



Department of Energy

Golden Field Office
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DOE/EA-1792

FINDING OF NO SIGNIFICANT IMPACT FOR THE UNIVERSITY OF MAINE'S DEEPWATER OFFSHORE FLOATING WIND TURBINE TESTING AND DEMONSTRATION PROJECT, GULF OF MAINE

AGENCY: U.S. Department of Energy, Golden Field Office

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: The U. S. Department of Energy (DOE) is proposing to authorize the expenditure of Federal funding by the University of Maine (UMaine) to perform research on and development of floating offshore wind turbine platforms. The primary objective of UMaine's research is to experimentally validate coupled aeroelastic/hydrodynamic computer models (i.e., computer models used for design and optimization of the turbine and turbine platform system that predict structural loads, deflections, dynamics, and turbine power output under various meteorological and oceanographic conditions) developed by the DOE National Renewable Energy Laboratory (NREL) and others for floating offshore wind turbines. UMaine proposes to use DOE funding to design, fabricate, deploy, test, and retrieve one to two approximately one-third commercial scale wind turbines on floating platforms within UMaine's Deepwater Offshore Wind Test Site (test site) in the Gulf of Maine, located approximately 2 to 3 miles south of Monhegan Island. The floating offshore wind turbines would be temporarily moored at the test site during some or all of July through November for two consecutive testing years.

DOE has completed all discussions, analyses, and findings related to the potential impacts of the proposed project and completed the *Final Environmental Assessment for the University of Maine's Deepwater Offshore Floating Wind Turbine Testing and Demonstration Project, Gulf of Main* (DOE/EA-1792; Final EA). The Final EA is hereby incorporated by reference. DOE prepared this FONSI in accordance with the *National Environmental Policy Act* (42 U.S.C. 4321 et seq.; NEPA), the Council on Environmental Quality NEPA regulations (40 CFR Parts 1500 to 1508), and DOE's NEPA implementing procedures (10 CFR Part 1021).

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ENVIRONMENTAL IMPACTS: The Final EA examines the potential environmental impacts of DOE's Proposed Action of authorizing UMaine to expend Federal funding to perform research on and development of floating offshore wind turbine platforms as well as a No Action Alternative, under which DOE would not authorize the UMaine to spend Federal funds on the proposed project. DOE assumed, for purposes of the EA, that UMaine would not conduct the offshore research and development of floating wind turbines without such financial assistance.

The primary objective of UMaine testing the one-third scale floating wind turbines is to obtain motion and structural response data to compare and validate numerical models developed by NREL that predict structural loads, deflections, dynamics, and turbine power output under various meteorological and oceanographic conditions. An experimentally validated numerical model would aid in the development of floating platform technology for offshore wind energy. These models take into account the time varying wind, wave, and current loads subjected on the platform and turbine and predict the response including structural loads in the blades, tower, platform, moorings, and anchors. These models, once validated, would be used for design and optimization of floating turbines to help reduce the cost per installed kilowatt. The test turbines would measure approximately 100 feet from waterline to the hub, the rotor diameter would measure 88.6 feet, and the total turbine height would be approximately 144 feet. The final dimensions of the turbines and platforms are under development as part of this research effort but would be close to a one-third scale. The wind turbine platforms would be fabricated at a shipyard, or similar existing coastal facility, and towed to and moored to UMaine's test site. The project site was selected as a test site by the State of Maine, separate of DOE's funding decision, following a comprehensive review of available information and numerous meetings with the public and interest groups, arising out of 2009 Maine legislation intended to encourage development of offshore wind energy off Maine's coast (*Maine Public Law*, Chapter 270 LD 1465).

Water depths in the area range from 180 to 360 feet. The test site is approximately 1.1 miles wide and 2.1 miles long and is bounded at the southern edge by the 3-nautical-mile line, indicating the extent of the State of Maine waters. The tower system would have a stand-alone grid simulator to simulate the electrical loading of the wind turbine. In addition, a series of batteries would be charged by the wind turbine to supply power to computers, navigational systems, and other instrumentation that requires electrical power. Any excess power would be converted to heat energy and dissipated in the ocean water. The floating offshore wind turbines would be moored at the project site during some or all of July through November during the initial deployment and during

the same time from of the subsequent testing year. Retrieval of the platforms would occur following each of the deployment periods (the evaluation of the second turbine deployment is being analyzed by this EA; however, depending on the first testing results and the availability of funding, the second test may not occur).

