SUPPLEMENT ANALYSIS 2

FOR THE SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT FOR THE

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

CASTINE, MAINE

DOE/EA-1792-S1

US Department of Energy

Office of Energy Efficiency and Renewable Energy

Golden, Colorado

November 2014

CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDIX A

1.0 Background

In March 2013, the U.S. Department of Energy (DOE) published the Final Supplemental Environmental Assessment (DOE/EA-1792-S1) for the University of Maine's Deepwater Offshore Floating Wind Turbine Testing and Demonstration Project, Castine, Maine. The associated Finding of No Significant Impact (FONSI) was issued by DOE on March 21, 2013. DOE/EA-1792-S1 was prepared to evaluate potential environmental impacts of providing funding to the University of Maine (UMaine) for their proposed project offshore of Dyce Head in Castine, Hancock County, Maine (Castine site). As described in the FONSI, the Deepwater Offshore Floating Wind Turbine Testing and Demonstration Project would consist of deploying and testing one, 1/8th-scale wind turbine rated at 20-kW on a floating platform at the Castine site within state waters. The turbine would be connected to the Central Maine Power (CMP) grid via a cable along the seabed surface from below the turbine to shore, and along the ground to an existing CMP power pole.

UMaine proposed to use congressionally directed funding administered through DOE to deploy the turbine, named VolturnUS, for four months in the spring and summer of 2013 and the removal of VolturnUS during summer 2013. Due to construction delays, UMaine did not deploy the floating platform and turbine at the Castine site until June 6, 2013.

In August 2013, UMaine proposed to extend the turbine deployment until May 31, 2014 to conduct additional testing. DOE developed a Supplement Analysis (SA) to examine the potential environmental impacts of the proposed modification (extending the deployment to May 31, 2014) to the original project deployment period to determine whether a Supplemental EA should be prepared. On September 5, 2013 DOE determined that the modified Proposed Action would not constitute a substantial change in actions and would not present any new circumstances or information relevant to the environmental concerns and bearing on the previously analyzed action or impacts, within the meaning of 40 CFR 1502.9(c) and 10 CFR 1021.314. DOE concluded that an additional Supplemental EA was therefore not required.

After nearly a year of testing, UMaine is proposing to further extend the turbine deployment, to about November 30, 2014 to conduct additional testing offshore of Castine. In compliance with NEPA (42 U.S. Code 4321, et seq.) and DOE's NEPA regulations (10 CFR 1021.330) and procedures, the purpose of this SA is to examine the potential environmental impacts of the proposed modification to the project deployment period (extending the deployment to about November 30, 2014) to determine whether a Supplemental EA should be prepared.

2.0 Description of the Modified Proposed Action

UMaine is proposing to extend the test period for the VolturnUS from 12 months to approximately 18 months. The turbine test period would continue until about November 30, 2014 under the modified Proposed Action. Then, the test turbine would be removed from the water[1], though the anchors and transmission cable would be left in place to facilitate a future deployment - UMaine is considering the possibility of deploying the turbine generator unit again in the summer of 2015.[2] UMaine plans to keep the anchors, mooring lines, and the electrical interconnection cable to shore lying along the bottom at the seabed level at or directly below their current permitted locations. The ends of the four mooring lines will be tied together for easier recovery later. UMaine would leave these along the seabed for up to one year, marked with U.S. Coast Guard approved Private Aids to Navigation (PATON), if necessary. The extension to the test period to 18 months and leaving the transmission cable and moorings in place are the only modifications considered in this supplemental analysis. UMaine would continue to comply with the applicant-committed measures as described in DOE/EA-1792-S1, Section 2.5.

3.0 Potential Environmental Impacts of the Modified Proposed Action

DOE/EA-1792-S1 evaluated potential effects of project deployment, operation, and removal. Potential effects associated with deployment and removal of the floating turbine platform and underwater cable remain the same as evaluated in DOE/EA-1792-S1, and therefore, this SA does not include a discussion of the effects of deployment and removal. The potential effects of keeping the onshore components (i.e., an electrical cable and associated equipment) in place for an additional six months also are not discussed because that equipment was designed to minimize disturbances and has a very small footprint, and thus there would be no additional effects to the terrestrial environment from keeping that equipment in place.

Potential effects of operation remain the same as what was evaluated in DOE/EA-1792-S1, with the exception that the exposure of receptors to the potential effects will occur over 18 months, rather than the four months evaluated in DOE/EA-1792-S1 and total of 12 months evaluated in the September 2013 SA. The following sections include a discussion of the resources that could experience a change in impacts from extending the deployment period and are, therefore, included in this SA.

3.1 Biological Resources

[1] The floating turbine was decommissioned and removed from the water on November 4, 2014.

[2] Following receipt of any necessary approvals and additional funding for the research program, redeployment of the turbine unit would occur no earlier than the summer of 2015 for a period of up to two years for additional testing.

The degree to which the presence and operation of the project components would affect use of the area by marine life would be minimized over the proposed extended period of operation, and would not affect populations of species that use the area, based on:

- The results of environmental monitoring that have occurred.
- The small spatial scale of the project - the turbine is 1/8 the scale of a commercial turbine, having a hub height of about 41 feet from the waterline and a rotor diameter of about 32 feet;
- The short duration of the project – the proposed 18 month deployment still represents a temporary deployment.

3.1.1 Environmental Monitoring Results

UMaine has conducted the following environmental monitoring of the deployed 1/8th-scale turbine during the previous year:

- Web camera surveillance of the turbine, both on the turbine itself (360°) as well as from shore, during all daylight hours
- Boat based visual observations for birds and marine mammals
- Bat monitoring at Dyce Head Lighthouse.

In addition, in June 2013, Vemco acoustic receivers were deployed in Penobscot Bay by NOAA researchers from the Maine Field Office of the Northeast Fisheries Science Center. The receivers have been recently retrieved by NOAA, and UMaine is coordinating with NOAA to examine tag hit distributions in the vicinity of the turbine (e.g., analysis of detected acoustically tagged sturgeon and salmon).

A summary of this monitoring (UMaine 2014) is provided in this SA, and a summary report of the monitoring is included as an appendix.

Web Camera Surveillance

A high definition camera to take video/pictures of the turbine was deployed on the property of a Castine resident who lives on land adjacent to the turbine. This camera is roughly 1,000 feet from the turbine with pan/tilt/zoom capabilities. UMaine proposed to examine one image every 30 seconds during daylight hours, but instead enhanced the analysis so as to examine images every 15 seconds. The spatial scope of the web surveillance included an area of approximately four platform diameters (platform diameter is 41.5 feet) in front of and behind the turbine. USFWS staff and Dr. Damian Brady of UMaine viewed collected images on August 21, 2013 and agreed that the most important data to collect during this effort was information regarding how birds approached the turbine (UMaine 2014). Additionally, a 360° camera mounted on the

turbine tower itself allows for surveillance of the area immediately beneath and adjacent to the turbine should a strike occur and a bird fall atop the turbine platform or surrounding water.

The protocol used for this analysis was as follows:

(1) if the screened image contained a bird, boat, or marine life, then the time was noted and recorded;
(2) if possible, the bird, boat, or marine life was identified to subcategory (e.g., crow, gull);
(3) if the image contained a bird, it was categorized as near-field (i.e., very close to the camera), mid-field (i.e., potentially close to the turbine), or far field (i.e., off in the distance); and
(4) the analyst reviewed the continuous video to determine if there was any bird-turbine interaction (e.g., collision, perching, etc.) for birds observed in the mid-field (UMaine 2014).

