* and sperm *(Physter macrocephalus)* whales are also seasonally present in New England waters but are typically found in deeper offshore waters and are not likely to occur in the action area.

Federally endangered leatherback *(Dermochelys coriacea)* and threatened loggerhead *(Caretta caretta)* sea turtles may also occur seasonally in the action area. These species are typically present in New England waters from June through October. While Kemp's ridley *(Lepidochelys kempi)* and green sea turtles *(Chelonia mydas)* also occur seasonally in New England waters, occurrence in the action area would be extremely rare.

Critical habitat
Critical habitat has been designated for listed Atlantic salmon pursuant to Section 4(b)(2) of the ESA. The critical habitat designation for the GOM DPS includes 45 specific areas occupied by Atlantic salmon at the time of listing that include approximately 19,571 km of perennial river, stream, and estuary habitat and 799 square km of lake habitat within the range of the GOM DPS which include those physical and biological features essential to the conservation of the species. The entire occupied range of the GOM DPS in which critical habitat is designated is within the State of Maine. Castine Harbor is not located within designated critical habitat for the Atlantic salmon GOM DPS. There is no other critical habitat designated by NMFS in Maine.

ESA Section 7 Consultation
Section 7(a)(2) of the ESA, states that each Federal agency shall, in consultation with the Secretary, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Any discretionary federal action that may affect a listed species must undergo Section 7 consultation. It is our understanding that depending on project siting, authorizations or permits may be required from the U.S. Army Corps of Engineers (USACE) and/or the Bureau of Ocean Energy Management (BOEM). We encourage you and the applicant to work with the ACOE and/or BOEM to initiate section 7 consultation as appropriate. We recommend that you complete any necessary consultation with us prior to issuing any final permits or authorizations. We also request that you identify a lead Federal agency for purposes of section 7 consultation and that your determination be provided to us in writing in a letter that identifies all of the federal authorizations or permits necessary for the project.

Marine Mammal Protection Act
All marine mammals listed under the ESA are also protected under the MMPA. In addition, other non-ESA listed marine mammal species may occur near Castine Harbor. Minke whales (*Balaenoptera acutorostrata*) are common in New England waters during spring and summer when their distributions are widespread. Minke whales are also present in New England waters during the fall at reduced levels and generally absent during winter months. In addition, based on information from stranding records, we know that grey seal (*Halichoerus grypus*), harbor seal (*Phoca vitulina*), Atlantic white-sided dolphin (*Lagernorhynchus acutus*), common dolphin (*Delphinus delphis*), short- and long- finned pilot whales (*Globicephala macrohynchus and G.*

melas) and Kogia (pygmy sperm whale) (*Kogia breviceps*) are also found in Maine coastal waters. If it is determined the project or alterations to the project technology could impact marine mammals the applicant needs to apply for an incidental take authorization pursuant to section 101 (a)(5)(A-D) of the MMPA. More information on the MMPA permitting program is available at: http://www.nmfs.noaa.gov/pr/permits/incidental.htm. You can also contact the Office of Protected Resources' Permits and Conservation Division in Silver Spring, Maryland at (301) 427-8400.

Essential Fish Habitat and Other Fishery Habitats

As noted in your letter, the proposed offshore wind test site in Castine Harbor, Maine, has been identified as EFH for federally-managed species. We concur that the adverse effects on EFH and other National Oceanic and Atmospheric Administration (NOAA) trust resources from the proposed project may be minimal. However, because some adverse effects on fishery habitats may result from anchoring and from the power cable, you should consult with us under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Fish and Wildlife Coordination Act (FWCA). The EFH regulations (50 CFR§600.905) guide the consultation requirements for EFH. The regulations mandate the preparation of EFH assessments and generally outlines each agency's obligations in this consultation procedure. An EFH Assessment should include at a minimum the following information:

1) a description of the proposed action;
2) an analysis of reasonably foreseeable impacts including secondary and cumulative effects on EFH, Federally-managed species and major prey species;
3) the action agencies views regarding the effects on EFH; and,
4) proposed mitigation, as appropriate.

Table 1 in your letter correctly lists the species and life history stages of EFH in the project area. Additional information on individual species' and life stage requirements can be found in a series of source documents published by NOAA's Northeast Fisheries Science Center and are available at the following website: http://nefsc.noaa.gov/publications/tm/.

In addition, a number of NOAA-trust resources will require consultation under the FWCA. The FWCA requires that Federal agencies consult with us for projects that may modify a water body. Because the waters in the vicinity of Castine, Maine, support populations of diadromous species, including blueback herring, alewife, rainbow smelt, striped bass, American eel, and American shad, the DOE should also consider the effects of the proposed project on these species. Diadromous fishery resources serve as prey for a number of federally-managed species and several species are considered a component of EFH pursuant to the MSA.

As noted above, there is a potential for adverse impacts on benthic habitats resulting from anchors, anchor lines, and the power cable during construction and operation of the test facility. We previously recommended, in our letter dated August 16, 2011, that a monitoring plan be developed to include an assessment of benthic impacts resulting from anchor placement and configuration (i.e., anchor line scour) as well as to assess recovery of benthic habitats once the mooring system is removed. We continue to recommend that a monitoring plan be developed for

the site in Castine Harbor, Maine, for potential anchor-related scour and power cable impacts. The monitoring plan should be appropriately designed to identify benthic impacts occurring during construction and operation of the facility.

Conclusions

Thank you for the opportunity to provide these comments on the proposed offshore wind test site off Castine Harbor, Maine. Should you have any questions regarding EFH and FWCA consultations, please contact Michael Johnson in our Habitat Conservation Division (Mike.R.Johnson@noaa.gov or (978) 281-9130). Please address questions related to the MMPA and any associated permitting to Michelle Magliocca in the Office of Protected Resources (Michelle.Magliocca@noaa.gov or (301)427-8426). Should you have any ESA related questions, please contact David Bean in our Maine Field Office (David.Bean@noaa.gov or (207) 866-4172).

Sincerely,

John Bullard
Northeast Regional Administrator

Cc: Johnson, Boelke – F/NER4
Bean – F/NER3
Magliocca – F/PR1

PRD Filing Code: Sec 7 tech assist - Dept. Energy: UMaine wind test site

AROOSTOOK BAND OF MICMACS
7 NORTHERN ROAD
PRESQUE ISLE, MAINE 04769
(207) 764-1972

November 29, 2012

Laura Margason
US Department of Energy
1617 Cole Boulevard
Golden Colorado 80401-3393

RE: Floating Offshore Wind Turbine Platform
Applicant: University of Maine
Municipality: Castine, Maine

Dear Laura Margason,
Thank you for the opportunity to review the above-referenced project for compliance with National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) requirements.

Based on the project description, we do not have knowledge of any specific sites or cultural features that exist at the proposed project location. However, this geographic area does constitute traditional areas that were historically utilized by members of the Aroostook Band of Micmacs and other northeaster Tribes. Therefore, we respectfully, request that if during the course of excavation/construction activities, human remains, artifacts, or any other evidence of Native American presence is discovered, that site activities in the vicinity of the discovery immediately cease, pending notification to us.

In addition, if this project results in wetland disturbances requiring mitigation, we are requesting that you utilize the black ash (Fraginus nigra) as the principle wetland species for wetland restoration activities. The black ash tree has special significance in the culture of the northeastern Tribes and is used extensively for weaving baskets and other Native American crafts. The black ash tree also provides valuable food and habitat for migratory waterfowl and other wildlife. Unfortunately however, this species has been selected against by foresters and landowners who favor other tree species. As a result of this, and other environmental factors, the black ash tree is in serious decline in Maine. The Aroostook Band of Micmacs has completed several black ash wetland restoration

projects and we have a dependable source for highly-quality seedlings, and the experience and expertise to assist you with black ash wetland restoration projects.

On the subject of human remains, artifacts, or any other evidence of Native American presence is discovered. The human remains will be reburied with the appropriate respect for the remains that is required at a distinctive and respectable site. The artifacts and other evidence of Native American discovery will be documented with appropriate detail. The items will be analyzed for the precise period of the items distinctive period and will be documented by the Tribal Historic Preservation Officer from the Aroostook Band of Micmacs.

If you have any questions or comments, please feel free to contact me at (207) 764-1972.

Sincerely,

John J. Dennis
Cultural Director / Tribal Historic Preservation Officer Designee

cc: Richard Getchell
Chief of the Aroostook Band of Micmacs

PENOBSCOT INDIAN NATION
CULTURAL & HISTORIC PRESERVATION DEPARTMENT
CHRIS SOCKALEXIS – TRIBAL HISTORIC PRESERVATION OFFICER
12 WABANAKI WAY, INDIAN ISLAND, ME 04468
E-MAIL: Chris.Sockalexis@penobscotnation.org FAX: 207-817-7450

NAME	Laura Margason
ADDRESS	US Department of Energy 1617 Cole Boulevard Golden, CO 80401-3393
OWNER'S NAME	University of Maine
TELEPHONE	
FAX	
EMAIL	laura.margason@go.doe.gov
PROJECT NAME	Floating offshore wind turbine platform
PROJECT SITE	Castine, ME
DATE OF REQUEST	November 2, 2012
DATE REVIEWED	November 29, 2012

Thank you for the opportunity to comment on the above referenced project. This project appears to have no impact on a structure or site of historic, architectural or archaeological significance to the Penobscot Nation as defined by the National Historic Preservation Act of 1966, and subsequent updates.

Also, if Native American cultural materials are encountered during the course of the project, please contact me at (207) 817-7471. Thank you.

CHRIS SOCKALEXIS, THPO
Penobscot Nation

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Earle G. Shettleworth, Jr., Director,
Maine Historic Preservation Commission
55 Capitol Street, 65 State House Station
Augusta, ME, 04333-0065

Dear Mr. Shettleworth:

Subject: University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine

The U.S. Department of Energy (DOE) is proposing to award federal funding to the University of Maine to construct, deploy, and retrieve one small-scale floating turbine offshore of Maine. In September 2011, DOE completed an Environmental Assessment (EA) that evaluated the potential effects resulting from the University's plans to deploy two 1/3-scale wind turbines on floating platforms within the deepwater offshore wind test site in the Gulf of Maine near Monhegan Island. In a letter to DOE dated April 29, 2011, your office concurred with DOE's finding that the Monhegan project would have no adverse effect on historic properties, as defined by Section 106 of the National Historic Preservation Act.

The University has since downscaled the size of their planned platform and turbine from 1/3 scale to 1/8 scale and plans to install one turbine, not two. Because of the change to a smaller size, for part of the year the platform and turbine would be deployed at a more sheltered nearshore location, near Castine Harbor, Maine (see attached figure). The project would be deployed for three to four months this spring/summer season (the University anticipates late March or April, of 2013) where its performance would be monitored to study the design prior to deployment into the open ocean at Monhegan Island.

The University proposes to deploy a Renewegy wind turbine with a power rating of 20 kilowatts onto a floating platform. The platform would be located in an existing cableway in water that is about 100 feet deep. The turbine would measure about 41 feet from the waterline to the hub, the rotor diameter would be about 32 feet, and the total height of the turbine above the water line would be up to about 57 feet. The platform would be moored with drag embedment anchors or gravity anchors, and catenary mooring lines. The turbine would be connected to the Central Maine Power grid via a cable that would be temporarily installed about 500 to 1,000 feet along

the seabed to shore. On shore, the cable would be positioned along the ground for 300 feet and cross one residential property, for which landowner permission has been granted.

DOE understands that the University has had several preliminary discussions with your staff regarding this project. To comply with obligations under Section 106 of the National Historic Preservation Act, DOE has defined the area of potential effects to historic properties based on two components. First, the area of the seabed that would be directly disturbed by deployment of anchors is included to account for the potential direct effects of the project on shipwrecks. Second, the area of the Castine peninsula from which the platform and turbine could be visible is included to address indirect impacts from a change in the viewshed from historic properties.

To identify historic properties in the area of potential effects, the University has reviewed the National Historic Register, conducted a dive survey and magnetometer survey, and has discussed the project with the Castine Historic Society. DOE has reached out to five Maine tribes that may have historic ties to the area. The Penobscot Indian Nation and the Aroostook Band of Micmacs, both in transmittals dated November 29, 2012, indicated that the project would not affect any sites of tribal significance. The remaining tribes have not responded to the consultation request or identified any concerns.

There are numerous historic markers in Castine, and the National Historic Register lists three historic or archeological districts and four historic properties in Castine:

- Castine Historic District,
- Pentagoet Archeological District,
- Off-the-Neck Historic District,
- Fort George,
- *Bowdoin* (schooner),
- Cate House, and
- John Perkins House.