Based on this and other information, DOE concluded that the proposed project would have no measurable impact on air quality, land use, terrestrial resources, wild and scenic rivers, terrestrial transportation and traffic, infrastructure and energy use, electromagnetic field, or intentional destructive acts. Therefore, DOE did not further analyze these resource areas in its Final EA.

Geophysical Resources

The proposed project would require the placement of seabed anchors to attach mooring cables for the floating turbine platforms. The seabed in the test site consists of primarily of north-to-south oriented bedrock outcroppings separated by muddy basins of various depths. Sand and gravel substrate is found adjacent to some rock outcrops. The primary effect of the project upon geological resources would be from placement of the foundations/anchors on or in the seabed. No pile driving would occur, and no blasting would be required. The footprint of the foundation/anchors being considered is variable and would depend upon final design of the turbine platform and condition of the seabed at the selected deployment site. The foundation/anchor that would have the largest footprint would be a skirted mat, which measures approximately 16 feet by 16 feet. Each of these foundations would cover an area approximately 256 square feet, and the total area of the seafloor covered by six foundations (assuming three foundations for each floating platform) would be 1,536 square feet (0.04 acre). Therefore, DOE concludes that the proposed project would have negligible effects on the geophysical resources.

Water Resources

The marine water within the test site is classified as Class SB waters by the Maine Bureau of Land and Water Quality. Temporary deployment of up to two wind turbines is not expected to affect water chemistry including dissolved oxygen and pH. Placement of anchors in areas of sand and mud would only cause a temporary and localized increase in turbidity. Water circulation in the Gulf of Maine generally follows a counter-clockwise direction with water inflow primarily over the Scotian Shelf through the Northeast Channel. Water leaves the gulf primarily through the Great South Channel, over and around the eastern portion of Georges Bank, and in some cases, through the Northeast Channel. Circulation is important for ecology including nutrient cycles, plankton, and

larval transport. As the relatively slow current moves past the proposed floating turbine platforms, eddies will form and produce minor localized stirring of the water column. Wind, along with tides, bathymetry, and Monhegan Island affect the hydrodynamics (i.e., water circulation, vertical mixing, and up- or down-welling) of the ocean near the test site. Wind turbines can potentially extract momentum from the wind and reduce their effect on surface water circulation. Given the temporary nature and small scale of the proposed floating turbines, the wind energy extracted by the two, one-third scale turbines would not have a measurable effect on the localized ocean surface circulation. Ocean vessels used for the deployment of the wind turbines would manage their on-board fuels, lubricating fluids, and other chemicals in accordance with U.S. Coast Guard (USCG) regulations. Limited amounts of petroleum fuel and other chemicals would be on board the floating wind turbines. Secondary containment and best management practices would be employed to prevent accidental discharges. DOE concludes that the project would have minimal impacts on water resources.

Ocean Habitat

The project test site is located in open ocean habitat approximately 2 to 3 miles south of Monhegan Island. Water depths in the area are variable, ranging from 180 to 360 feet, and the test site contains habitat used by benthic communities (species that live on or in the seafloor), demersal species (species that live and feed near the bottom), and pelagic species (species that live and feed away from the bottom). The deployment and testing of the wind turbines could impact biological resources through habitat alteration, above-water collisions by birds or bats in turbine blades, and entanglement and collision by marine mammals with underwater structures.

Placement of anchors could cover or injure slow-moving or immobile benthic organisms, such as bivalves, snails, and worms directly beneath the foundation/anchors. The foundation/anchor that would have the largest footprint would be a skirted mat (16 feet by 16 feet) that would cover an area approximately 256 square feet for a total of 1,536 square feet (or 0.04 acre) for six foundations (assuming three foundations for each floating platform). Mobile invertebrates (e.g., lobster and crabs), fish species that feed on or near the bottom (e.g., hakes and flatfishes), and species that shelter on the bottom at times (e.g., herring and redfish) would likely move away from the immediate vicinity of the anchors and move to nearby areas during deployment and removal activities.

The seabed anchors and associated positioning pipes and cabling and mooring lines would provide underwater structures that would be colonized by biofouling organisms.

Artificial structures that occur in marine areas where there is comparably little structure associated with the seabed can be particularly attractive to structure-oriented species and result in subsequent colonization by marine life that otherwise would not occur in a particular area. In turn, the change in marine life could attract other predatory fish. The floating turbine platforms also would provide surfaces for colonization by biofouling organism and would possibly attract aggregations of fish. Both effects would likely increase the diversity and species richness of the immediate area. Above-water portions of turbine platform could provide perching and nesting for birds and a haul-out site for seals as a place to rest. Platforms would be designed to prevent hauling out by seals.