From a review of data collected over the approximate 11 month period (June 6, 2013 to May 15, 2014) that the turbine has been deployed, researchers have not observed (in visual observations or camera monitoring) any collisions or marine mammal haul out on the camera-collected data. In addition, no interactions between birds or marine mammals and the turbine were observed during 39 boat-based surveys (described below) conducted after deployment of the turbine (UMaine 2014).

This monitoring has been effective for a number of reasons, including event driven adaptive mitigation. For example, a double crested cormorant perched on the turbine on multiple days in mid-August, 2013, prompting the team to mount a bird deterrent on the perch site. No birds have been observed perching on the turbine since that event. Another example of the use of this monitoring occurred on June 17, 2013, when the USFWS informed Dr. Brady that an injured eagle had been located near the Dice Head Lighthouse. The team was immediately able to review footage and determine there was no interaction with the turbine and that the turbine was only operating for 30 minutes on that day (UMaine 2014).

Another advantage of this technique, in addition to its efficacy as a collision monitoring tool, is the ability to characterize overall bird activity at the site, including:

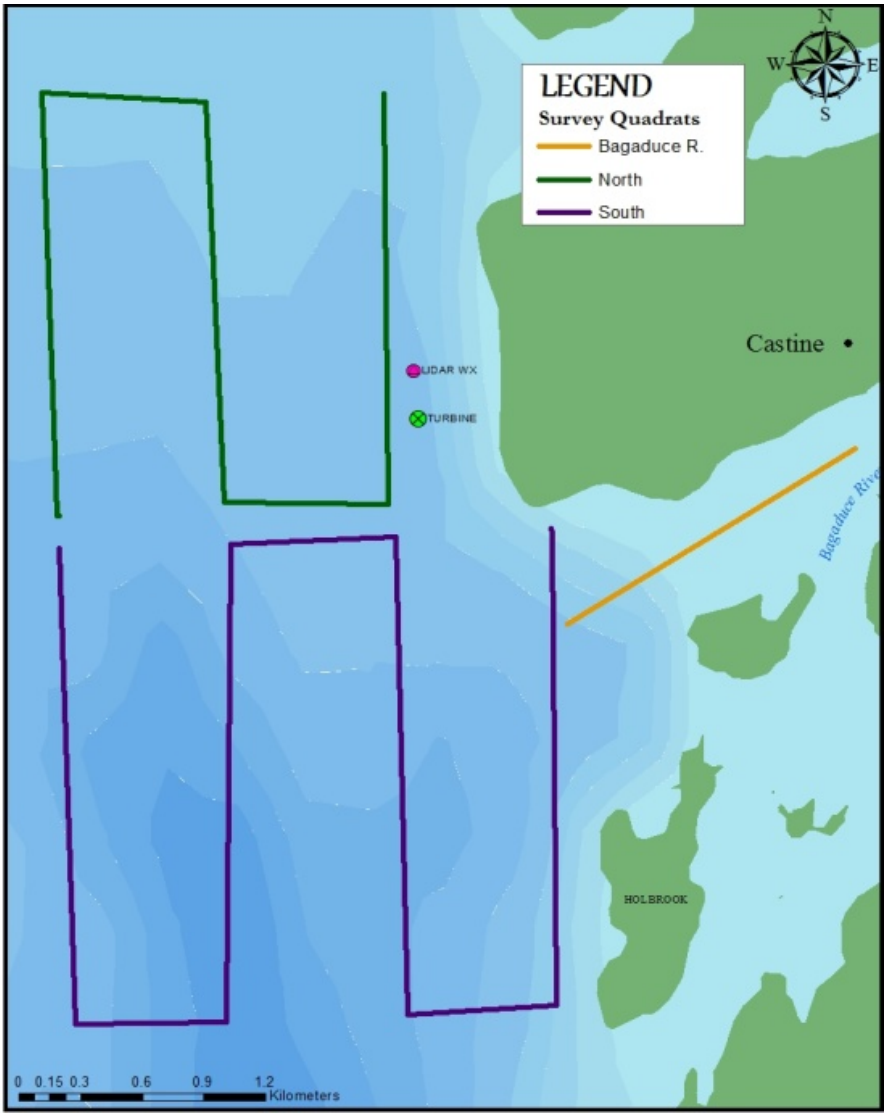
- Number of birds observed per day throughout the year - it appears that the number of birds is highest in the summer and fall and lowest during winter,
- Number of birds by hour during the day - highest activity occurs during the early morning and then tapers off during the day, and
- Number of boats observed per day throughout the year - boat activity and bird activity have long been known to co-vary as birds follow potential fishing boats; however, no link

is apparent from the data collected. This could be because many of the boats seen were not fishing boats (UMaine 2014).

See the summary report (UMaine 2014) in the appendix for details. Data analysis continues, and UMaine plans to correlate observed bird activity with meteorological variables (wind speed, direction, precipitation) and human marine uses (e.g., lobster boat activity in the area).

Boat Based Visual Observations for Birds and Marine Mammals

Boat-based visual observations of birds and marine mammals were conducted in three areas: a "North" quadrat in which the floating turbine is located, a "South" quadrat, and a 1-mile transect inland into the "Bagaduce River" (Figure 1). Thirty nine surveys occurred through December 2013, and this corresponds to an average rate of one survey per week. Of these, 17 surveys were before the turbine was deployed (surveys occurred from March to June 2012), and 22 surveys were after deployment (June through December 2013), Although surveys have continued into 2014 (12 surveys have been conducted in 2014 to date, for a total of 51 surveys pre- and post-deployment) at an average rate of two surveys per month, due to the reduced quality of marine conditions during the winter months, these data have not been included in UMaine's preliminary analysis (UMaine 2014).



Source: UMaine 2014

Figure 1. Location of the survey quadrats for boat-based visual observations of birds and marine mammals.

Three marine mammal species (harbor seal, gray seal, and harbor porpoise) and 40 bird species were identified during the surveys, with the most abundant avian species being: common eider (5.4 birds/km^2), herring gull (5.3/km^2), black guillemot (3.8/km^2), Bonaparte's gull (2.7/km^2), ring-billed gull (2.1/km^2), double-crested cormorant (1.1/km^2), common loon (0.96/km^2), and long-tailed duck (0.47/km^2) (UMaine 2014).

Information on the flight height and behaviors of birds observed was recorded to better understand the birds' habitat use of the site (e.g., feeding, resting, and passing through the area). During these surveys no dead or injured birds were observed, and no roosting, perching, or hauled out birds or marine mammals were observed on the structure (UMaine 2014).

Results of monitoring indicate that there is very little risk of birds colliding with the turbine or spinning blades. With a hub height of 50 ft (15.2 m) and a rotor diameter of 31.5 ft (9.6 m), the rotor-sweep zone spins at a height of 10-20 m. Only 20 percent of all birds observed flew at this height. The largest portion of birds flying at this height was within the Bagaduce River (UMaine 2014).

Bat Monitoring – Dyce Head Lighthouse

A bat acoustic detector was deployed by Stantec Consulting Services, Inc. (Stantec) on Dyce Head Lighthouse, the nearest feasible monitoring location to the Castine turbine location. Results have been evaluated for May to October 2013, which is when bats begin to hibernate and the detector was removed. Survey methods replicated the 2012 acoustic monitoring efforts at this same location, and followed those used by similar assessments of bat activity conducted by Stantec in the Gulf of Maine since 2009 (UMaine 2014).