The Castine Historic District was added to the National Register of Historic Places in 1973, and includes the peninsula of Castine (referred to as On-neck Castine). The Pentagoet Archeological District is the site of a trading post built by the French during the 17th century located on the shore of Castine Harbor (National Historic Landmarks Program 2012). The Off-the-Neck Historic District is located north of the Castine peninsula, facing the Bagaduce River, and contains a number of dwellings, many in the Federal style of architecture (Downeast and Acadia 2012). Fort George is an earthworks fort built by the British in 1779 during the American Revolutionary War. It has been partially restored as a state memorial. The *Bowdoin* is a historic ship built in 1921 for Arctic exploration and owned by Maine Maritime Academy. Cate House and Perkins House both located in the Village of Castine, are historic colonial residences (National Historic Register 2012). Also, Dyce Head Lighthouse is listed in the inventory of historic light stations and is included in the Castine Historical District. The Town of Castine also

has established an historic district, which consists of the downtown area of Castine. That local historic district and is on the opposite side of the peninsula from the proposed turbine location (Town of Castine 2011).

The turbine platform would be located in a previously disturbed cable ROW to minimize the risk of disturbing shipwrecks or other underwater cultural and natural resources. No known shipwrecks have occurred in the project area and no signs of shipwrecks were observed during the University's diver surveys conducted at the site in 2012. As directed by the Maine SHPO, the University staff consulted with Dr. Warren Riess, a marine archaeology professor at the University, to further evaluate whether any Penobscot Expedition shipwrecks or other related historic resource concerns could be located in the project area (Pers. comm. R. Reed, Maine SHPO with D. Brady, University of Maine, October 18, 2012). In correspondence with SHPO staff, Dr. Reiss stated "...that all of the known and assumed locations of the Penobscot Expedition vessel remains are well north of the proposed site. The only exception is the privateer *Defence*, which is miles west of Castine", (Pers. comm. Dr. W. Reiss, University of Maine with R. Reed, Maine SHPO, October 19, 2012).

Dr. Riess oversaw a magnetometer survey of the proposed project site on December 10, 2012, and survey results confirmed that there are no shipwrecks at the site. Results of that survey were submitted to your office by Dr. Riess on December 12.

The University would locate the turbine off of the western shore of the Castine peninsula in part to minimize its visibility from historic properties. As such, it would not be visible from the Off-the-Neck Historic District or most occupied areas on the peninsula, including much of the Village of Castine, such as where the Cate and Perkins houses and the Pentagoet Archeological District are located and the schooner *Bowdoin* is docked. The closest historic property to the proposed turbine location is the Dyce Head lighthouse, which is accessible to the public. The turbine would not be visible to the public from that lighthouse or from some other areas on the western side of the peninsula because of the steep shoreline and dense vegetation located there (see attached photograph). However, the turbine might be visible from some areas along the western portion of the Castine Historic District and from some of the higher points on the peninsula. There might also be some properties from which the turbine could be viewed that are eligible for listing under the National Register of Historic Places. Because the 1/8-scale turbine would have a maximum height of 57 feet above the waterline, it would appear small from any location within the Castine Historic District or elsewhere on the peninsula. In emails to SHPO dated November 16, 2012, the Town Manager stated, regarding the Town of Castine historic district, that "the turbine site is approximately 1 mile from the closest boundary of our historic district and can't be seen from the district", and the Chair of the Castine Historic Preservation Commission stated that they "...do not feel there is any impact to the Historic District viewscape" (Emails dated November 16, 2012 from Jimmy Goodson, Chair of Historic Preservation Commission and Dale Abernethy, Town Manager, to Robin Reed, SHPO). Finally, because the turbine would be deployed for less than four months, any change in the view from an

historic property would be temporary. Therefore, the turbine and platform would not dominate or otherwise substantially change the view from historic properties in a way that would diminish the integrity of the properties' significant historic features.

Based on this analysis, DOE finds that there would be no direct adverse effect to underwater historic properties from deployment and retrieval of the floating platform or indirect adverse effects to the viewshed from historic properties on the Castine peninsula, and we request your input and/or concurrence with this conclusion.

DOE is in the process of developing a Supplemental EA to cover these activities off of Castine. A notification will be sent to your office when the Draft Supplemental EA is available for public review.

If you have any questions, please contact me at 720-356-1322 or via my email at Laura.Margason@go.doe.gov.

Sincerely,

Laura Margason

Laura Margason
NEPA Document Manager

Attachments (map and photograph)

References:

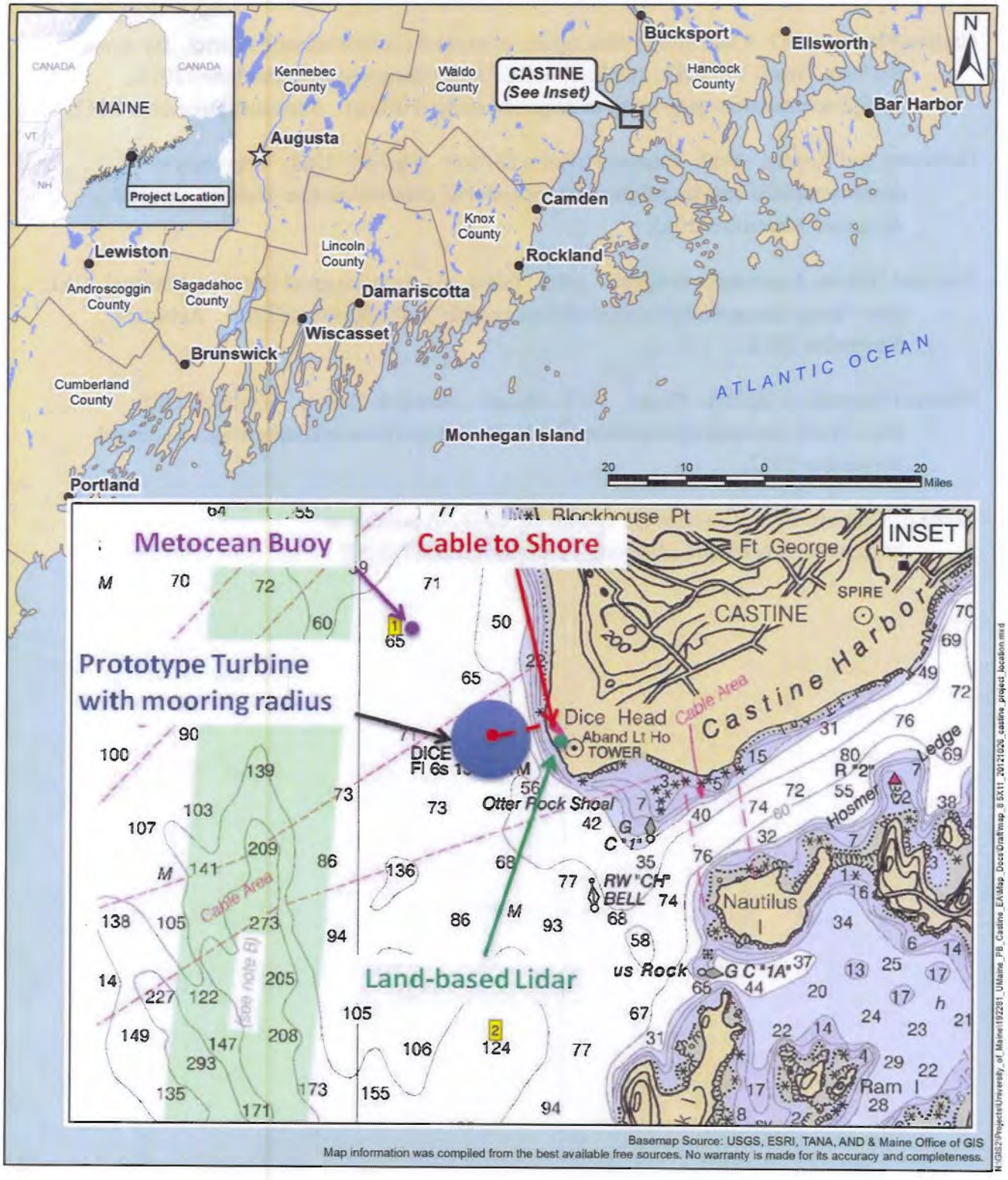
Castine Patriot. 2012. Commision tries, again, to expand Castine historic district. By Anne Berleant. April 12, 2012. [Online] URL: http://castinepatriot.com/news/2012/apr/12/commission-tries-again-to-expand-castine-historic/. Accessed December 2012.

Downeast and Acadia. 2012. Castine Historic District. [Online] URL: http://www.downeastacadia.com/highlights/history/historic_districts/castine_historic_district/. Accessed November 2012.

National Historic Landmarks Program. 2012. Pentagoet Archeological District. [Online] URL: http://tps.cr.nps.gov/nhl/detail.cfm?ResourceId=2148&ResourceType . Accessed November 2012.

National Register of Historic Places. 2012. Maine – Hancock County. [Online] URL: http://www.nationalregisterofhistoricplaces.com/me/Hancock/state.html. Accessed November 2012.

Town of Castine. 2011. Zone Map. March 26, 2011. Available at http://www.castine.me.us/Zoning%20Map%202011-2.pdf.


CANADA
CANADA
MAINE
VT
NH
Project Location
Kennebec County
Waldo County
CASTINE
(See Inset)
Hancock County
Bucksport
Ellsworth
Bar Harbor
Augusta
Camden
Knox County
Lincoln County
Rockland
Lewiston
Androscoggin County
Sagadahoc County
Damariscotta
Wiscasset
Brunswick
Cumberland County
ATLANTIC OCEAN
Monhegan Island
Portland
20 10 0 20 Miles
N
Metocean Buoy
Cable to Shore
Prototype Turbine with mooring radius
Land-based Lidar
INSET
Blockhouse Pt
Ft George
SPIRE
CASTINE
Castine Harbor
Dice Head
Aband Lt Ho
TOWER
Cable Area
DICE
Fl 6s
Otter Rock Shoal
RW "CH" BELL
Nautilus I
Hosmer
Ledge
R "2"
Ram I
Basemap Source: USGS, ESRI, TANA, AND & Maine Office of GIS
Map information was compiled from the best available free sources. No warranty is made for its accuracy and completeness.

VIEW FROM THE BASE OF THE DYCE HEAD LIGHTHOUSE TOWARD THE SHORE.

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

PAUL R. LEPAGE
GOVERNOR

EARLE G. SHETTLEWORTH, JR.
DIRECTOR

January 2, 2013

Mr. Andrew D. Qua
Kleinschmidt
P.O. Box 650
Pittsfield, ME 04967

Project: MHPC# 1539-12 - University of Maine deepwater offshore floating wind turbine testing and demonstration project: Castine Harbor

Town: Castine, ME

Dear Mr. Qua:

In response to your recent request, I have reviewed the information received December 12 and 20, 2012 to continue consultation on the above referenced project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA).

Based on the information submitted, I have concluded that the proposed undertaking will have **no adverse effect** on historic properties, as defined by Section 106 of the National Historic Preservation Act.

However, our concurrence is conditional upon the following understanding: This deployment of the floating wind turbine off of the shore of Castine will be a temporary installation only.

Please contact Robin Reed of my staff if we can be of further assistance in this matter.

Sincerely,

Kirk F. Mohney

Kirk F. Mohney
Deputy State Historic Preservation Officer

cc. Laura Margason, U.S. Department of Energy
Dr. Damian Brady, University of Maine
Dr. Warren Riess, University of Maine
Dale Abernathy, Town of Castine

PHONE: (207) 287-2132 FAX: (207) 287-2335

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

January 16, 2013

Mr. John Bullard
Assistant Regional Administrator for Protected Resources
National Marine Fisheries Service, Northeast Region
55 Great Republic Drive
Gloucester, MA 01930

Subject: Section 7 Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Marine Mammal Protection Act, and Fish and Wildlife Coordination Act Consultation for the University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine

Dear Mr. Bullard:

The U.S. Department of Energy (DOE) is requesting concurrence from the National Marine Fisheries Service (NMFS) that the proposed University of Maine (UMaine) project, described below, *may affect, but is not likely to adversely affect* species of ESA-listed fish, mammals, and turtles. These include three fish species: Atlantic salmon, Atlantic sturgeon, and shortnose sturgeon; five species of whales: North Atlantic right, fin, humpback, sei, and sperm whales; and three species of sea turtles: Atlantic Ridley, loggerhead, and leatherback.

Essential Fish Habitat (EFH) has been designated in the test site area for 16 federally-managed fish and their various life stages under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). In addition, as noted by NMFS in a letter to DOE dated November 16, 2012, the waters in the vicinity of Castine support populations of diadromous species including blueback herring, alewife, rainbow smelt, striped bass, American eel, and American shad. Diadromous fish serve as prey for a number of federally-managed species and several species are considered a component of EFH pursuant to the MSA.

In addition to the five species of whales listed under the ESA, a number of other marine mammals could occur in the test site or surrounding region, including harbor seals, grey seals, minke whales, harbor porpoise, Atlantic white-sided dolphin, common dolphin, short- and long-finned pilot whales, and Kogia. Marine mammals are protected under the Marine Mammal Protection Act (MMPA) of 1972, which restricts the taking, possession, transportation, selling, offering for sale, and importing of marine mammals. We are requesting a concurrence with NMFS that incidental take of marine mammals is unlikely to occur.