Deployments of the floating wind turbines would result in minor, short-term, and possibly beneficial change to the ocean habitat. Structure-oriented fish may be attracted by in-water project components, with the anchors and platforms representing an artificial reef effect and the platforms representing a fish aggregation device effect where fish are known to be attracted to floating objects. Adding an anthropogenic structure to an open-water habitat may consequently result in a change in the type, distribution, and abundance of marine species near the two turbine platforms relative to a control site. However, the degree to which the project would change the habitat or the marine community in the test site area is expected to be negligible, and would not affect populations of species that use the area, including any threatened and endangered species.

Avian and Bat Resources

The rotating turbine blades pose a potential hazard to flying species, such as birds and bats. The maximum height of the blades would be approximately 144 feet. Radar surveys at Monhegan Island show that 93 percent of flying species during the day and 95 percent of flying species during the night were detected at heights of 246 feet or higher, almost twice as high as the top of the proposed turbines. The likelihood of a bird colliding with a turbine would depend on the ability of the birds to see the tower and blades and the birds' maneuverability. Potential for collisions would increase during periods of poor visibility and at night.

A study of bats on Monhegan Island detected 13 positive bat echolocation sequences belonging to three bat guilds: big brown/silver-haired bats, eastern red bats/tri-colored bats, and *Myotis* species. These species are representative of tree roosting bats, which constitute the majority of bat fatalities at land-based wind farms. The project site is located approximately 12 miles from the mainland, and 2 to 3 miles from Monhegan

Island. Therefore, the probability of these species being struck by the turbine blades at the test site is extremely low.

While data indicate that bird flight altitudes over sea are lower than over land, the pre-installation monitoring indicates that during the day over 93 percent of the birds fly at altitudes higher than 246 feet, well above the 144 foot height of the turbine rotors. In addition, the one-third scale turbines would have a small rotor-swept area (6,165 square feet each) and would be deployed for a short duration of no more than two 5-month periods. As a vast majority of flying species have been detected flying above the turbine-swept area, and the proposed project would be small scale and have a short operational duration, the number of birds and bats potentially affected by turbine strike would be minimal, including threatened and endangered species.

Marine Mammals

Entanglement in mooring lines is a potential risk to whales and sea turtles. Collision with mooring lines and submerged parts of the turbine platform is a potential risk for marine mammals. These species have sensory capabilities that will help them avoid both natural and manmade features. Marine mammals are not likely to become entangled in the project mooring lines because the mass/buoyancy of the platforms and mass of the anchors is expected to create substantial tension in the mooring lines, which would prevent formation of loops around a passing marine mammal. Whale collisions with moored ships and buoys are uncommon, and it is expected that marine mammals will detect and avoid the project's floating turbine platforms and the mooring lines. Vessel traffic associated with the project would be infrequent and short term. Therefore, the potential that marine mammals, including endangered species, will become entangled or collide with project structures or collide with service vessels is negligible.

Threatened and Endangered Species

DOE has completed consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) regarding potential effects on threatened and endangered terrestrial and marine species. Both agencies, for the reasons discussed in the preceding paragraphs, concur with the DOE finding that the project may affect but would not adversely affect any listed species. The NMFS also concurs with DOE's finding that project effects on essential fish habitat (e.g., waters and substrate necessary for normal fish activity, such as spawning, breeding, and feeding) are expected to be negligible because the project is small scale and temporary.

Noise

The predominant source of noise during project installation, maintenance, and removal would be the service vessels' propellers. However, this noise would be limited to a short period of time. During most of the project deployment, no project-related vessel traffic would occur. Noise associated with installation, maintenance, and removal activities may cause some marine life to avoid the service vessels, as they might avoid any vessel commonly used along the coast; however, any effects associated with the temporary project would be infrequent, short term, and negligible, with activities 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. The sound of the turbine would be largely undetectable on Monhegan Island except on very calm days with the wind blowing from the south. The maximum predicted sound level received on Monhegan Island (35.6 dBA) would be low and would not interfere with activities on the island. Underwater noise created from the combined turbine and support structure would be caused by noise transferred from the turbine or nacelle into the substructure via vibration. Acoustic emissions under water, 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. Because the floating platform lacks any rigid structure below water that could efficiently transmit vibrations from the turbine into the water, the expected noise propagation to the marine environment would be much lower for the proposed one-third scale floating turbines than a bottom-mounted commercial turbine. Underwater noise resulting from turbine operations is not expected to negatively affect marine mammals or fish, including species listed as endangered pursuant to the Endangered Species Act. The UMaine plans to monitor underwater noise during testing of the turbines.