A total of 1,326 bat call sequences were recorded during the 151-night period. Between 0 and 103 call sequences were recorded per night, with an overall activity level of 8.8 call sequences per detector-night. Bats were detected during 126 out of the 151 surveyed nights (83%). Of the 1,326 recorded call sequences, 829 (63%) were identified to species or guild and the remaining 497 call fragments were either too short or lacked sufficient characteristic detail to be identified to species, and were classified as either high frequency or low frequency "unknown." The BBSH guild, including the big brown bat (*Eptesicus fuscus*) and silver-haired bat (*Lasionycteris noctivagans*) was the most frequently identified guild (about 600 sequences recorded), followed by a similar level of detected activity from both the Myotis and RBTB (including the eastern red bat [*Lasiurus borealis*] and tricolored bat [*Perimyotis subflavus*]) guilds (about 100 sequences recorded). Lastly, approximately 25 call sequences of hoary bat (*Lasiurus cinereus*) were recorded (UMaine 2014).

Bat fatality rates at terrestrial windpower sites are typically highest during the fall migratory period. The 2012 surveys conducted at the Dyce Head lighthouse only documented bat activity during the summer residency period, from May to mid-July. In order to measure activity during the more vulnerable fall migratory period, the 2013 acoustic survey period was extended into mid-October. Similar to the 2012 data, bats in 2013 were found to be present on most nights from May–July; this activity likely represents the local foraging of resident bats. Both the nightly range in activity levels and variability among survey nights are typical of this type of survey. A comparison of monthly detection rates suggests that *Myotis* species and big brown bats are most active during June and July, followed by declining monthly detection rates from August to mid-October. Conversely, the migratory tree bats, including the hoary bat, red bat, and silver-haired

bats, had relatively low monthly detection rates from May–July, but recorded the highest monthly detection rate in August (UMaine 2014).

3.1.2 Potential Effects

Extending the deployment period has the potential to affect individuals of some species. For example, biofouling organisms would have additional time to grow on the underwater project components before the project would be removed, but any artificial reef effect of the project would still be temporary. Extending the turbine deployment from 12 to 18 months would not be expected to change the habitat or the marine community in the deployment area (e.g. artificial reef effect, fish aggregation device effect, avoidance of or attraction to the project area by resident and migratory species) because of the small spatial scale of the project and its temporary nature. The continued presence of the transmission cable and moorings would also not be expected to change the habitat or the marine community in the deployment area

As discussed in the Supplemental EA, there are a number of federally managed fish species with Essential Fish Habitat (EFH) in waters off of Castine. Habitat types that represent EFH include all portions of the water column and various substrate types (NOAA 2012). Diadromous fish species also occur in the project area that may serve as prey for a number of federally-managed species and several species are considered a component of EFH. Continued presence of the moorings and cable might have slightly decreased available bottom foraging habitat and areas considered to be EFH. The type of habitat disturbed is very prevalent along the Maine coast and the area covered by the anchors and the subsea cable is very small (combined area of about 64 ft^2 for drag embedment anchors and 357 ft^2 for the 2½-inch subsea cable and associated strip weights). Extending the deployment period would increase the length of time during which habitat within the project footprint, including EHF, would be less available for fish and invertebrates; however, this would still be a negligible and temporary loss of habitat.

As indicated above, no whales, other than harbor porpoise, were observed in the project area during 39 surveys (UMaine 2014). Scheduled and unscheduled inspections, maintenance, and repairs would continue to be required periodically (i.e., weekly to monthly); thus, the extended deployment would result in a slight increase in vessel traffic for project maintenance and research, but it would continue to be a very small portion of the traffic in the area surrounding the platform. Effects to harbor seals, gray seals, and harbor porpoise would remain negligible for this small-scale and temporary project. The turbine platform was designed to limit the horizontal surfaces, and the platform deck height precludes the haul out of seals. As demonstrated by monitoring results, the potential for marine mammal interactions with the platform is unlikely (UMaine 2014), but NMFS marine mammal avoidance procedures would be implemented in the event that a marine mammal is encountered by a service vessel. The small spatial scale of the

project components and small size of service vessels visiting the site (i.e. similar in size to a typical lobster boat) are also expected to minimize any disturbance to marine mammals caused by project operations. Keeping the transmission cable and moorings on the seabed would not affect marine mammals.

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 have been observed in the project area (harbor porpoise, harbor seals, and gray seals [UMaine 2014]) would be able to detect and avoid underwater moorings, regardless of the deployment duration. The extended deployment of the project would not increase the risk of large whales encountering the project because it is unlikely that large whales would be present in the near-shore area where the platform is deployed, and because of the small size of the project footprint relative to the surrounding open ocean area of Penobscot Bay. This is reinforced by monitoring results; from 39 boat-based surveys and review of surveillance footage of the turbine and environs, harbor porpoises are the only cetacean seen in the area, and there has been no evidence of marine mammal interactions, including no haul out on the structure by seals (UMaine 2014).

The proposed extended deployment would increase the period during which migrating and foraging birds would be at risk of colliding with the turbine. With an extended deployment, there is a greater chance that some birds would collide with the turbine and be killed or injured. However, the rotor-swept area of the turbine is 779 feet^2, which is much smaller than a commercial scale wind turbine. The turbine design does not have external ladders or other structures that would allow birds to perch near the turbine blades, with the exception of a web camera which is being used to monitor operations and bird use, as agreed upon during consultation with USFWS, and required navigation lighting (all of which have bird deterrent porcupine wire installed atop). The small rotor diameter of the Castine 1/8th-scale turbine, the turbine design, and the still temporary nature of the extended deployment, would minimize collision risk for birds. UMaine is conducting boat-based visual surveys of birds and has been working with the USFWS to monitor for bird activity near the turbine using a camera. From 39 boat based surveys and review of surveillance footage of the turbine and environs, no bird strikes have been observed and no birds have roosted on the turbine and platform since surface bird deterrents were added. In addition, no birds have been found dead or injured in the survey area (UMaine 2014). UMaine plans to continue bird observations in collaboration with the USFWS over the proposed extended period of deployment.

The results of bat monitoring at Dyce's Head Lighthouse demonstrate that bats are present in Castine (UMaine 2014). It is unknown how many would be expected to be flying over the open water by the turbine. UMaine and the Biodiversity Research Institute developed a marine buoy system designed to gather detailed data near the turbine, including acoustic activity for bats.

However, the high frequency interference from the buoy's other data collection devices made bat detection and identification impossible. Researchers are currently reanalyzing the buoy set up and evaluating changes to the platform in order to successfully detect and identify bat vocalizations near the turbine (UMaine 2014). However, the U.S. Army Corps of Engineers permit requires the following protection for bats at the project: "In order to minimize potential impacts to bats, turbine testing and windpower generation shall be curtailed when mean wind speeds drop below 5.0 m/s during the window of time from one hour before sunset to one hour after sunrise." Because of the relatively small rotor diameter of the Castine 1/8-scale turbine; because the turbine is located about 800 feet from shore, rather than on a forested ridgeline where bats are more common[3]; and because of the cut in speed for the turbine, specifically implemented to minimize risk to bats, the probability of bats being injured by the operating turbine over the proposed extended deployment remains very low.

Threatened and Endangered Species

The project area overlaps with a migratory corridor used by juveniles and adults of three fish species listed as threatened or endangered under the Federal Endangered Species Act (ESA): Atlantic salmon, shortnose sturgeon, and Atlantic sturgeon. Because of the small footprint of the proposed project relative to the surrounding marine habitat, the limited time these fishes would be migrating through the area surrounding the project site, and the overall lack of potential mechanism for effects to fish, there would be very little or no additional risk to these three species from extending the deployment period.