Background and Project Summary

DOE is proposing to authorize the expenditure of Congressionally Directed federal funding to UMaine to deploy, test, and retrieve one small-scale floating turbine offshore of Castine, in Hancock County, Maine (Project). DOE has previously authorized the expenditure of federal funding by UMaine to conduct similar deployment, testing, and retrieval activities at the UMaine Deepwater Offshore Wind Test Site at Monhegan Island, Maine (Monhegan test site).

UMaine originally planned to fabricate and temporarily deploy up to two, 1/3-scale turbines at the Monhegan test site. Per the National Environmental Policy Act (NEPA) and DOE's NEPA

implementing regulations, an Environmental Assessment (DOE/EA-1792, DOE 2011) was completed for the Monhegan site project. Upon completion of the EA, DOE issued a Finding of No Significant Impact (September 2011). Per requirements under Section 7 of the Endangered Species Act (ESA), DOE initiated informal consultation with NMFS for that project. In a letter dated August 2011, NMFS concurred that the temporary deployment of those turbines may affect, but is not likely to adversely affect listed species. Since completion of this EA and ESA consultation, UMaine has changed the scope of their project and has proposed to downscale the size of the tower and turbine from 1/3 scale to 1/8 scale. Because of the change, UMaine is now proposing to deploy their Project at a more sheltered nearshore location just west of Castine, Maine (Figure 1) (Castine site) for the initial testing.

Under the new scope, the University would deploy a 20 kilowatt Renewegy wind turbine onto a floating platform. The platform would be located in an existing cableway in water that is about 100 feet deep. The turbine would measure about 41 feet from waterline to the hub, the rotor diameter would measure about 32 feet, and the total turbine height would be about 57 feet. The platform would be moored with drag embedment anchors, which are similar to boat anchors, and catenary mooring lines. In the event that the drag embedment anchors prove infeasible, UMaine would use four gravity anchors. The turbine would be connected to the Central Maine Power grid via a cable that would be temporarily installed about 500 to 1,000 feet along the seabed and existing cableway to shore. From the high tide line, the cable would extend about 300 feet along the ground in a protective conduit to the point of interconnection near Dyce's Head Road. The conduit would be removed at the end of the project.

The Project would be deployed for up to four months in the spring and early summer of 2013. During testing, the performance would be monitored to study and validate the Project design, a necessary step prior to deployment into the open ocean Monhegan test site. During the Castine site testing, the University would use platform installed sensors and telemetry systems in order to evaluate how their design performs under varying wind and wave conditions. Environmental monitoring for birds (visual surveys and web camera observation), marine mammals (visual surveys), bats (echolocation detectors), and benthic invertebrates (remotely operated vehicle surveys and visual surveys) has been ongoing by UMaine since 2012. These studies would continue in the area surrounding the test site during the deployment. In addition, acoustic detection of tagged fish in the area surrounding the test site occurs with acoustic receivers located nearby, and this monitoring would continue during the deployment.

In a letter dated October 18, 2012, DOE requested from your agency a list of threatened, endangered, proposed species, and/or designated or proposed critical habitat under NMFS jurisdiction that "may be present" within the project area. In response to this inquiry, NMFS provided information on ESA-listed species, marine mammals and diadromous fish species that may occur in the project area, and EFH. DOE is also consulting with the U.S. Fish and Wildlife Service regarding species protected under the Endangered Species Act and other trust resources managed by that agency.

Threatened and Endangered Species

Fish - Three fish species, all anadromous, listed under the ESA have the potential to occur in the project area. The Atlantic salmon, Gulf of Maine Distinct Population Segment, is federally endangered, shortnose sturgeon is federally endangered, and Atlantic sturgeon is listed as federally threatened for the Gulf of Maine Distinct Population Segment (DPS) and federally

endangered for the New York Bight DPS[1]. The proposed project is not located within any currently designated critical habitat for any ESA-listed fish species.

All three species were detected at the Dyce Head acoustic detection array during monitoring from 2009 to 2011. Movements through the array were seasonal with Atlantic salmon movements focused in May, Atlantic sturgeon movements throughout the year but focused in May and October, and shortnose sturgeon movements occurring from May to July (Zydlewski 2012). These three species use the project area as a migration corridor. This part of Penobscot Bay is very expansive and quite deep, and the project would not obstruct these species as they swim into and out of the Penobscot River and estuary. The small size of this research project relative to the surrounding marine habitat, the short nature of the deployment, the limited time these migratory fishes would be in the project site, and the overall lack of potential mechanism for effect to fish, all minimize the risk of effect to these three species.

Marine Mammals – Five ESA-listed whales that have the potential to occur in waters offshore of Maine are North Atlantic right, fin, humpback, sei, and sperm whales. None of these species were observed during the 17 boat-based visual surveys conducted in the project area by UMaine in 2012 (Kennedy 2012), nor are they expected to occur near shore in upper Penobscot Bay where the project is located. The likelihood of exposure of ESA-listed whales to the proposed project is extremely small, given that ESA-listed whales are uncommon in the project area, the small size of the project relative to the surrounding Penobscot Bay, and the fact that the platform would be temporarily deployed for up to four months. In addition, the mass/buoyancy of the platform and mass of the anchors is expected to create substantial tension in the mooring lines, which would prevent the formation of loops that could entangle a passing animal.

Underwater sound generated from the turbine and mooring system could potentially affect whales and other marine mammals. However, sound levels underwater resulting from turbine noise transferred through the sea surface are expected to be substantially lower than the sound source levels, due to the reflective nature of the sea surface (Jones et al. 2010). Acoustic emissions underwater, due to vibrations of the turbine and platform structure, are expected to be low frequency and low amplitude, and are strongly dependent on turbine and platform configuration and dynamic loads (Jones et al. 2010). Because of the low level of noise created by a Renewegy 20 kW turbine, the temporary nature of the deployment, and because only a small amount of sound can transfer through the sea surface from above, underwater noise levels resulting from turbine operation are expected to be very low. In addition, as discussed in the August 2011 letter from NMFS to DOE regarding the deployment of turbines offshore of Monhegan Island, measured and predicated levels of noise from operating wind turbines for offshore wind projects in Europe generally were below background sound levels.

Turtles - There are three ESA-listed sea turtles with the potential to occur in the Gulf of Maine: Atlantic Ridley, loggerhead, and leatherback sea turtles. Sea turtle sightings in the Gulf of Maine are rare, and these species are very unlikely to occur near shore in upper Penobscot Bay where the project is located. The likelihood of exposure of sea turtles to the proposed project is extremely small given that sea turtles are uncommon in the project area, the small size of the project relative to the surrounding Penobscot Bay, and the fact that the platform would be temporarily deployed for up to only four months. Also, the substantial tension in the mooring lines would prevent the formation of loops that could entangle a passing animal. No other

[1] NMFS (2012) estimated that 1% of Atlantic sturgeon in the Penobscot River are New York Bight origin, based on a mixed stock analysis conducted in the Bay of Fundy, Canada that concluded that 1% of Atlantic sturgeon in the Bay of Fundy were New York Bight origin.

potential effects on sea turtles are anticipated.

Based on this information, DOE concludes that the effects to threatened and endangered fish, marine mammals, and sea turtles would be insignificant and discountable, and that the project is not likely to adversely affect these species.

Magnuson-Stevens Fisheries Conservation Act and Fish and Wildlife Coordination Act

There are a number of federally managed fish species with EFH in waters off of Castine. Habitat types that represent EFH include all portions of the water column or substrate types, such as soft bottom, hard bottom, and various mixtures of hard and soft (NOAA 2012). The footprint of the anchors and cable might slightly decrease available bottom foraging habitat and areas considered to be EFH. However, the maximum area covered by the anchors (combined area of about 64 ft^2 for drag embedment anchors, 400 ft^2 if gravity anchors are used) and the 2½-inch subsea cable and associated strip weights (footprint of about 357 ft^2) would be very small, and the type of habitat to be disturbed is very prevalent along the Maine coast. Placement of anchors and the subsea cable in areas of soft bottom substrate would likely result in a temporary and localized increase in turbidity during deployment and removal; with only four anchors to be deployed, this effect would be small scale and short term, and recovery from any disturbance to the bottom is expected to occur quickly. Mobile species such as fish, would likely avoid the immediate deployment area during project installation activities. Project deployment activities for the marine components of the project are expected to total five days (two days to deploy the four anchors, one day to deploy the floating turbine platform, and two days to deploy the subsea cable). Project removal activities would take a similar amount of time. Therefore, any shift in habitat use by marine or diadromous species during installation or removal activities would be small scale and temporary and impacts of the project on EFH will be minimal.

Marine Mammal Protection Act

During the 17 boat-based surveys UMaine conducted in the project vicinity, 66 harbor seals, one gray seal, and 34 harbor porpoise were observed. No large whales or other marine mammals were observed (Kennedy 2012). Harbor seals, gray seals, and harbor porpoise would likely avoid the immediate vicinity of the project during deployment and removal activities. While the potential for a vessel and marine mammal interaction is unlikely, NMFS marine mammal avoidance procedures, in compliance with the Marine Mammal Protection Act, would be implemented in the event that a marine mammal is encountered by a service vessel. The small scale of the project and the short duration of deployment and removal activities are expected to minimize any disturbance to marine mammals caused by deployment and removal of the project.

The presence of floating turbine platforms in the water column and floating above the water may result in temporary altered use by marine life. For example, seals are known to haul out on nearly any accessible floating platform. UMaine is implementing design measures to prevent seal haul out (the platform deck will be raised several feet above the water level). Because of the small size and temporary nature of the project, it is not expected that it would change the habitat or the marine community in the deployment area in other ways (e.g. artificial reef effect, fish aggregation [FAD] effect, avoidance of the project area by resident and migratory species).

Because of the acute sensory capabilities of toothed whales (echolocation) and the small size and maneuverability of seals, it is expected that the marine mammal species that occur in the project area would be able to detect and avoid underwater moorings. Collisions with mooring cables and the floating platform are extremely unlikely because of the low probability of a marine mammal encountering the project and because marine mammals expected to occur in

the area have well-developed sensory abilities (echolocation or vision) that allow them to avoid structures. Entanglement in mooring cables is unlikely because of the tension which would prevent looping.

Based on the minimal potential for interaction with marine mammals and any negative impact from these interactions, DOE finds that incidental take of marine mammals is unlikely to occur during the deployment, operation, and retrieval of the UMaine Project Castine test site.

DOE is in the process of developing a Supplemental EA to cover these new activities at the Castine test site.The Draft Supplemental EA was posted on DOE's website on January 10, 2013. A DOE EA Notification of Availability was sent to NMFS staff at that time. Additional background information and analysis can be found in this document and can be viewed at www.eere.energy.gov/golden/Reading_Room.aspx.

If you have any questions, please contact me at 720-356-1322 or via my email at Laura.Margason@go.doe.gov.

Sincerely,

Laura Margason

Laura Margason
NEPA Document Manager

Cc: Michael Johnson, National Marine Fisheries Service
David Bean, National Marine Fisheries Service
Michelle Magliocca, National Marine Fisheries Service

References

Jones, M., P. Ramuhalli, and M. Watkins. 2010. *Characterization of acoustic noise propagation from offshore wind turbines – white paper.* Pacific Northwest National Laboratory, Richland, WA. Unpublished.

Kennedy, L. 2012. Visual Observations for Birds, Turtles, and Marine Mammals at the University of Maine Test Site near Castine, Maine. Prepared by Lubird Kennedy Environmental Services for the University of Maine's Advanced Structures and Composites Center. September, 2012.

National Oceanic and Atmospheric Administration (NOAA). 2012. Guide to Essential Fish Habitat Designations in the Northeastern United States. [Online] URL: http://www.nero.noaa.gov/hcd/index2a.htm. (Accessed October 2012).

U.S. Department of Energy (DOE). 2011. Final Environmental Assessment for University of Maine's Deepwater offshore Floating Wind Turbine Testing and Demonstration Project, Gulf of Maine. DOE, Office of Energy Efficiency and Renewable Energy, Golden Field Office. September 2011. Available online at:

http://www.eere.energy.gov/golden/NEPA_FEA_FONSI.aspx.

Zydlewski, G.B. 2012. Dice Head Acoustic Receiver Array Detections 2009-2011. Data collected by: University of Maine, School of Marine Sciences and School of Biology and Ecology; NOAA Fisheries Maine Field Station, NEFSC; and USGS Maine Cooperative Fish and Wildlife Research Unit.

FIGURE 1

PROPOSED LOCATION OF DEPLOYMENT OF FLOATING OFFSHORE WIND TURBINE PLATFORM.