Navigation, Commercial and Recreational Uses

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. Commercial fishing would be prohibited in a 95-acre safety zone surrounding each deployed wind turbine. This exclusion zone would be temporary and would not impact any commercial fishing operations.

While recreational saltwater fishing takes place along the entire coast of Maine, the majority of boats operate in southern Maine. Because of the small area of the navigation

safety zone, the short duration of the turbine deployments, and the distance of the site from the mainland (approximately 11.8 miles), the project is not anticipated to adversely affect recreational fishing activities in the area.

Cruising in Maine has long been a popular vacation and recreational activity. No tour excursions are offered within the UMaine test site and therefore would not impact cruise, seabird, or whale-watching tours.

There are three major ports in Maine: Portland, Searsport, and Eastport. Monhegan Island is located approximately 46 miles east of Portland and 56 miles southwest of Searsport. The three ports handle more than 1.5 million tons of dry cargo collectively and roughly 125 million barrels of petroleum products have been handled by Portland and Searsport. There are no designated navigation channels, recommended vessel routes, or recommended two-way routes in the vicinity of Monhegan Island. Ferries travelling to/from Monhegan Island approach the island from the west and dock along the west side of Monhegan Island, thereby avoiding the UMaine test area. The turbine towers and platforms will be marked according to USCG criteria for offshore structures for navigational safety. Therefore, the proposed project is not anticipated to affect current navigation patterns or routes.

Visual and Aesthetics Resources

Maine coastal islands are valued for their unique aesthetic character and undeveloped nature. Visitors from around the nation and from other parts of Maine are drawn to Monhegan Island by the scenic natural beauty, remote nature, and opportunities for wildlife viewing at the island. Monhegan Island is a fishing village as well as an historic artist's colony. The two one-third scale wind turbines would be the only vertical feature on the ocean surface and would be visible, albeit very small, when viewed from Monhegan Island during clear days with low relative humidity. From the mainland, the wind turbines would be very difficult to discern on the horizon. Due to the temporary nature of the turbine deployments (two 5-month deployments), the distance of the turbines from shore, and the small scale of the turbines, the project would not have a significant effect on visual aesthetics on Monhegan Island.

Historical Resources

Maine's complex sea level history and long history of fishing and maritime commerce creates the potential for both pre-Columbian and historic cultural resources within State offshore waters. Human occupation of these areas is established by the recovery of pre-Columbian stone artifacts from Maine's nearshore region. There are several known

shipwrecks in the Monhegan Island vicinity. To identify high-potential areas for pre-Columbian archaeological remains and exposed historic shipwrecks, multi-beam bathymetry, seismic reflection, side scan sonar, and magnetometer survey data were acquired and analyzed. All areas with water depth greater than 200 feet within the UMaine test site show no potential for pre-Columbian cultural resources, as these areas were not subaerially exposed since the last glaciation of the region. All known wrecks are located well outside of the UMaine test site. Anchors will be placed at depths of 200-plus feet in areas that have very low potential for cultural resources. Given the sea depths at the site, which preclude the presence of pre-Columbian cultural resources, and the results of the magnetometer survey, which indicates no shipwrecks inside the test sites, the platform anchors can be deployed in a location that contains no historic resources.

Several properties on Monhegan Island and Manana Island are registered with the *National Register of Historic Places*. Due to the temporary nature of the turbine deployments (a maximum of two 5-month deployments), the distance of the turbines from shore, and the small scale of the turbines, the project would create a very small visual intrusion when viewed from the listed historic properties or anywhere else on the island. DOE concludes that there would be no indirect adverse effects from noise or visual intrusion on any eligible and listed historic properties on Monhegan Island or Manana Island.

Environmental Justice

A number of businesses are located on Monhegan Island that include inns and bed and breakfasts, art galleries, cafes, gift shops, and fish markets. An artists' colony continues at Monhegan Island, as it has been for more than 100 years. The island's fishing and lobstering activities occur in the Fish Beach area. According to the U.S. Census Bureau, Decennial (2000) Census, employment sectors consisted of the following for Monhegan Island: 32 percent of population employed by farming, fishing, and forestry occupations; 29.2 percent of population employed by management, professional, and related occupations; 20 percent of population employed by sales and office occupations; and 18.4 percent of population employed by construction, extraction, and maintenance occupations.