As described in DOE/EA-1792-S1, five ESA-listed whales that have the potential to occur in waters offshore of Maine: North Atlantic right, fin, humpback, sei, and sperm whales. None of these species were observed during 39 boat-based visual surveys UMaine conducted from March through June 2012 and in June and July 2013 in the project vicinity (UMaine 2014, Appendix A), nor are they expected to occur near shore in the upper Penobscot Bay where the turbine is deployed. The project area is not a known concentration area for these whale species; occasional transient right, humpback, and fin whales could be present in the area while migrating or moving between foraging areas (NMFS 2013). Because there will only be one test unit deployed in Penobscot Bay in an area where listed species are not known to concentrate, the likelihood of a whale encountering the project components during the extended deployment remains extremely low.

[3] 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).

The three ESA-listed sea turtle species that have the potential to occur in the Gulf of Maine are Kemp's ridley, loggerhead, and leatherback sea turtles, although Kemp's ridleys are rare in waters this far north. These species generally occur in New England waters during the warmer months, and are most common off of Maine between July and October. The waters off of Maine are not high use areas for these species, occurrence in the project area is relatively rare, and is likely limited to transient individuals migrating or moving between coastal foraging areas (NMFS 2013). No sea turtles have been observed during UMaine's environmental monitoring conducted at the site (UMaine 2014). The likelihood of exposure of these species to the proposed project during the extended deployment period would continue to be extremely small given that sea turtles are uncommon in the project area and the project footprint is very small relative to the surrounding Penobscot Bay. Keeping the cables and anchors on the seabed would not affect any listed fish, mammals, or turtles.

There are two ESA-listed birds, the endangered roseate tern and the federally-threatened piping plover, and a number of state-protected birds that have the potential to occur in the project area. The red knot, which is proposed for listing as threatened, also could occur in the area. Only one state threatened species was definitively observed and included a total of nine razorbills (*Alca torda;* 0.03/km^2). However, additional birds were observed that were unable to be specifically identified to species, but may have included other federal or state threatened, federal or state endangered, or other federal and state-designated conservation status species (as seen in Table 1) (UMaine 2014).

In a letter to DOE dated August 6, 2013, the USFWS noted that piping plover foraging habitat is absent in the project area, and that the project is 33 miles from the nearest roseate tern nesting colony, which is a greater distance than these birds normally travel to forage. Because the rotor-swept area of the Castine 1/8th-scale turbine is small (799 ft^2), and because the turbine is located far from any nesting areas of ESA-listed species (USFWS 2013), the potential for protected birds to be harmed by the operating turbine during an additional six months of deployment would continue to be so small it is discountable.

Table 1. Species of special conservation designation observed during 39 boat based surveys conducted from June through December 2013.

SPECIES	SCIENTIFIC NAME	STATUS	NUMBER
Red-throated loon	*Gavia stellata*	USFWS Birds of Conservation Concern (BCC)	8
Horned grebe	*Podiceps auritius*	BCC	10
Unidentified duck		State threatened (StTh*), State special concern (SSC)*	52
Great blue heron	*Ardea herodias*	SSC	2
Laughing gull	*Larus atricilla*	SSC	17

SPECIES	SCIENTIFIC NAME	STATUS	NUMBER
Bonaparte's gull	*L. philadelphia*	SSC	339
Common tern	*Sterna hirundo*	SSC	22
Unidentified tern	*Sterna sp.*	Federal endangered (FE*), StTh*, BCC*, SSC*	25
Razorbill	*Alca torda*	StTh	9
Unidentified alcid		StTh*, SSC*	7
Unidentified shorebird		F*, Federal threatened (FT)*, StTh, State endangered (StE)*, BCC*, SSC*	6
Barn swallow	*Hirundo rustica*	SSC	3
Tree swallow	*Tachycineta bicolor*	SSC	1
Bald eagle	*Halieetus leucocephalus*	BCC, SSC	7
Peregrine falcon	*Falco peregrinus*	StE, BCC	1
Unidentified hawk		SSC*	10

Source: UMaine 2014

* Indicates potential SCC

The northern long-eared bat, which is proposed to be listed as endangered, has a state-wide distribution in Maine. This bat could occur in the nearshore environment during migration between summer and winter habitats (email dated May 15, 2014 from Wende Mahaney, USFWS, to Lori Gray, DOE). Because of the relatively small rotor diameter of the Castine 1/8th-scale turbine and because of the cut in speed for the turbine, specifically implemented to minimize risk to bats, the probability of northern long-eared bats being injured by the operating turbine over the proposed extended deployment remains very low.

There is no designated critical habitat for federally-listed species in the project area.

DOE re-initiated consultation for the first extended deployment period to May 31, 2014. A summary of the completed consultations are described in the first Supplement Analysis dated September 2013.

In a letter to DOE dated September 11, 2014, the USFWS concurred with DOE's determination that the extended deployment of the turbine at Castine is not likely to adversely affect piping plover, roseate tern, red knot, or northern long-eared bat (USFWS 2014). By emails to DOE dated June 9, 2013, NMFS concurred that the extended deployment of the turbine is not likely to adversely affect ESA-listed species, Essential Fish Habitat (as regulated under the Magnuson-Stevens Fishery Conservation and Management Act), or other trust resources. In an email to the

UMaine team dated November 17, 2014, the U.S. Army Corps of Engineers (USACE) stated that it had coordinated with the USFWS and NMFS regarding the cable and moorings staying in place, and that those two agencies, as well as the USACE, had no objection.

3.2 Noise and Vibration

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). Underwater noise associated with the visits to the site by service or research vessels during the extended deployment have the potential to 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 vessels leave the site. Because of the low level of noise created by a Renewegy 20 kW turbine, and because only a small amount of sound can transfer through the sea surface from above (Jones et al. 2010), underwater noise levels resulting from turbine operation would be expected to continue to be very low during the extended deployment (DOE/EA-1792-S1).

Threatened and Endangered Species

Noise associated with project maintenance and research activities (vessel operations) over the extended deployment period has the potential to 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 project would be infrequent and short term with behavior returning to normal after the service vessels leave the site. In addition, there would be very few project vessels relative to current traffic in the area. Effects of project noise resulting from the proposed extended deployment period would be minimized because of the small scale of the turbine, the low likelihood that listed species would be exposed to the project, the low level of turbine noise, and because only a small amount of sound is expected to result from transfer of above-water sound through the sea surface.