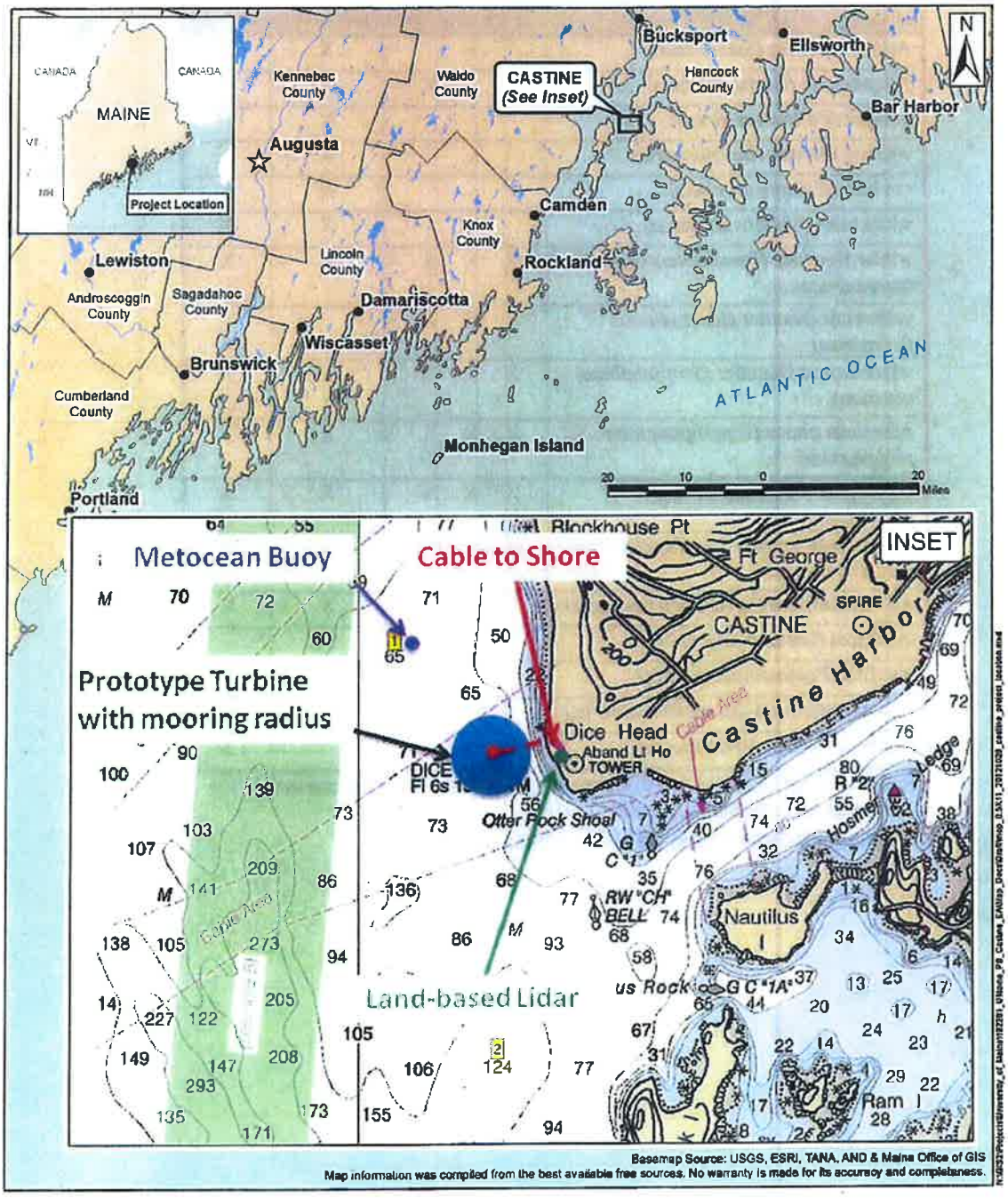


TABLE 1

MARINE SPECIES AND LIFE STAGES FOR WHICH ESSENTIAL FISH HABITAT OCCURS IN WATERS OFF OF CASTINE.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic salmon *(Salmo salar)*			X	X
Atlantic cod *(Gadus morhua)*		X	X	X
pollock *(Pollachius virens)*			X	
whiting *(Merluccius bilinearis)*			X	X
red hake *(Urophycis chuss)*			X	X
white hake *(Urophycis tenuis)*			X	X
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
yellowtail flounder *(Limanda ferruginea)*	X	X		
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*	X	X	X	X
ocean pout *(Macrozoarces americanus)*	X	X	X	X
Atlantic sea scallop *(Placopecten magellanicus)*	X	X	X	X
Atlantic sea herring *(Clupea harengus)*		X	X	X
monkfish *(Lophius americanus)*				
bluefish *(Pomatomus saltatrix)*			X	X
Atlantic mackerel *(Scomber scombrus)*			X	X
bluefin tuna *(Thunnus thynnus)*				X

Source: NOAA. 2012. Guide to Essential Fish Habitat Designations in the Northeastern United States. [Online] URL: http://www.nero.noaa.gov/hcd/STATES4/nmaine.htm.

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

January 16, 2013

Mr. Mark McCollough
Field Supervisor
U.S. Fish & Wildlife Service
17 Godfrey Drive, Suite 2
Orono, ME 04473

Subject: Section 7 Endangered Species Consultation for the University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine

Dear Mr. McCollough:

The U.S. Department of Energy (DOE) is requesting concurrence from the U.S. Fish & Wildlife Service (USFWS) that the proposed University of Maine (UMaine) project, described below, *may affect, but is not likely to adversely affect* either the ESA-listed roseate tern (endangered) or piping plover (threatened).

Background

In response to a 2010 Congressional Directive, the U.S. Department of Energy (DOE) has awarded federal funding to the University of Maine and is proposing to authorize expenditure of that funding to deploy, test, and retrieve one small-scale floating turbine offshore of Castine, in Hancock County, Maine (Project). DOE has previously authorized the expenditure of federal funding by UMaine to conduct a similar project at the UMaine Deepwater Offshore Wind Test Site adjacent to Monhegan Island, Maine (Monhegan test site).

UMaine originally planned to fabricate and temporarily deploy up to two, 1/3-scale turbines at the Monhegan test site. Per the National Environmental Policy Act (NEPA) and DOE's NEPA implementing regulations, an Environmental Assessment (DOE/EA-1792, DOE 2011) was completed for the Monhegan site project. Upon completion of the EA, DOE issued a Finding of No Significant Impact (September 2011). Per requirements under Section 7 of the Endangered Species Act (ESA), DOE initiated informal consultation with the USFWS for that project. In August 2011, the USFWS concurred that the temporary deployment of those turbines *may affect, but is not likely to adversely affect* roseate terns and piping plovers. Since completion of this EA and ESA consultation, UMaine has changed the scope of their project and has proposed to downscale the size of the tower and turbine from 1/3 scale to 1/8 scale. Because of the change, UMaine is now proposing to deploy their Project at a more sheltered nearshore location just west of Castine, Maine (Figure 1) (Castine site) for the initial testing.

Project Summary

Under the new scope, the University would deploy a 20 kilowatt Renewegy wind turbine onto a floating platform. The platform would be located in an existing cableway in water about 100 feet deep and would be moored with catenary mooring lines and either a drag embedment or gravity anchors. The turbine would measure approximately 41 feet from waterline to the hub, the rotor diameter would measure about 32 feet, and the total turbine height would be about 57 feet. The turbine would be connected to the Central Maine Power grid via a cable that would be temporarily installed about 500 to 1,000 feet along the seabed and existing cableway to shore. From the high tide line, the cable would extend about 300 feet along the ground in a protective conduit to the point of interconnection near Dyce's Head Road. The conduit would be removed at the end of the project.

The Project would be deployed for up to four months in the spring and early summer of 2013. During testing, the performance would be monitored to study and validate the design, a necessary step prior to deployment into the open ocean Monhegan test site. During theCastine site testing, the University would use platform installed sensors and telemetry systems in order to evaluate how their design performs under varying wind and wave conditions. Environmental monitoring for birds (visual surveys and web camera observation), marine mammals (visual surveys), bats (echolocation detectors), and benthic invertebrates (remotely operated vehicle surveys and visual surveys) has been ongoing by UMaine since 2012. These studies would continue in the area surrounding the test site during the four month Project deployment.

Determination and Rationale

In a letter dated October 18, 2012, DOE requested from your agency a list of threatened, endangered, proposed species, and/or designated or proposed critical habitat under your jurisdiction that "may be present" within the project area. It was determined that two species may be present: roseate tern and piping plover. The test site does not contain critical habitat for either species. DOE is also consulting with the National Marine Fisheries Service regarding marine species protected under the Endangered Species Act and other trust resources managed by that agency.

The operation of the proposed Project would introduce static and moving above-water components at the site, potentially within the flyway of birds. During Project operation, migrating and foraging birds could be at risk of colliding with the turbine. As described below, there is a very low probability of birds being killed or injured by the four month deployment of the 1/8-scale floating turbine design.

The proposed Renewegy turbine would have a rotor diameter of 31.5 feet and a rotor-sweep zone ranging from approximately 25 feet to 57 feet above the water surface. Of the 456 flying birds observed during the 17 surveys UMaine conducted from March through June, 2012, the majority flew at 16.4 feet (5 meters) above the water surface and 40% flew 3.2 feet (1 meter) or

less above the surface (Figure 2). Approximately 19% flew within the height of the rotor sweep zone (Kennedy 2012). One unidentified tern (*Sterna* sp.) and no piping plovers were observed during the surveys.

Although a low probability, there is a chance some birds might collide with the turbine during the four-month deployment. However, the rotor swept area would be 779 feet^2, which is much smaller than the 1/3-scale turbines evaluated at the Monhegan site, which had a rotor swept area of 6,165 feet^2, almost eight times larger. The relatively small rotor diameter of the 20 kilowatt turbine and the temporary nature of the Project would minimize any collision risk for birds. During the period of deployment, boat based visual surveys of birds would be performed on site weekly and a web camera would be installed on the turbine to monitor potential bird strikes. Visual observation methods would replicate the ongoing pre-deployment monitoring activities.

As the majority of avian species have been detected flying above or below the turbine-swept area, and the proposed Project would be of small scale and have a short operational duration, the likelihood of either two ESA-listed species interacting with the turbine rotors is minor and affects would be negligible. For these reasons, DOE concludes that the Project *may affect, but is not likely to adversely* affect the ESA-listed roseate tern or piping plover.

DOE is in the process of developing a Supplemental EA to cover these new activities at the Castine test site. The Draft Supplemental EA was posted on DOE's website on January 10, 2013. A DOE EA Notification of Availability was sent to USFWS staff at that time. Additional background information and analysis can be found in this document and can be viewed at www.eere.energy.gov/golden/Reading_Room.aspx.

If you have any questions, please contact me at 720-356-1322 or via my email at Laura.Margason@go.doe.gov.

Sincerely,

Laura Margason

Laura Margason
NEPA Document Manager

References

Kennedy, L. 2012. Visual Observations for Birds, Turtles, and Marine Mammals at the University of Maine Test Site near Castine, Maine. Prepared by Lubird Kennedy Environmental Services for the University of Maine's Advanced Structures and Composites Center. September, 2012.

U.S. Department of Energy (DOE). 2011. Final Environmental Assessment for University of Maine's Deepwater offshore Floating Wind Turbine Testing and Demonstration Project, Gulf of Maine. DOE, Office of Energy Efficiency and Renewable Energy, Golden Field Office. September 2011. Available online at: http://www.eere.energy.gov/golden/NEPA_FEA_ FONSI.aspx.

FIGURE 1
PROPOSED LOCATION OF DEPLOYMENT OF the UMAINE FLOATING OFFSHORE WIND TURBINE PLATFORM PROJECT.