With the exception of the small exclusion zone around each test wind turbine, lobstering and commercial fishing are expected to continue in this area. Given the 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 would not adversely affect lobstering or commercial

fishing activities. The project also would not affect any of the businesses that occur on Monhegan Island, except for a slight increase in business at inns or for other expenditures of people working on the project who spend money while visiting Monhegan Island.

Executive Order 12898 directed Federal agencies to incorporate environmental justice considerations into the NEPA process 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. The proposed offshore wind project would be located 2 to 3 miles offshore of Monhegan Island. No potential adverse impacts to human health have been identified in the Final EA. Therefore, there would be no disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

Cumulative Impacts

DOE evaluated the cumulative impacts of past, ongoing, and planned activities within the offshore wind test site and in the surrounding region. Reasonably foreseeable future actions include potential testing of ocean energy technologies at two offshore testing sites designated by the Maine Legislature and the potential deployment and testing of a 3- to 5-megawatt turbine at a Monhegan Island test site. These three sites were selected by the State for testing of ocean energy technologies because they were located in areas with the least amount of physical, environmental, and human conflicts. A potential future offshore wind development in the Federal waters of the Gulf of Maine is a 25-megawatt deepwater offshore wind pilot project. On September 1, 2010, the Maine Public Utilities Commission released a request for proposals for a 25-megawatt wind farm to be located at least 10 nautical miles offshore of any land, including islands, and in waters at least 300 feet deep. It is likely that a project of this scale would be composed of five 5-megawatt floating offshore wind turbines. However, because this project would likely require a 5- to 7-year permitting process, the deployment of this project would occur after the removal of the UMaine project and, therefore, does not represent cumulative impacts to the UMaine project. Because the UMaine project is temporary, the added and cumulative impacts would only be realized if the identified projects were constructed and operated concurrently.

Because of the small size and scale of the proposed project, the similar small scale of the other potential offshore wind projects being considered and described above, and the overall negligible effects of the proposed project on fish, marine mammals, birds, and other marine life, the project does not represent an incremental impact. Cumulative

impacts of the proposed project would be negligible because there are no past, present, or reasonable foreseeable future actions that, when combined with the proposed project, would result in impacts beyond those that already exist or have already been identified and discussed in the Final EA.

PUBLIC PARTICIPATION IN THE EA PROCESS: DOE sent scoping letters on September 20, 2010, to Federal, State, and local agencies; tribal governments; businesses; organizations; special interest groups; and interested individuals, providing 15 days to comment on the scope of the EA. DOE also published the Scoping Notice on the DOE Golden Field Office Public Reading Room Website and in the Herald Gazette, a local newspaper. In response to the Scoping Notice, DOE received comment letters from two government agencies, two organizations, and one citizen. The Final EA includes a summary of the comments and DOE's responses. In addition, DOE initiated consultation with USFWS, NMFS, Houlton Band of Maliseet Indians, Aroostook Band of Micmacs, Passamaquoddy Tribe, Penobscot Indian Nation, Maine State Historic Preservation Officer, and Advisory Council on Historic Preservation. Appendix B of the Final EA contains a copy of these consultation letters and all responses.

DOE issued the Draft EA for comment on May 11, 2011, and posted it on the DOE Golden Field Office Public Reading Room and NEPA websites. DOE sent Notices of Availability (NOAs) announcing the availability of the Draft EA to identified stakeholders and published the NOA on the websites and in the Herald Gazette. The comment period ended on June 9, 2011. DOE received six comments from agencies, organizations, or interested individuals. The Draft EA was modified to address these comments.

DETERMINATION: Based on the information presented in the Final EA (DOE/EA-1792), DOE has determined that its Proposed Action, funding the permitting, design, fabrication, deployment, testing, and retrieval one to two one-third commercial scale wind turbines on floating platforms within UMaine's Deepwater Offshore Wind Test Site in the Gulf of Maine would not constitute a major Federal action significantly affecting the quality of the human environment within the context of NEPA. Therefore, the preparation of an environmental impact statement is not required, and DOE is issuing this FONSI.

The UMaine's commitment to obtain and comply with all appropriate Federal, State, and local permits required for fabrication, deployment, operation, and retrieval of the one to two one-third commercial scale floating wind turbines, and to minimize potential impacts through the implementation of best management practices detailed in the Final EA, shall

be incorporated and enforceable through DOE's financial assistance agreement. The Final EA and this FONSI are available at the DOE Golden Field Office Reading Room Website:

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

For questions about this FONSI, please contact:

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