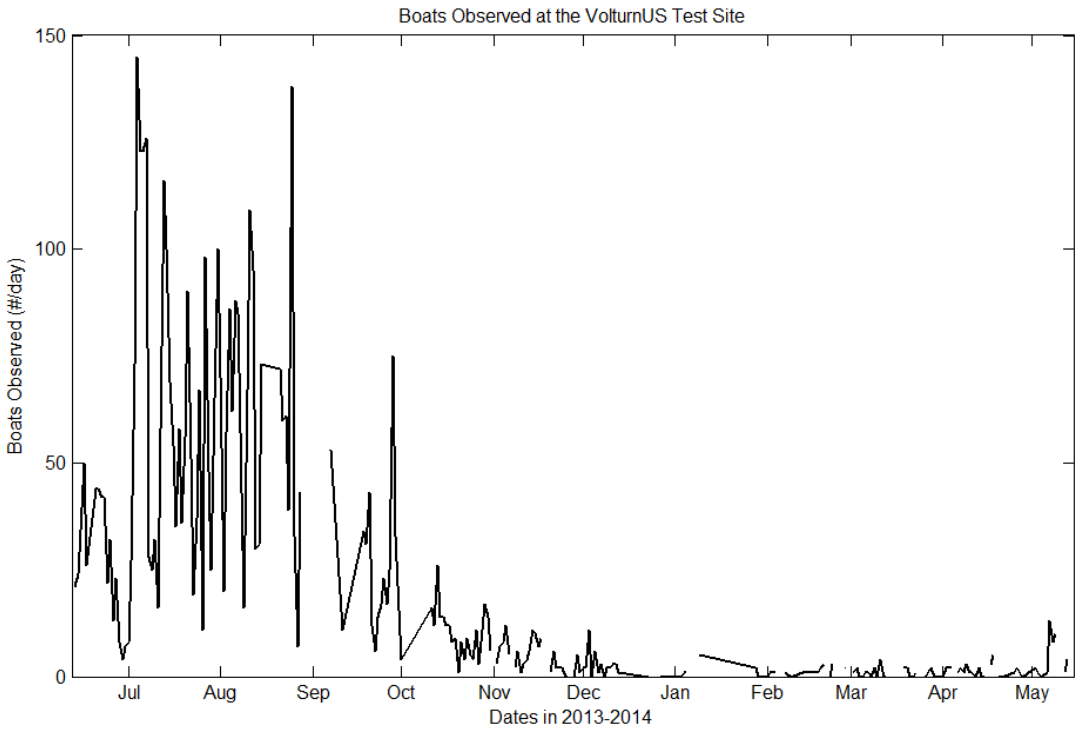
3.3 Ocean and Land Use

Restrictions on lobstering and commercial fishing within a 35-acre area surrounding the platform and an additional area immediately along the electrical cable would continue for the additional deployment period as well as during the period the moorings are kept in place following removal of the turbine platform. This is a very small area relative to the surrounding bay so the project is anticipated to only minimally reduce or temporarily limit lobstering or commercial fishing activities during the extended deployment period.

Surveillance footage of the turbine and environs showed that boat activity at the site fell precipitously from 100 boats per day in the summer to negligible boat activity during the winter (Figure 2). October 1st appears to be a day when many boaters in the area may have hauled their

vessels out of the water for the winter (UMaine 2014). The extended deployment period (June 1 to November 30) overlaps with the period of heaviest boat use in the area.

However, the relatively small area of the navigation safety zone in comparison to the rest of Penobscot Bay would not reduce recreational fishing, recreational boating and cruising, and other recreation activity that occurs in the area during extended deployment of the turbine. Recreational boats are frequently observed passing by the turbine, and the turbine has become an attraction to residents and tourists[4].



Source: UMaine 2014

Figure 2. Number of boats observed via web surveillance per day at the VolturnUS 1:8 scale test site, June 6, 2013 and May 15, 2014.

A navigation safety plan has been developed for the project and approved by the U.S. Coast Guard (USCG). The proposed extension of the deployment has also been approved by the USCG Sector Northern New England, with the requirement that UMaine coordinate with the 1st Coast Guard District to update the Notice to Mariners (USCG 2014). UMaine is coordinating with the 1st Coast Guard District to update the Notice to Mariners. The Navigation Safety Plan

[4] This has been observed from the video surveillance of the unit: boats are seen circling the unit, and schooners, groups of kayaks, etc. pass by. Interest in the turbine has also been indicated during discussions between recreational boaters with Maine Maritime Academy staff who work on the waterfront

and the small scale of the project, minimize the chance of boat collisions with the floating platform during the proposed extended period of deployment.

The cable crosses one private residential property, from which landowner permission has been granted for the extended deployment[5]. The project does not otherwise affect terrestrial land use.

3.4 Cultural Resources

Based on the analysis in DOE/EA-1792-S1, DOE concluded, and the Maine Historic Preservation Office concurred, 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. Visibility of the platform and turbine from most or all historic properties would continue to be limited during the extended deployment period. Consistent with the analysis in the SEA, there would also be no direct adverse impacts or indirect adverse impacts due to the proposed extended deployment period. In an email dated May 15, 2014 to DOE, the Maine Historic Preservation Commission stated "The revised deployment timeline is acceptable to our office."

4.0 Conclusions and Determination

The potential impacts associated with the modified Proposed Action were evaluated and found to be similar to those identified for the Proposed Action in DOE/EA-1792-S1. DOE has therefore determined that the modified Proposed Action would not constitute a substantial change in actions and would not present any new circumstances or information relevant to the environmental concerns and bearing on the previously analyzed action or impacts, within the meaning of 40 CFR 1502.9(c) and 10 CFR 1021.314. An additional Supplemental EA is therefore not required.

5.0 Literature Cited

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).

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.

[5] A previous Memorandum of Understanding was signed by the landowner, which expired at the end of July. He has since given verbal consent for the extended deployment.

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. Front. Ecol. Environ 5(6):315-324. [Online] URL: http://www.bu.edu/cecb/files/2009/12/kunzbats-wind07.pdf.

National Marine Fisheries Service (NMFS). 2013. Letter from J. Bullard, NMFS, to L. Margason, DOE dated February 20, 2013.

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).

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

University of Maine (UMaine). 2014. Interim Environmental Monitoring Report for the 1:8 VolturnUS Deployment in Castine, ME. Prepared by: The University of Maine. May 2014.

U.S. Coast Guard (USCG). 2014. Personal communication from Lt. Megan Drewniak, USCG, to Andy Qua, Kleinschmidt, May 16, 2014.

U.S. Fish and Wildlife Service (USFWS). 2014. Letter from L. Zicari, USFWS, to L. Gray, DOE, dated September 14, 2014.

U.S. Fish and Wildlife Service (USFWS). 2013. Letter from L. Zicari, USFWS, to L. Margason, DOE, dated August 6, 2013.

Appendix A
Interim Environmental Monitoring Report

Interim Environmental Monitoring Report for the 1:8 VolturnUS Deployment in Castine, ME

Prepared by:

The University of Maine

May 2014

On June 13th, 2013, the University of Maine led DeepCwind Consortium deployed VolturnUS 1:8, the first floating offshore wind turbine in the US. Since that time, DeepCwind has monitored the turbine for potential environmental impacts. What follows is a summary of what is known to date. In summary, the turbine has been monitored by web surveillance (one image every 30 seconds at least) and weekly visual observations (every two weeks during winter), in addition to opportunistic observation during maintenance. No bird collisions or marine mammal haul out has been observed during this time. Only one bird was observed perching on the turbine, and after bird deterrent was installed, no birds have perched on the unit since August 2013. No bird or bat carcasses were observed floating or on the turbine (there are downward facing cameras on the platform). Although analysis is ongoing, after one year of monitoring, it appears as though environmental impacts have been minimal.

Web Camera Surveillance Monitoring

During the course of finalizing the Fish and Wildlife Monitoring plan for the VolturnUS 1:8 scale deployment, US Fish and Wildlife Service inquired as to the role of web surveillance in DeepCwind's monitoring program. In collaboration with US Fish and Wildlife, it was determined that DeepCwind would deploy a web camera adjacent to the VolturnUS 1:8 turbine on the property of a Castine resident who lives on land adjacent to the turbine. Although the Fish and Wildlife Monitoring Plan called for examining one image every 30 seconds during daylight hours, as part of a student project the analysis below examined images every 15 seconds. The spatial scope of the web surveillance included that air/water space of approximately 4 platform diameters (platform diameter is 41.5 feet) in front and behind the turbine (see Figure 1 for detail of the spatial coverage). US Fish and Wildlife and Dr. Damian Brady viewed images on August 21st 2013 during a site visit to the turbine and agreed that the most important data to collect during this effort was information regarding how birds approached the turbine.

Figure 1. Example of the video coverage of the VolturnUS 1:8 scale turbine.