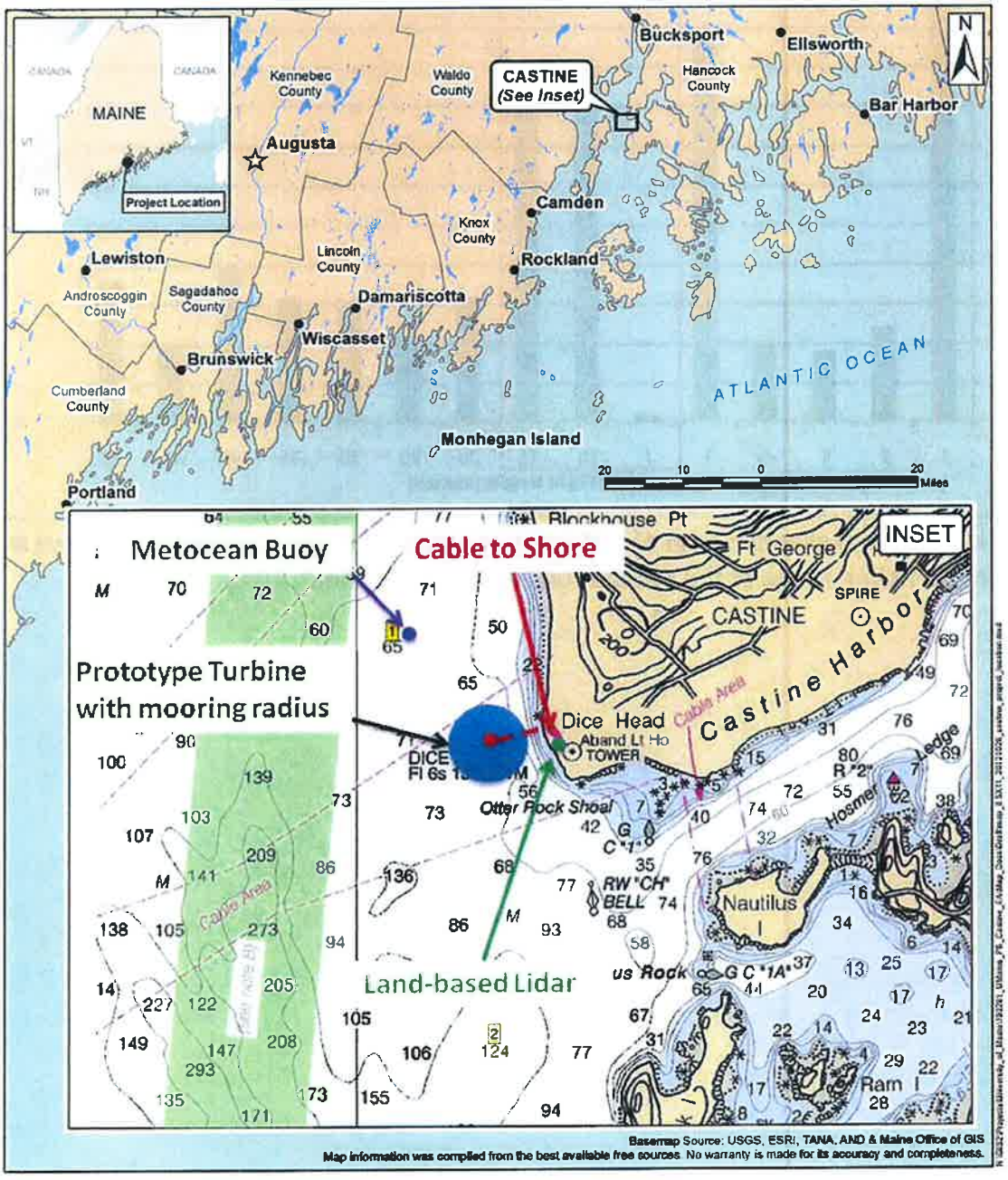
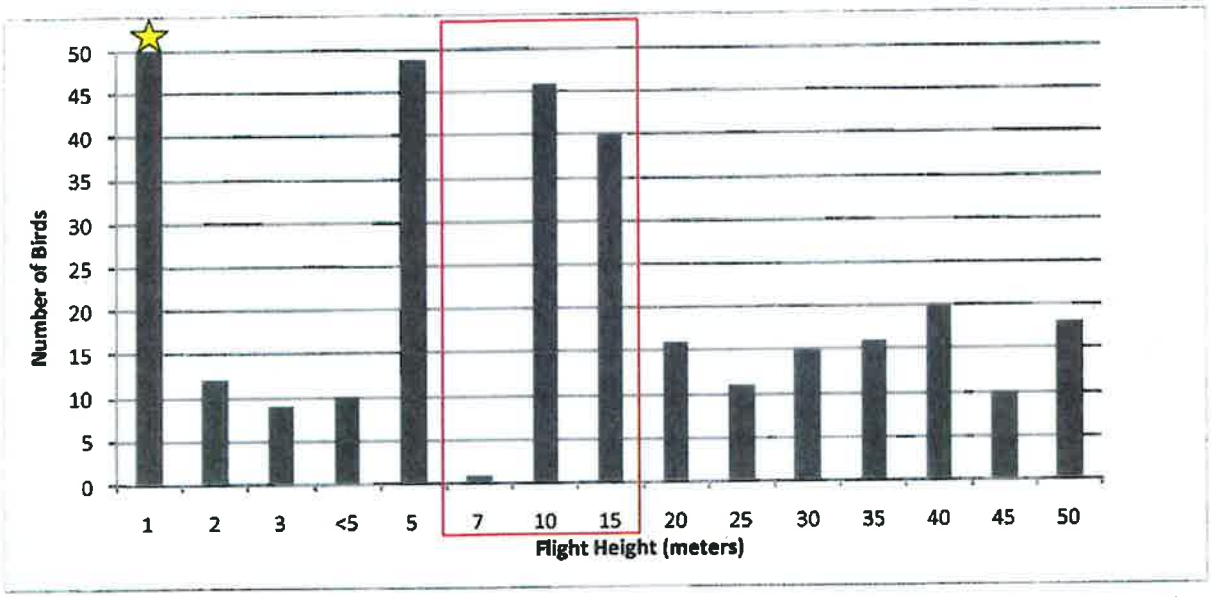


FIGURE 2
FLIGHT HEIGHTS FOR BIRD SPECIES OBSERVED DURING UMAINE 2012 VISUAL SURVEYS.



The yellow star represents a total of 183 birds at one meter high. The red box shows the approximate height range of the turbine rotor. Source: Kennedy 2012.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

FEB 20 2013

Laura Margason
Department of Energy
NEPA Document Manager
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401 -3393

Re: UMaine offshore wind turbine interim demonstration project, Castine, Maine

Dear Ms. Margason,

We have reviewed your January 16, 2013, letter requesting consultation under section 7 of the Endangered Species Act (ESA) of 1973 as amended and the Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for the University of Maine's (UMaine) proposed interim offshore wind project near Castine, Maine. You have made the determination that the proposed project may affect, but is not likely to adversely affect any species listed as threatened or endangered by NMFS, and that the proposed project would have minimal adverse affects on EFH that has been designated within the project area. Since all effects of the proposed action will be insignificant and discountable, we concur with your determination that the proposed project may affect, but is not likely to adversely affect any ESA listed species under our jurisdiction. In addition, we concur with your determination that the proposed project would have minimal adverse effects on EFH. Our conclusions are based on information provided in a Draft Supplemental Environmental Assessment (DSEA) (DOE/EA-1792S Jan. 2013). The justifications for our determinations are outlined below.

Funding for the demonstration project comes largely from the Department of Energy (DOE), so the federal actions associated with the deployment of the test unit are the delegation of funds by the DOE and the issuance of a permit under Section 10 of the Rivers and Harbors Act by the US Army Corps of Engineers (ACOE). The DOE is the lead Federal agency for the project for purposes of this consultation and coordination under the National Environmental Policy Act.

Proposed Project

The project involves the temporary deployment and testing of a 1/8 scale wind turbine within state waters offshore of Castine, Maine, by the University of Maine (Figure 1). UMaine proposes to use DOE funding to deploy and retrieve one 20-kW wind turbine on a floating platform located offshore of Castine, Maine. In addition, UMaine proposes to conduct initial

testing of the floating platform and wind turbine system. The turbine would be connected to the Central Maine Power (CMP) grid via an electrical cable to be installed along the seabed surface in an existing cable right-of-way (ROW) from below the turbine to shore, and above ground to an existing CMP power pole. The turbine platform would carry sensor and telemetry systems that would provide data to evaluate the engineering, structural, and motion performance of the turbine platform under combined wind, wave, and environmental conditions. Additionally, environmental monitoring for birds (visual surveys and web camera observation), marine mammals (visual surveys), bats (echolocation detectors), and benthic invertebrates (remotely operated vehicle surveys and visual surveys), which was initiated by UMaine in 2012 to support development of the DSEA, would continue in the area surrounding the test site during the deployment. Further, ongoing acoustic monitoring of tagged fish in the project area will also continue.

The floating platform consists of a pre-formed concrete structure which is held in place by multiple anchor points on the sea floor in approximately 100 feet of water. A wind turbine and monitoring equipment will be mounted on the platform and will stand approximately 57 feet above mean sea level (MSL). The floating platform on which the wind turbine is mounted will be constructed onshore and will be towed to the proposed deployment site via a tug boat. We anticipate it will take approximately two hours to tow the floating turbine from the launch site to the final destination at Dyce Head, Castine. Notice would be given to the Maine Marine Patrol and United States Coast Guard (USCG) to alert fishermen about towing operations and to advise for the removal of gear from the planned tow route. Upon arrival at the site, the structure will be connected to the mooring structure in place and secured to the ocean floor via catenary mooring lines and four embedded anchors. Deployment operations are expected to occur in several stages starting in early spring of 2013 to place anchors, followed by towing the fully assembled structure from a shore based facility to the deployment site, and setting the platform and wind turbine unit in place. The anticipated time required for project installation would be two days to deploy the four anchors, one day to install the turbine platform, two days to install the subsea cable, and two weeks for the land-based work.

The demonstration unit will remain in place during the spring of 2013 for a period of four months (i.e., April through July) to collect engineering and environmental data on site. The floating offshore wind turbine system would be retrieved from Castine at the end of the deployment period in late July or early August. At the end of the scheduled deployment, the structure will be removed by disconnecting the deepwater platform from the anchors and towing it back to the shore for disassembly. It is possible that unanticipated removal of the turbine would be necessary in the case of an extreme weather event. Therefore, the design incorporates the capability to disconnect the floating turbine system from its moorings and tow it safely to port. The removal of the floating turbine system and its associated moorings would be completed in two stages: 1) removal of the floating turbine system and; 2) removal of the catenary moorings lines and anchors. All electrical interconnection equipment also would be removed at the conclusion of the test.
Additional periodic visits to the floating platform and wind turbine will be required to visually inspect the structure, perform general maintenance of instruments, and address other issues as

they arise. The frequency of visits will vary depending on purpose and weather conditions. Towing of the structures from shore out to the site and back will be performed via tug boats, other smaller vessels will be used for routine maintenance, operations and monitoring activities associated with the project. The onboard management of fuels and lubricating fluids aboard all vessels would be managed in accordance with USCG regulations applicable to each vessel. The requirements are dictated by vessel size and intended operations, but in each case do not permit the discharge of petroleum or hazardous substances into the environment and require a spill prevention plan and certificate of financial responsibility.

Power would be generated at the turbine at 480-V, 3-phase, and would be delivered to the CMP grid through a combination of submarine and land based cables. Beginning at the offshore turbine mooring anchor, the electrical cable would run along the seabed approximately 500 to 1,000 feet to the shore, just below the low tide line. The cable would be anchored to the seafloor using simple weight strands every five feet, and these would be removed with the cable at the project's conclusion. At the point the cable is exposed above ground, the cable would be contained in a Schedule 40 rigid metal conduit within the tidal zone and Schedule 80 polyvinyl chloride (PVC) from the high tide location to the CMP point of interconnection in order to meet electrical code requirements. The 2.5-inch PVC conduit would extend approximately 300 feet from the high tide line to the point of interconnection near Dyce's Head Road.

If you fund the proposed project, the following measures will be implemented by UMaine to minimize or avoid potential biological and environmental effects:

- To prevent seals from using the turbine platform for resting (seal haul out), the platform has been designed to limit the horizontal surfaces, and the platform deck height will preclude haul out of seals.
- The turbine tower will not have external ladders or other structures that will allow birds to perch near the turbine blades.
- The specifications for lighting of the floating platform and turbine will be developed in compliance with USFWS lighting requirements.
- UMaine will conduct monitoring for birds, bats, marine mammals, benthic invertebrates, and fish. The continued monitoring effort will complement the pre-deployment monitoring that has already been performed. Results of the monitoring will be provided to DOE and applicable resources agencies.
- NMFS marine mammal avoidance and best management procedures will be implemented in the event that a marine mammal is encountered by a construction or maintenance vessel http://www.nero.noaa.gov/prot_res/mmv/approach.html.
- Fuels and lubricating fluids aboard all vessels will be managed in accordance with U.S. Coast Guard regulations applicable to each vessel.
- Following completion of the project, the floating turbine platform, anchors, and the electrical cable will be retrieved. The electrical cable anchors on shore will be removed, any bolts will be cut to flush with existing grade, and support blocks and the conduit will be removed. Disturbed areas will be stabilized with straw mulch.

NMFS Trust Resources in the Project Area

The proposed project is located offshore of Castine, Maine at approximately N 44° 23' 07", W 68° 49' 25" (Figure 1). For purposes of the section 7 consultation, the action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50CFR§402.02). For this project, the action area is limited to the project footprint and the transit route used by vessels delivering and servicing the platform. There is no critical habitat designated for any species under our jurisdiction in the action area. This area is expected to encompass all of the effects of the proposed project.

Several species of fish under our jurisdiction are likely to occur in the action area; these include, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic salmon (*Salmo salar*).

The Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon (*Salmo salar*) includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. Included are all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH). This project is located within the range of the GOM DPS of Atlantic salmon.

The distribution of federally endangered shortnose sturgeon (*Acipenser brevirostrum*) in waters off the coast of Maine is not well understood or documented. In Maine, shortnose sturgeon are known to occur in the Penobscot River, the Kennebec/Sheepscot/Androscoggin River complex, the Saco River, and occasionally in several smaller coastal rivers. Limited information on coastal migrations is available; however, the best available information suggests that when in coastal waters, shortnose sturgeon are likely to occur closer to the coast.

New York Bight (NYB) and Gulf of Maine (GOM) Distinct Population Segments (DPSs) of Atlantic sturgeon occur in the action area. In 2012, four DPSs of Atlantic sturgeon were listed as endangered (NYB, Chesapeake Bay, Carolina, and South Atlantic) and one as threatened (GOM). We have considered the best available information on the distribution of Atlantic sturgeon and have determined that most Atlantic sturgeon in the action area are likely to be of GOM DPS origin. However, it is likely that some Atlantic sturgeon occurring in the action area are of Canadian origin (and therefore, not listed under the ESA) and a small portion of Atlantic sturgeon occurring in the action area are likely to be NYB origin. Further, recent information from telemetry studies conducted on sturgeon in the Gulf of Maine indicates many individuals are utilizing coastal bays and estuaries while migrating along the coast. Therefore, based on this information, we anticipate sub-adult and adult Atlantic and shortnose sturgeon to be present in the action area while participating in coastal migrations and for foraging.

Information on the distribution and movements from a variety of acoustically tagged listed fish (e.g., shortnose sturgeon, Atlantic salmon and Atlantic sturgeon), are available since 2005 from

acoustic receivers which have been deployed throughout the GOM. UMaine in collaboration with NMFS and United States Geological Survey (USGS), have been conducting telemetry studies to track the movements of listed Atlantic salmon, Atlantic sturgeon and shortnose sturgeon within the Penobscot River and through Penobscot Bay. This is a significant part of a larger effort across the GOM which includes other telemetry receivers and arrays deployed by Ocean Observing System/NERACOOS system (GOMOOS), Maine Department of Marine Resources and University of New England (Figure 2). Together, these receivers can provide detailed information on the location and movement of tagged individuals which pass the stationary acoustic tag detection units. For example, hundreds of juvenile Atlantic salmon smolts are tagged annually from the Penobscot River. Since 2006, approximately 20-30 adult shortnose sturgeon captured annually in the Penobscot River have been fitted with acoustic tags. Since 2005, the acoustic receivers, with a detection range of approximately 0.6 miles, have made over 9,000 detections of acoustic tags. These 9,000 detections were from 37 different individual acoustic tags.

More recently, data have been compiled for 2009, 2010 and 2011 from the acoustic array found adjacent to the project area off Dice Head, Castine, Maine (Figure 2). These data show all three species to be found in the vicinity of the project area, with some differences in detection times mostly dependant on seasonality (Zydlewski 2012). According to the acoustic tag report, movements of Atlantic salmon smolts through the Dice Head array started in late April and peaked in May, followed by Atlantic sturgeon movements throughout the year, increasing in frequency during May and October, in addition to, low numbers of shortnose sturgeon movements occurring from May through July. Some of the shortnose sturgeon had transmitters that also provided information on depth of movement. For the five individuals detected in 2009, their average depth of movement was 34.6 ± 4.4 (mean ± SD) feet. The channel in this reach of the bay can be up to 120 feet deep.

Three species of listed sea turtle species occur in New England waters during the warmer months, generally when water temperatures are greater than 15°C. The sea turtles in these waters are typically small juveniles with the most abundant being the federally endangered leatherback (*Dermochelys coriacea*), federally threatened loggerhead (*Caretta caretta*) and federally endangered Kemp's ridley (*Lepidochelys kempi*) sea turtles; however, Kemp's ridleys are rare in waters north of Massachusetts and only leatherback or loggerhead sea turtles are likely to occur in coastal Maine waters. Sea turtles move into waters off the coast of Maine from their southern wintering grounds in late June/July and most sea turtles move south from these waters by the first week in November. The highest numbers of sea turtles are present in these waters between July and October each year. Depths at the deployment site are approximately 100 feet, with an adjacent deep channel that reaches depths of 120 feet. Since the location of this site within Penobscot Bay is near shore in a coastal environment, it is anticipated sea turtles may pass through the project area during periods of migration and any use of the deployment area by sea turtles is likely to be transient. In addition, sea turtles may also occur seasonally along the vessel transit route while migrating or resting.
Listed whales also occur in the waters off the coast of Maine. In the action area, North Atlantic right whales (*Eubalaena glacialis*) as well as occasional humpback whales (*Megaptera*

novaeangliae) and fin whales (*Balaenoptera physalus*) could be present. These large whales are listed as endangered under the ESA and are also protected under the MMPA. Seals and porpoises are protected under the MMPA but are not listed under the ESA. During 2012, UMaine researchers conducted 17 marine mammal surveys while boating along dedicated transects that traversed the proposed test site. Visual observations included 66 harbor seals (*Phoca vitulina*), one grey seal (*Halichoerus grypus*), and 34 harbor porpoise (*Phocoena phocoena*), no large whales were encountered during the marine mammal surveys (Kennedy 2012). These data are consistent with strandings and observer data from the nearshore areas of the GOM. The action area is not a known concentration area for right whales; however, individual transient right whales could be present in the action area as individuals move between migration corridors and foraging areas. Similarly, while humpback and fin whales are not known to concentrate in the action area, occasional transient individuals could be present in the area year-round while migrating along the Atlantic coast or moving between foraging areas located in the GOM.

Essential Fish Habitat and Fish and Wildlife Coordination Act

As noted within the DSEA, the proposed project area has been designated as EFH for a range of federally managed species including, but not limited to Atlantic cod, haddock, and American plaice. Complex substrates consisting of rock, sand/gravel and mud are present within the proposed project area and serve as important habitats for benthic fish and shellfish resources. In addition, as you have noted, a number of NOAA-trust resources covered under the Fish and Wildlife Coordination Act (FWCA) consultation requirements occur in the project area. The FWCA requires that Federal agencies should consult with wildlife agencies, including NOAA, for projects that may modify a water body. Some of the species potentially affected include diadromous species such as blueback herring, alewife, rainbow smelt, striped bass, American eel, American shad and American lobster. Diadromous fishery resources also serve as prey for a number of federally-managed species and several species are considered a component of EFH pursuant to the MSA.

Effects of the Action

Potential effects to listed species from the deployment of the test platform mooring gear could result from extraneous noise, entanglement, entrapment, effects on benthic habitat or changes to the marine community composition in the area where the platform is moored, or interaction of marine mammals with the platform or its anchoring system and from interactions with project vessels as described below.

Interactions or Entanglement with the Platform and its Anchoring System

As explained above, the test unit will consist of a floating platform with four embedded anchors attached by cable, chain and/or synthetic material. As noted above, based on information from acoustic receivers, the location of the proposed project area overlaps with a migratory corridor used by juvenile and adult Atlantic salmon, Atlantic and shortnose sturgeon. Also, since we did not identify specific Primary Constituent Elements (PCEs) for an oceanic migratory corridor at the time of designating critical habitat, the action area does not occur within designated critical habitat for Atlantic salmon. Therefore, since it is unlikely that the placement

of the associated mooring structure will reduce the amount of forage available to migrating Atlantic salmon or otherwise affect migrating Atlantic salmon, we have determined any effects to listed Atlantic salmon will be insignificant. While Atlantic and shortnose sturgeon are susceptible to the effects to benthic resources identified herein, any effects to the benthic environment will be minor and temporary, and there is not likely to be any change in species composition or substrate type in the action area (see effects to marine and benthic resources below). Thus, we have determined that any effects to Atlantic and shortnose sturgeon resulting from the temporary deployment of mooring gear and electrical cable are insignificant and discountable.

We have considered the potential for whales and/or sea turtles to interact with the test unit and become entangled in its anchoring system. In order for an entanglement to occur, an animal must first encounter the gear. Since there will only be one test unit deployed in an open ocean environment in an area where listed species are not known to concentrate, the likelihood of a whale or sea turtle encountering the gear is extremely low. The catenary mooring system proposed to be used to anchor could potentially pose a risk of entanglement because the anchor lines would have a slightly horizontal orientation in the water column due to a 3:1 scope and depth of water. However, these anchor lines would be under high tensile loads and will be composed of synthetic material or steel cables and chains at least 2-3 inches in diameter, which should greatly reduce the risk of any entanglement of marine mammals. The proposed deployment of the floating platform and accompanying mooring system should reduce the risk of entanglement because of the: 1) tensile loads maintained in the cantenary mooring design; 2) the diameter and composition of the anchor lines, and; 3) the mooring array is comprised of a limited number of vertical lines. Furthermore, humpback, right and fin whales can occur in the action area; however, occurrence in the action area is relatively rare and is likely to be limited to transient individuals. Similarly, while listed sea turtles also occur seasonally in the action area, the waters off of Maine are not high use areas for these species, occurrence in the action area is relatively rare, and is likely to be limited to transient individuals completing coastal migrations or moving between coastal foraging areas. Therefore, based on the analysis herein, it is extremely unlikely that a whale or sea turtle will interact with the test unit and become entangled. As such, we have determined that any effects to listed marine mammals and sea turtles from the deployment of the test unit on these species are insignificant and discountable.

Underwater Sound Generated from Unit or Support Structure

Underwater sound generated from the deployment of the floating platform and operation of the wind turbine along with the supporting mooring system gear could potentially affect marine mammals in the area. According to information provided in the DSEA, the Renewegy 20-kW turbine creates noise levels of about 50 dB at 120 feet (Renewegy 2012) and only a small amount of sound is expected to result from transfer of above-water sound through the sea surface. Underwater sound levels resulting from extraneous turbine noise transferred through the sea surface are expected to be substantially lower than the sound source levels, due to the reflective nature of the sea surface (Jones *et al.* 2010). Acoustic emissions underwater, due to vibrations of the turbine and platform structure are expected to be low frequency and low amplitude, and are strongly dependent on turbine and platform configuration and dynamic

loads (Jones *et al.* 2010). Due to the small scale of the project and composition of the floating platform, we do not anticipate underwater noise levels greater than 120 dB (the MMPA defines the threshold for Level B behavioral harassment for marine mammals as 120 dB for continuous noise and 160 dB for impulse sound). However, if the data collected during operation shows noise levels exceed this threshold, an Incidental Take Authorization for marine mammals would be necessary.

Effects to Marine and Benthic Resources

The mooring system is configured with embedded anchors which will be in contact with the seafloor for up to four months (Figure 3). An electrical cable will be temporarily installed on the ocean floor in a specified Right of Way (ROW). According to the DSEA, the actual footprint of project components resting on the seabed would be approximately 421 ft^2, this would consist of the four anchors (combined footprint of 64 ft^2 at most) and the subsea cable and strip weights (combined footprint of about 357 ft^2). In the event that gravity anchors are used instead of drag embedment anchors, each of the four anchors would have a footprint of 100 ft^2 (combined footprint of 400 ft^2) for a total of approximately 757 ft^2. This will result in the loss of an extremely small area of substrate available as potential foraging area (421 ft^2 or worst case scenario 757 ft^2). Further, as deployment of the test unit will be temporary, and the placement of the electrical cables and mooring system will be temporary, any effects to the sea bottom and benthic resources will be temporary. The area where this gear is in contact with the bottom will not be available for foraging Atlantic and shortnose sturgeon and sea turtles that feed on benthic organisms. Therefore, considering the temporary limited benthic footprint of the proposed project from the placement of the mooring system and electrical cable (421 ft^2 or 757 ft^2) will result in minimal impacts to EFH. However, there is also the potential for impacts resulting from anchorline scour during initial placement and operation of the test facility. We recommend the proposed monitoring plan include an assessment of benthic impacts resulting from the placement and configuration of electrical cables and anchors, as well as assess recovery of EFH once the mooring system is removed.

Leatherback sea turtles forage on jellyfish, while loggerheads feed on crustaceans and mollusks. Right whales feed on copepods, humpback whales feed on fish such as sand lance and herring, and fin whales feed on krill and other small schooling fish. The fish community structure in the immediate project vicinity could potentially be impacted from the placement of a floating platform and wind turbine. However, the distribution of fish is not likely to be affected by the placement of the test unit or the mooring system and other mobile benthic prey species such as crustaceans, crabs and shrimp are likely to move away from the immediate area where the test unit will be placed. Furthermore, the applicant has developed a monitoring plan to provide annual data for analysis to validate these assumptions. As such, annual reporting requirements will include both environmental and biological information to evaluate the changes to benthic and marine resources from the placement of the test platform and wind turbine unit. Therefore, we have determined there is not likely to be a significant reduction in the amount of forage available to sea turtles or whales in the action area. As there will be no anticipated reduction in sea turtle forage items and an extremely small reduction in the amount

of available benthic habitat, any effects to foraging sea turtles or whales will be insignificant and discountable.