The protocol used for this analysis was as follows: (1) if the screened image contained a bird, boat, or marine life, then the time was noted and recorded; (2) if possible, the bird, boat, or marine life was identified to subcategory (e.g., lobster boat or sail boat); (3) if the image contained a bird, it was categorized as near-field (i.e., very close to the camera), mid-field (i.e., potentially close to the turbine), or far field (i.e., off in the distance); and (4) the analyst reviewed the continuous video to determine if there was any bird-turbine interaction (e.g., collision, perching, etc.) for mid-field categorized birds. The most important early result of our analysis is that we have not observed (in visual observations and camera monitoring) any collisions or marine mammal haul out. This type of monitoring was effective for a number of reasons, including event driven adaptive mitigation. In one example, a double crested cormorant visited the turbine on multiple days in mid-August, prompting the team to deploy bird deterrent on that area of the turbine. Interestingly, no birds were observed perching on the turbine since that event. That assessment applies both to the video observation and the weekly visual surveys. Another example of the use of this monitoring occurred on June 17, 2013, when US Fish and Wildlife Service informed Dr. Brady that an injured eagle had been located near Dice Head Lighthouse. The team was immediately able to review footage and determine there was no interaction with the turbine and that the turbine was only operating for 30 minutes on that day.

Another advantage of this technique, in addition to its efficacy as a collision monitoring tool, is the ability to characterize overall bird activity at the site (Figure 2).

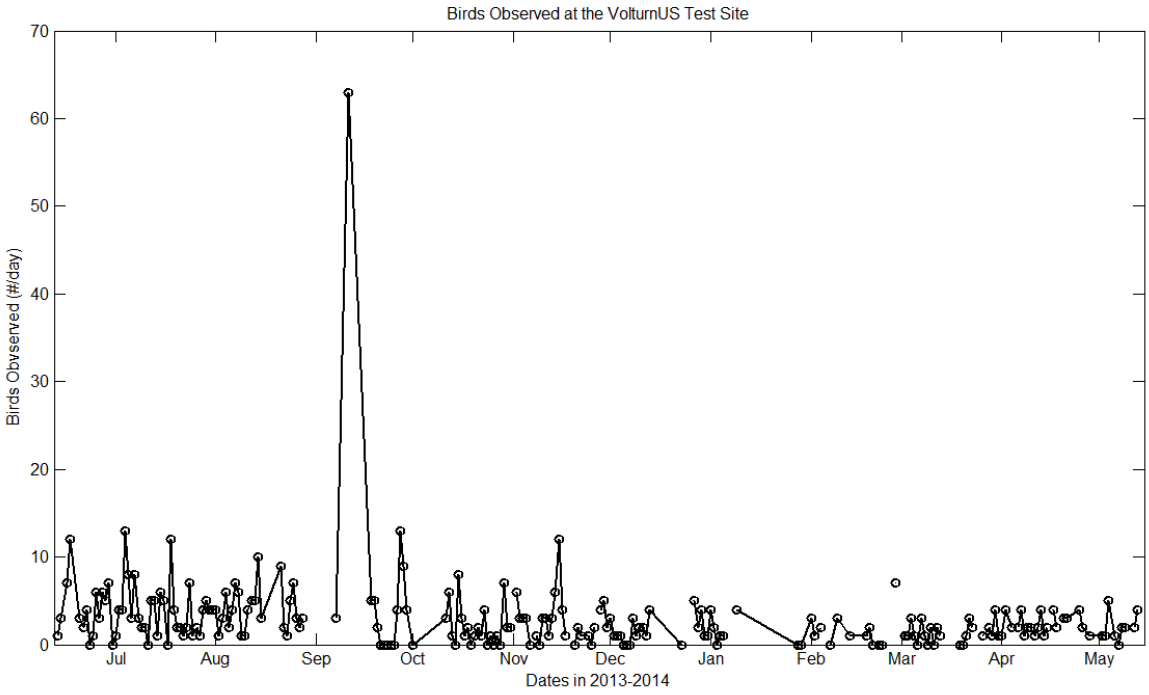


Figure 2. Number of birds observed per day at the VolturnUS 1:8 scale per day, June 6, 2013 and May 15, 2014.

Results are preliminary and analysis is ongoing, however, from review of images collected between June 6, 2013 and May 15, 2014, it appears that the number of birds is highest in the Summer and Fall (one day being particularly active in mid-September; Figure 2). Not surprisingly, winter bird activity was

relatively low. Figure 3 shows bird activity plotted by hour of the day. It appears that most bird activity occurs during the early hours of the day.

We can also explore covariation between bird activity and potential drivers. For instance, boat activity and bird activity have long been known to co-vary as birds follow potential fishing boats. Not surprisingly, boat activity at the site fell precipitously from 100 boats per day in the summer to negligible boat activity during the winter (Figure 4). October 1st appears to be a day when many boaters in the area may have hauled their vessels out of the water for the winter. Preliminary results indicate that boat and bird activity are higher in the summer/fall; however further analysis and parsing based on subcategories of boat (fishing) and bird (gull species) are still pending.

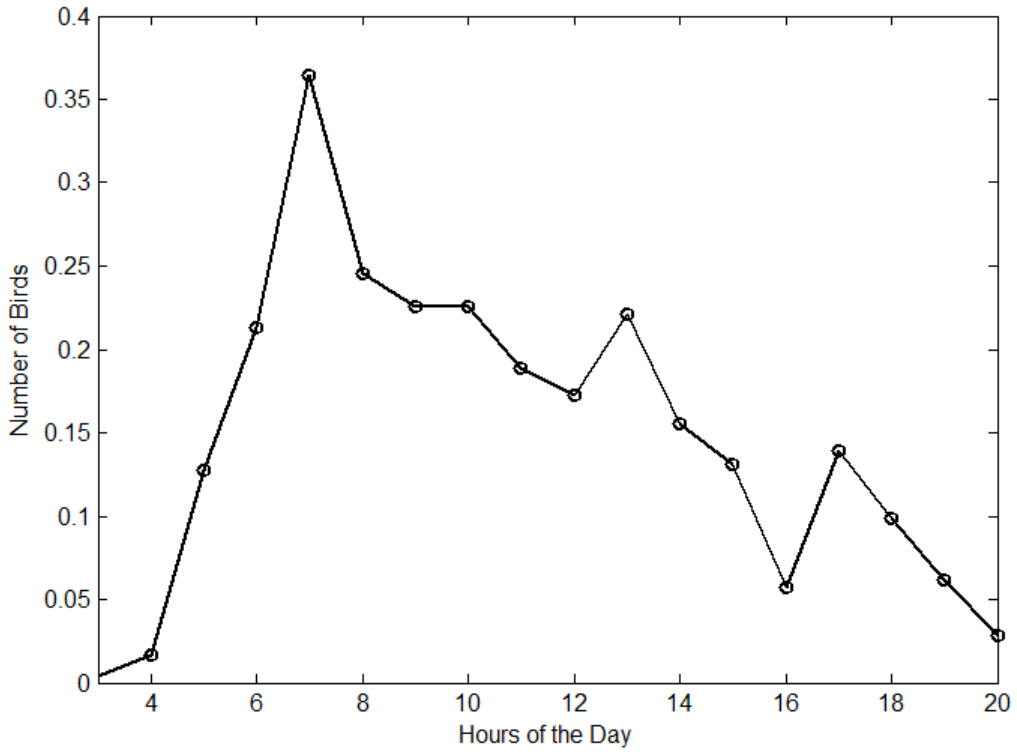


Figure 3. Average number of birds observed via web surveillance for each hour during daylight, June 6, 2013 and May 15, 2014.