Risk of Vessel Strike

Collision with vessels remains a source of anthropogenic mortality for sea turtles, whales, and sturgeon. However, sturgeon vessel strikes typically occur in more confined regions such as rivers and given the location of the action area, it is unlikely that vessel strikes on sturgeon will occur. The deployment of the test unit as well as periodic maintenance and inspection will require the use of vessels; these vessels will represent an increase in vessel traffic in the action area. This increase in vessel traffic will result in some increased risk of vessel strike of listed marine mammals and sea turtles. However, due to the limited information available regarding the incidence of ship strike and the factors contributing to ship strike events, it is difficult to determine how a particular number of vessel transits or a percentage increase in vessel traffic will translate into a number of likely ship strike events or percentage increase in collision risk. In spite of being one of the primary known sources of direct anthropogenic mortality to whales, and to a lesser degree, sea turtles, ship strikes remain relatively rare, stochastic events, and an increase in vessel traffic in the action area would not necessarily translate into an increase in ship strike events. To compensate for the lack of site specific data, an ESA listed marine mammal monitoring plan will be in place for the term of the project to observe ESA listed marine mammal activity in the project area. The risk of collision is greatest when vessels are moving at high speeds. As identified in the DSEA, it is anticipated that towing the unit to and from the site will take approximately 2 hours and requires one tugboat. Average speed for platform towing operations is anticipated to be between approximately 2 and 4 knots. Once installation is completed, vessel speed returning to the mainland (and to the project for removal) will likely be typical commercial boat speed of approximately 12 knots. Other visits to the test unit are likely to be with a single vessel. Normal vessel speed traveling to and from the site for monitoring is anticipated to be approximately 20 knots. Lower speeds, ranging from 0 to 5 knots, will be necessary within the deployment site in order to observe the equipment and accurate collection fish and wildlife observation data. UMaine will implement NMFS marine mammal avoidance procedures in the event that a marine mammal is encountered by a construction or maintenance vessel. Additionally, project vessels will abide by the NMFS Northeast Regional Viewing Guidelines, as updated through the life of the project. The presence of a lookout on the vessel who can advise the vessel operator to slow the vessel or maneuver safely when listed species or marine mammals are spotted will further reduce the potential for interaction with vessels.

Large whales, particularly right whales, are vulnerable to injury and mortality from ship strikes. Although the threat of vessel collision exists anywhere listed species and vessel activity overlap, ship strike is more likely to occur in areas where high vessel traffic coincides with high species density. In addition, ship strikes are more likely to occur and more likely to result in serious injury or mortality when vessels are traveling at speeds greater than ten knots. Therefore, with a likelihood of encountering a whale low and the chance of vessel strike extremely low, we have determined that the increased risk of vessel collision posed by project vessel operation in the action area is insignificant.

ESA Conclusions
Based on the analysis concluding that all effects of the proposed project on listed species will be insignificant and discountable, we concur with the determination that the pilot deployment of one test unit in 2013 for a four month period (April through July) is not likely to adversely affect any listed species under our jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required. Reinitiation of consultation is required and shall be requested by the Federal agency or by us, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action.

EFH and FWCA Conclusions
We concur with your determination that adverse impacts to EFH and FWCA species and habitats will be minimal. According to your letter, a monitoring program has been in place since 2012 to evaluate the effects of the project on benthic resources and fish, and that this program will continue during the project deployment. We support this continued monitoring program, and request a copy of monitoring reports be sent to us for review upon completion of the project. Please also note that a distinct and further EFH consultation must be reinitiated pursuant to 50 CFR 600.920(l) if new information becomes available or the project is revised in such a manner that affects the basis for the above determination.

Marine Mammal Conclusions
Based on the information provided, we do not anticipate any impacts to marine mammals caused from extraneous noise, entanglement or vessel strike. If it is determined during the project deployment or due to alterations to the project technology, that activities could impact marine mammals, then we recommend that operations be suspended and UMaine either; 1) consult with us to implement further mitigation to avoid take or; 2) apply for an incidental take authorization pursuant to section 101 (a)(5)(A) and (D) of the MMPA.

Should you have any ESA related questions about this correspondence please contact David Bean at (207) 866-4172 or by e-mail (David.Bean@Noaa.gov). For questions in regards to effects to EFH and FWCA resources, please contact Michael Johnson at (978) 281-9130 or by

email (mike.r.johnson@Noaa.gov). For questions regarding the MMPA, please contact Michelle Magliocca in NMFS' Office of Protected Resources in Silver Spring, Maryland at (301) 427-8426 or by email (Michelle.Magliocca@Noaa.gov).

Sincerely,

John K. Bullard
Regional Administrator

EC: Bean, F/NER3
Magliocca, F/PR1
Johnson, FNER4
Boelke, F/NER4
Jay Clement, ACOE

File Code: Sec 7 UMaine Offshore Wind Turbine Interim Castine, Maine
PCTS: I/NER/2013/9477

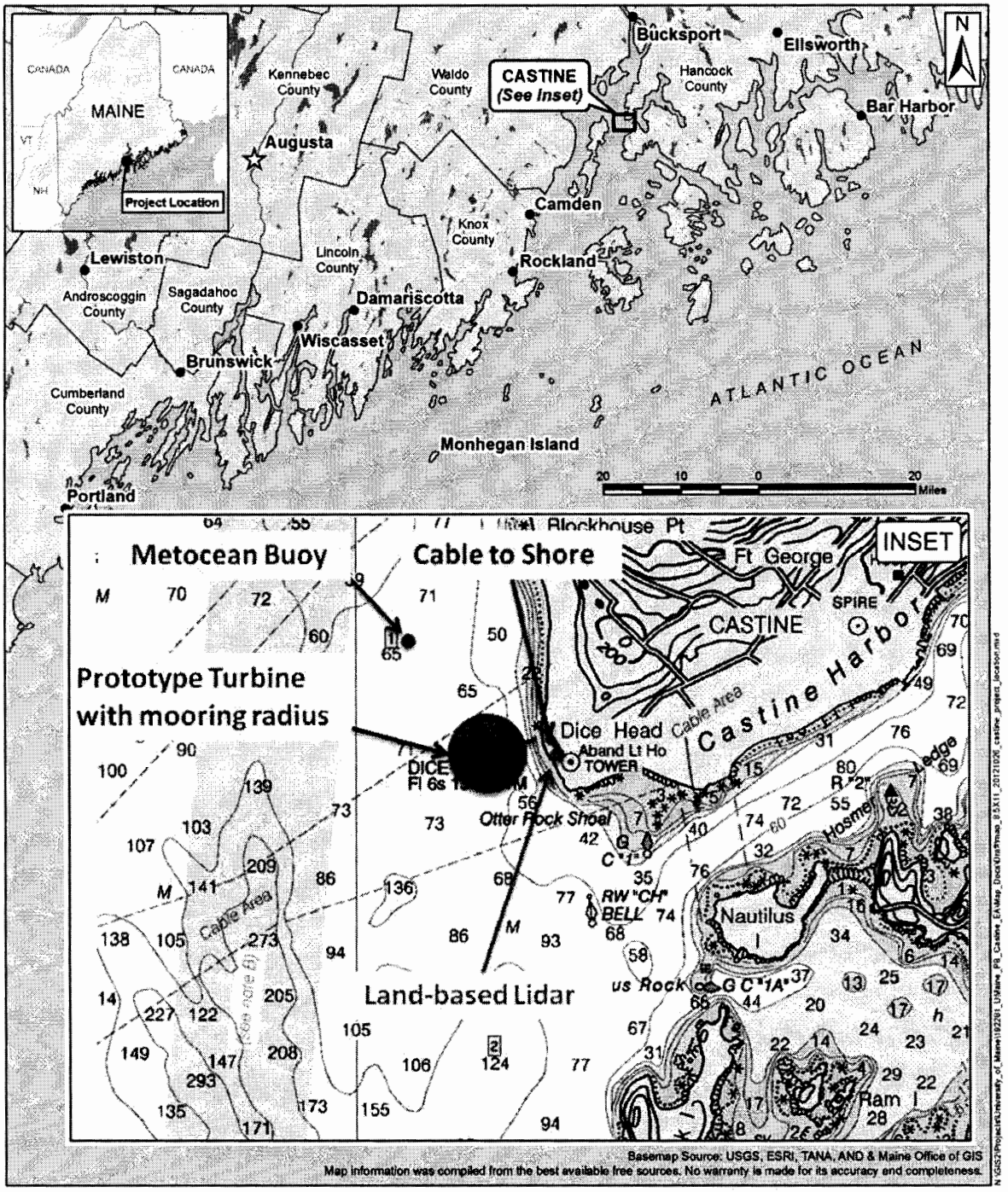


Figure 1. Map of Project Area

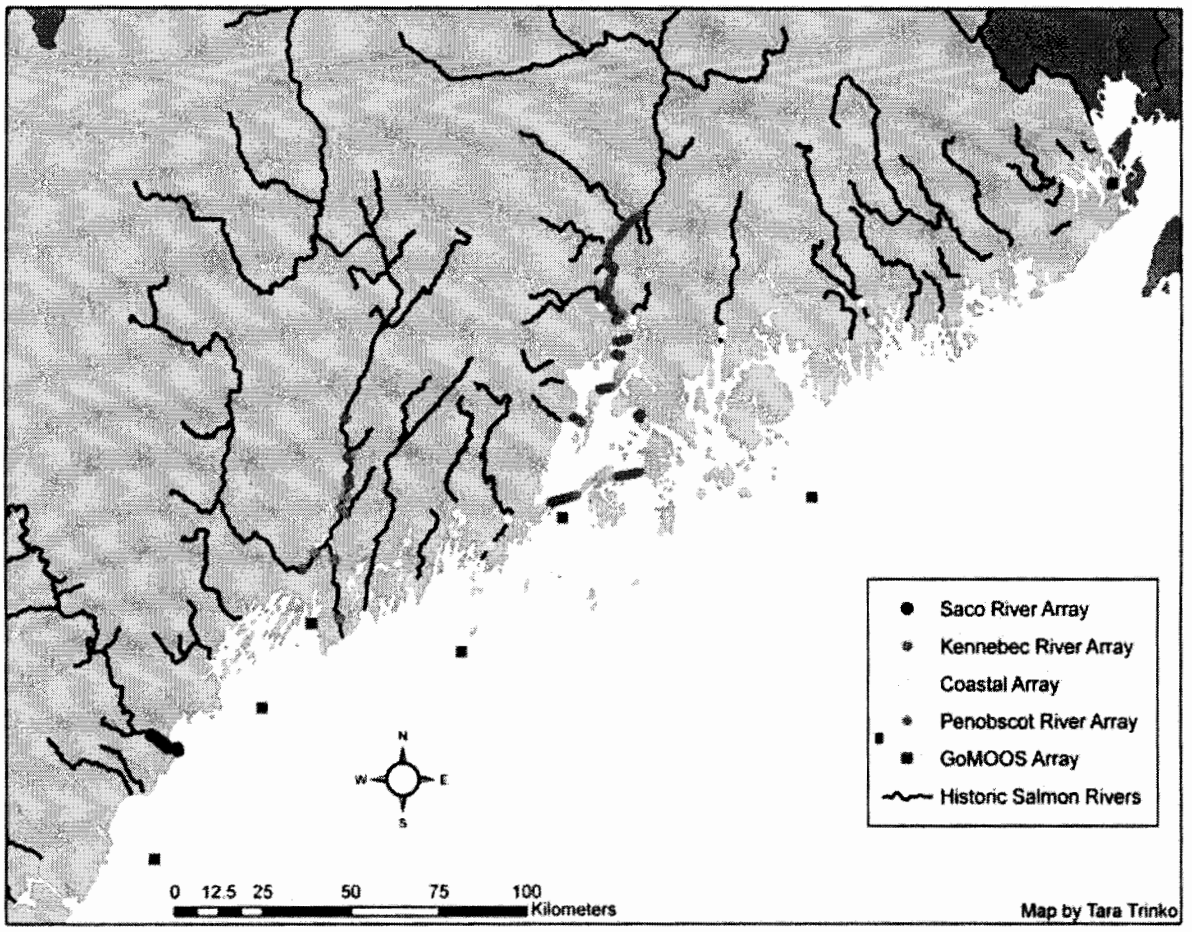


Figure 2. Gulf of Maine Telemetry Array (each circle or square represents one receiver, gold circles represents Penobscot River Array)

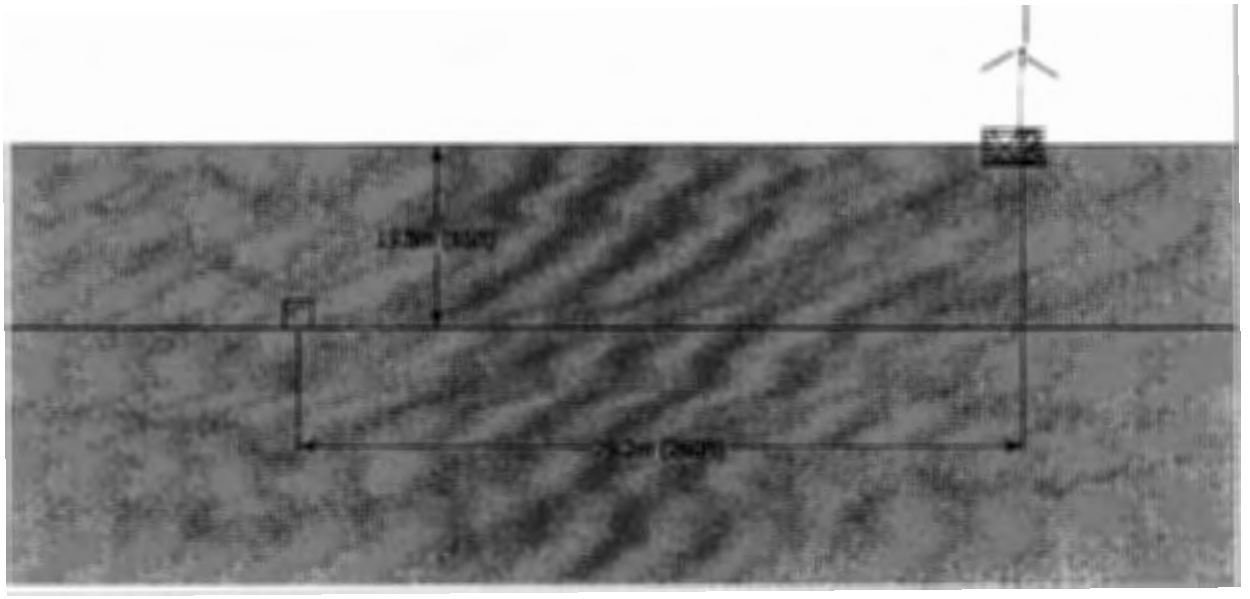


Figure 3. Proposed mooring line design for anchoring floating platform

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Maine Field Office
17 Godfrey Drive, Suite 2
Orono, Maine 04473
207/866-3344 Fax: 207/866-3351

March 7, 2013

Laura Margason
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Dear Ms. Margason:

This letter responds to your January 16, 2013 letter requesting consultation pursuant to section 7 of the Endangered Species Act (ESA). This letter provides the U. S. Fish and Wildlife Service's (Service) response pursuant to section 7 of the ESA, as amended (16 U.S.C. 1531-1543), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d, 54 Stat. 250), and the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667d).

Project Name/Location: **University of Maine Testing of a Floating Offshore Wind Turbine Platform, Castine, Maine**

Log Number: **05E1ME00-2012-I-0076**

The University of Maine intends to deploy a 20 kW Renewegy wind turbine on a floating platform in Castine, Maine. The turbine would measure about 41 feet from waterline to the hub, the rotor diameter would measure about 32 feet, and the total turbine height would be about 57 feet. The floating platform would be connected by cable to the Central Maine Power grid near Dyce's Head Road. The project would be deployed for up to four months in the spring and early summer of 2013. During the testing, the performance will be monitored in addition to monitoring birds (visual surveys and web camera observation), marine mammals (visual surveys), and bats (bat detectors). Similar pre-construction studies were conducted in 2012. Results of 2013 studies will be shared with the Service.

The Department of Energy (DOE) has acknowledged that some birds may collide with the turbine during the four-month deployment. However, the DOE has made a determination that the project is not likely to adversely affect the federally threatened piping plover (*Charadrius melodus*) and endangered roseate tern (*Sterna dougallii*) and has, therefore, requested the

Service's concurrence with this determination.

The Service has reviewed the Draft Supplemental Environmental Assessment (EA), which covers the activities at the Castine test site. We met with the University of Maine in early 2013. They provided additional information and answered questions on the EA as requested.

ESA Listed Species in the Action Area

Piping plover

The piping plover (*Charadrius melodus*) nests on sand beaches on the coast of Maine. The closest nesting location is located at Reid State Park, which is located approximately 45 miles southwest of the Castine project area. It is unlikely that piping plovers from Maine nesting areas would be in the vicinity of Castine during the test period. However, approximately 250 pairs nest in eastern Canada and could be passing through the test area during the time that the turbine is deployed.

Little is known about the migration routes, altitude, flight patterns, and timing of migration of piping plovers migrating to eastern Canada. Northward migration from wintering grounds to breeding grounds occurs during late February, March, and early April. Piping plovers arrive in Nova Scotia from mid to late April. Southward migration begins as young plovers fledge in late July and extends through August, trailing off in early September. Plovers are generally believed to migrate in close proximity to the shoreline making shore stopovers lasting from a few days to a month at coastal locations during their migration. It is possible that as many as 500 northward migration flights by piping plovers may occur along the coast of Maine each spring. It is also possible that some or all eastern Canada plovers could migrate over water in the Gulf of Maine.

Risk to piping plovers from wind turbine generators sited near shore was assessed for another offshore wind generation project in New England in the Service's Biological Opinion for the Cape Wind Energy Project in Nantucket Sound, Massachusetts (2008). The Cape Wind project is proposed at a location that is two miles from the closest piping plover nesting beaches. The Cape Wind Biological Opinion reviewed and evaluated potential risk to piping plovers from other wind projects in eastern Canada and Massachusetts located near plover nesting beaches. None of these projects has caused detectable injury to piping plovers up to the time the Cape Wind Opinion was completed. Modeled collision rates for Cape Wind for migratory and resident piping plovers were estimated to be 0.18 collisions per year.

Impacts may vary with the specific size, number, and configuration of proposed wind turbine generators and site-specific factors such as juxtaposition of nesting and foraging habitats and weather patterns.

Because of the project location (the Castine test location is located far from nesting areas in Maine), the duration of the project testing (scheduled to be deployed for only four months), the absence of foraging habitat (there is little shorebird foraging habitat in the vicinity), and the overall size of the project (there is only a single turbine with small rotor swept area), we concur with the DOE that the project in not likely to adversely affect the threatened piping plover.

Roseate tern

Roseate terns (*Sterna dougallii*) nest on islands off the coast of Maine. The closest nesting location is Seal Island in outer Penobscot Bay approximately 33 miles south of the project area. Roseate terns prefer to feed inshore, especially in shallow areas and shoals. During the breeding season, roseate terns forage over shallow coastal waters, sometimes near the colony and at other times at distances over 20 miles. They typically hover and dive from a height of 3.3 to 20 feet, but may do so from up to 40 feet. University of Maine preliminary studies documented few terns in the project area.

Risk to roseate terns from wind turbine generators sited near shore was assessed in the Service's Biological Opinion for the Cape Wind Energy Project in Nantucket Sound, Massachusetts (2008). This project is proposed at a location 19 miles from the closest roseate tern nesting colony. The Biological Opinion reviewed risk to terns from other wind projects in eastern Canada and Massachusetts located near tern colonies. Although none of the three wind projects reviewed have caused injury to roseate terns, other tern species, gulls, and passerine species have been killed. Pre-construction studies associated with the Cape Wind Project indicated the flight height of 90 percent of terns was less than 70 feet. Similar studies associated with the Massachusetts Maritime Academy single wind turbine documented that average flight height was 63 feet, and that terns avoided spinning rotor blades. However, ability to avoid wind turbines would be expected to be reduced during fog, rain, and low visibility conditions. Modeled collision rates were estimated to be four to five roseate terns killed per year at the Cape Wind Project.

Impacts of wind projects to terns will vary with the specific size, number, and configuration of proposed wind turbine generators and site-specific factors such as juxtaposition of nesting and foraging habitats and weather patterns. In Castine, the project is a single, small turbine, deployed for four months. The project is located 33 miles from the closest roseate tern nesting colony, which is farther than these birds normally travel to forage. Pre-construction data indicates the Castine area is not a concentrated foraging or migration staging area for terns. Therefore, the Service concurs with DOE that risk from a single wind turbine with small a rotor swept area at this location is not likely to adversely affect this species.

Red knot

The red knot (*Calidris canutus*) is a candidate for Federal listing. Red knots use intertidal habitats as feeding areas and roost in Maine during their spring and fall migrations. Red knots regularly occur in Maine in late summer during their fall migration, but are very rare during the spring migration. Because of the small turbine size and timing of project deployment (deployed for four months during a time that red knots are largely absent from the State), the Service concurs that the project is not likely to adversely affect this species.

The University of Maine and DeepCWind Consortium's application to the Army Corps (February 13, 2013) indicates that the test turbine will be shut down if there is "adverse interaction (direct or potential harm) with ...any federally listed threatened or endangered

species..." The Service requests that the University of Maine immediately (within 24 hours) contact the Service if this scenario occurs.

Other Protected Species

Bald and Golden Eagles

As noted in our correspondence with the University of Maine, the closest known active bald eagle nest is located within about 2.5 miles of the project area. Nesting and non-nesting bald eagles would be expected to be in the vicinity of the project area during the test.

Risk to bald eagles at the test area is expected to be low because of the distance to the closest nesting site and the small size of the single turbine. The University of Maine proposed to conduct web camera surveillance and visual observations during the test of the turbine. Special circumstances (especially a local abundance of natural food or carrion) could attract eagles to the area. Although unlikely, eagles may be attracted to a small turbine as a perch site. Given that the blades on the test turbine could be moving at a high rate of speed, eagles may not see the spinning blades. An eagle was recently killed in this manner at a small turbine in Maryland. We request that bald eagle movements in the area be closely monitored on the web camera and by visual observations. If eagles are frequenting the area, we request that the University contact the Service to discuss ways to avoid or minimize risk of take. We request that all eagle encounters documented on the web camera be recorded and provided to the Service as part of the post-construction monitoring program. This would be valuable information and some of the first information of its kind collected in Maine.

Migratory Birds and Bats

Small passerine birds, raptors, resident seabirds and waterfowl, and bats will all be present during the test period (March 1 to June 30). Preliminary studies by the University of Maine show a diverse assemblage of birds present at the site. Data on flight heights and behaviors suggest that the majority of birds observed in the test area fly above and below the turbine swept zone, but 19 percent were in the rotor swept zone. We have no experience with risk to birds from wind turbines placed on the water and urge the University of Maine to design studies to evaluate bird behavior in relation to an operating turbine. In particular, studies should be done to determine whether bird use in the test area increases or decreases in comparison to baseline studies. Behavioral studies should be done to determine how birds at greatest risk (those species most likely to fly in the rotor swept zone – gulls, loons, eagles, and some waterfowl) respond to the operating turbine; especially what percentage show avoidance behavior and what percentage fly through the rotating rotors. Any bird strikes should be reported to the Service's, Maine Field Office by telephone at 207/866-3344, Extension 115 within 24 hours. The web camera should record bird activity continuously during all daylight hours including pre-dawn and dusk. Camera recordings should be analyzed promptly to document bird strikes and record, analyze, and document bird behavior. We request that all bird and bat encounters documented on the web camera be recorded and provided to the Service as part of the post-construction monitoring program.

The test period will occur during the spring migration when birds and bats are migrating along the coast at night. Preliminary studies by the University of Maine at the Castine test site did not evaluate night migration of passerine birds. Migration studies from other inland wind projects in Maine indicate that about 80 to 85 percent of the migration stream occurs above the turbine swept zone of large (approximately 3 mW) wind turbines. Thus, a relatively small proportion of migrating passerine birds would be expected to migrate at the 65 foot height of the test turbine. However, relatively little is known about coastal passerine bird migration. Large numbers of migrants accumulate and move along the coast because many species are reluctant to migrate over large expanses of open water.

The University of Maine interim report of radar studies of bird migration on Monhegan Island (Mizrahi 2011) show that some coastal migrating birds and bats would be expected to occur at less than 65 feet (height of the test turbine), especially in inclement weather (fog, low overcast). The data indicate 2 to 27 percent of targets flew below 50 meters in height on nights in July 2010. No radar measurements were taken during the spring migration on Monhegan Island that would coincide with the test period at Castine. The Service would appreciate receiving a final report for the radar studies conducted on Monhegan Island in 2010.

The University of Maine and DeepCWind Consortium's application to the Army Corps (February 13, 2013) indicates that to minimize risk to bats, cut-in speed will be approximately 3.5 meters per second, except during the time window of one hour before sunset and 2 hours after sunset, when cut-in speed will be approximately 5 meters per second. In addition, we recommend that the approximately 5 meters per second cut in speed be implemented throughout the night time hours to minimize risk to bats.

Proposed Project Visibility Lighting

Patterns of lighting (red versus white light, blinking or constant) will affect relative attraction to or avoidance of turbines by birds migrating at night. Our Service Land-Based Wind Energy Guidelines recommend that project developers: "Employ only red, or dual red and white strobe, strobe-like, or flashing lights, not steady burning lights, to meet Federal Aviation Administration (FAA) requirements for visibility lighting of wind turbines, permanent met towers, and communication towers. Only a portion of the turbines within the wind project should be lighted, and all pilot warning lights should fire synchronously."

Several authors have found that steady burning FAA obstruction lighting and some other types of lighting on mainly land-based tall structures (generally communication towers at heights of 1,000 feet) can attract or disorient night migrating birds, resulting in collisions with those structures. In a Michigan study, there was a 71 percent reduction in avian collision mortality at communication towers after red, continuous lights were extinguished and replaced with flashing or strobe lights,

A recent comprehensive review of research on the effects of lights from tall structures on night migrating birds concluded that the use of synchronously flashing LED lights significantly reduces avian mortality at tall structures.

We noticed that the test turbine on the University of Maine campus has a single continuously burning, red light. If it meets FAA requirements, we recommend an LED flashing red light or no light at all.

We appreciate your cooperation to date and look forward to continued coordination regarding this project. If you have any questions about our comments, please contact Mark McCollough, endangered species biologist, by email at *Mark_McCollugh@fws.gov* or by telephone at 207/866-3344 Extension 115.

Sincerely,

Laury A. Zicari,
Field Supervisor
Maine Field Office