As stated previously, analysis is ongoing and in the future we hope to correlate observed bird activity with meteorological variables (wind speed, direction, tide and precipitation) and human marine uses (e.g., lobster boat activity in the area).

Boat Based Visual Observations for Birds and Marine Mammals

Boat-based visual observations of birds and marine mammals were conducted at the University of Maine's Castine test site where the DeepCwind's VolturnUS 1/8 scale turbine test unit on a semi-submersible floating platform is located. Specific information pertaining to the flight heights, behaviors, and species found at this location were obtained which help to better understand the birds' habitat use of the site (e.g., feeding, resting, and passing through the area). Figure 5 shows the survey design for the transects, divided into three sections: surveys begin at the northeast corner of the "South" quadrat,

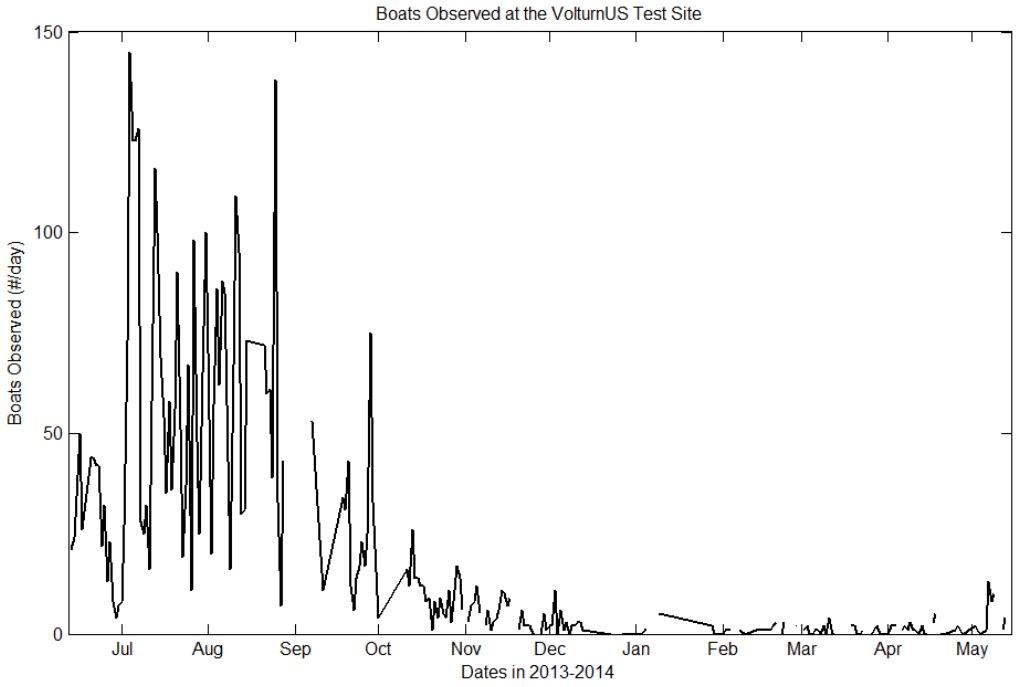


Figure 4. Number of boats observed via web surveillance per day at the VolturnUS 1:8 scale test site, June 6, 2013 and May 15, 2014.

then proceed into the "North" quadrat (in which the floating turbine is located), and finish with the 1-mile drive into the "Bagaduce River" transect, where the survey ends. These data have provided essential components in the environmental assessment of this project. This report evaluates 39 surveys that occurred through December 2013, and this corresponds to an average rate of one survey per week. Of these, 17 surveys were before the turbine was deployed (surveys occurred from March to June 2012), and 22 surveys were after deployment (June through December 2013), Although surveys have continued into 2014 (12 surveys have been conducted in 2014 to date, for a total of 51 surveys pre- and post-deployment) at an average rate of 2 surveys per month, due to the reduced quality of marine conditions during the winter months, these data will not be included in this preliminary synopsis at this time.

Throughout these surveys no birds were found dead and floating in the entire survey area, nor were collisions ever observed. Also, no birds or marine mammals were observed roosting, perching, or hauled out on the structure. Three marine mammal species (harbor seal, gray seal, and harbor porpoise) and 40 bird species were identified across the 39 surveys, with the most abundant avian species listed from greatest to lesser as the following: common eider (5.4 birds/km^2), herring gull (5.3/km^2), black guillemot (3.8/km^2), Bonaparte's gull (2.7/km^2), ring-billed gull (2.1/km^2), double-crested cormorant (1.1/km^2), common loon (0.96/km^2), and long-tailed duck (0.47/km^2). Only one definite State Threatened (MESA) species was observed and included a total of nine razorbills (*Alca torda;* 0.03/km^2). However, additional birds were observed that were unable to be specifically identified to the species, but may have included other Federal (FT or FT*) or State Threatened (StTh or StTh*), Federal (FE) or State Endangered (StE), or other federal and state-designated conservation status species (birds of conservation concern [BCC]: USFWS or species of special concern [SSC]: MDIFW), as seen in Table 1.

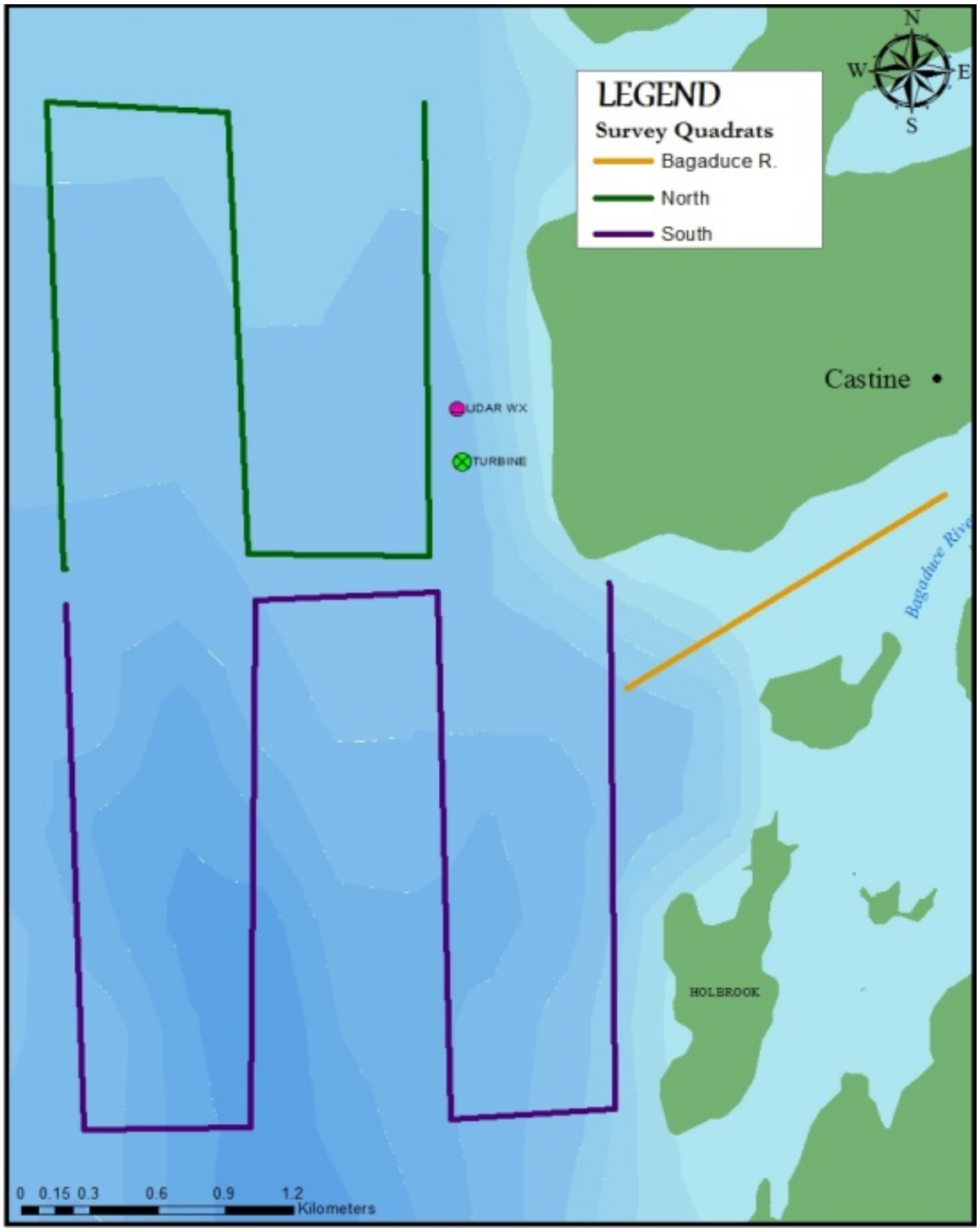


Figure 5. Location of the survey quadrats for boat-based visual observations of birds and marine mammals used for the Castine Test Site with UMaine's VolturnUS 1/8th scale floating turbine and Lidar Weather Station.

Table 1. Species of special conservation designation, including potential species.

STATUS	SPECIES	SCIENTIFIC NAME	NUMBER
BCC	red-throated loon	*Gavia stellata*	8
BCC	horned grebe	*Podiceps auritius*	10
StTh*, SSC*	unidentified duck		52
SSC	great blue heron	*Ardea herodias*	2
SSC	laughing gull	*Larus atricilla*	17
SSC	Bonaparte's gull	*L. philadelphia*	339
SSC	common tern	*Sterna hirundo*	22
FE*, StTh*, BCC*, SSC*	unidentified tern	*Sterna sp.*	25
StTh	**razorbill**	***Alca torda***	**9**
StTh*, SSC*	unidentified alcid		7
F*, FT*, StTh/E*, BCC*, SSC*	unidentified shorebird		6
SSC	barn swallow	*Hirundo rustica*	3
SSC	tree swallow	*Tachycineta bicolor*	1
BCC, SSC	bald eagle	*Halieetus leucocephalus*	7
StE, BCC	peregrine falcon	*Falco peregrinus*	1
SSC*	unidentified hawk		10

* indicates potential SCC

Temporal trends varied by the species type within the surveyed months of March through December. Typically the ducks, eider, scoters, and grebes were most present in the months of April and then again in October and November. Loons were the least abundant in June and August. Gull species were most abundant in June, September, October, and December, but terns were seen in very small abundance in June, peaking in July, and last seen in August. Alcids were least abundant in May through July and most abundant from August through December, consisting entirely of black guillemot except when razorbills and unidentified alcids appeared in December. Unidentified shorebird species were observed only in August and October. A few passerine species were observed only in April, May and July; however crows were present March through November, with highest abundances in March and October. Osprey were observed April through August, peaking in June, whereas a large number of unidentified hawks were recorded in September, likely associated with hawk migration. Marine mammals were consistently present, although peaks occurred in May and June, and then again from August through October. Bird behaviors included 49% sitting in the water, followed by 32% flying direct, and 14% were performing a behavior associated with active foraging. The most common flight height involved 37% of birds flying at one meter above the water, although 69% of all flying birds were at or below five meters.

The risk of animals colliding with this single 1/8th scale floating turbine on a semi-submersible platform is very low, even considering direct strike from the spinning blades. With a hub height measuring 50ft (15.24m) and a rotor diameter of 31.5ft (9.6m), the rotor-sweep zone spins at the 10-20m height. Flying within this zone involved only 20% of all birds, however this is spread across the entire survey area and the largest portion was within the Bagaduce River. Any other potential attractant-effect of human boating activity or addition of loafing structures appears negligible on the gull species. Although the gull species are consistently the only group of birds that are abundant enough and most often flying within the rotor-sweep zone to be the species of most concern for direct impacts, possible effects of reduced numbers in the region nearest the spinning turbine further reduces the concern.

Continuing analysis of the January through May data will provide further insight due to the overlapping seasons in the pre-deployment months (March – end of July 2012) and the post-deployment years (June 2013 – present). It is imperative as many overlapping seasons continue to be monitored to best assess the potential direct or indirect impacts to the avian species within the Castine Test Site region of Penobscot Bay.

Passive Acoustic Monitoring from Buoy by the BioDiversity Research Institute

Although passive acoustic detection of birds was not a component of the Fish and Wildlife Monitoring Plan, a Maine Sea Grant award to Dr. Brady and the Biodiversity Research Institute allowed the team to experiment with a buoy-deployed passive acoustic detector to monitor birds and bats. The following represent the rationale for this project and preliminary results. And while the technology has shown a lot of promise in identifying songbirds, bat detection on these types of buoys will prove difficult in the future.

Marine wildlife acoustic data were collected continuously from May to November 2013 from a buoy deployed near the Castine turbine. A subset of days was selected for further analysis of bird and bat acoustics to determine if the platform was effectively recording data. Standard acoustic detectors were able to consistently identify songbird flight calls (short, relatively high calls that can be difficult to capture effectively) as well as nearby territorial songbirds calls and seabird calls during the day. Diversity of migrating songbirds was high early in the fall and we were able to identify a species under a variety of environmental conditions and evenings. Analysis is ongoing and results will be provided to USFWS and IFW upon completion. In the initial analysis of the ultrasonic bat acoustic data, we found that high frequency interference from the buoy's other data collecting devices made bat detection and identification impossible. We are currently reanalyzing our buoy set up and we think that changes to the platform can improve our ability to successfully detect and identify bat vocalizations.

Bat Monitoring

Two SD-1-based acoustic detectors were deployed on Dice Head Lighthouse by Stantec. Below is a brief summary of their findings from May-October 2013 (the detector was removed at approximately the period when bats begin to hibernate). Results and analysis for the spring 2014 are ongoing:

Stantec Consulting Services, Inc. (Stantec) conducted a second year of acoustic bat surveys from the tower of the Dice Head Lighthouse in Castine, the nearest feasible monitoring location to the Castine turbine location. Survey methods replicated the 2012 acoustic monitoring efforts at this same location,

and followed those used by similar assessments of bat activity conducted by Stantec in the Gulf of Maine since 2009.

An acoustic detector was deployed on the tower of the Dice Head Lighthouse on May 14, 2013, and operated on a nightly basis through the night of October 11, 2013. A total of 1,326 bat call sequences were recorded during this 151-night period. Between 0 and 103 call sequences were recorded per night, with an overall activity level of 8.8 call sequences per detector-night. Bats were detected during 126 out of the 151 surveyed nights (83%). Of the 1,326 recorded call sequences, 829 (63%) were identified to species or guild and the remaining 497 call fragments were either too short, or lacked sufficient characteristic detail to be identified to species, and were classified as either high frequency or low frequency "unknown." The BBSH guild, including the big brown bat (*Eptesicus fuscus*) and silver-haired bat (*Lasionycteris noctivagans*) was the most frequently identified guild, followed by a similar level of detected activity from both the *Myotis* and RBTB (including the eastern red bat [*Lasiurus borealis*] and tricolored bat [*Perimyotis subflavus*]) guilds (Figure 6).

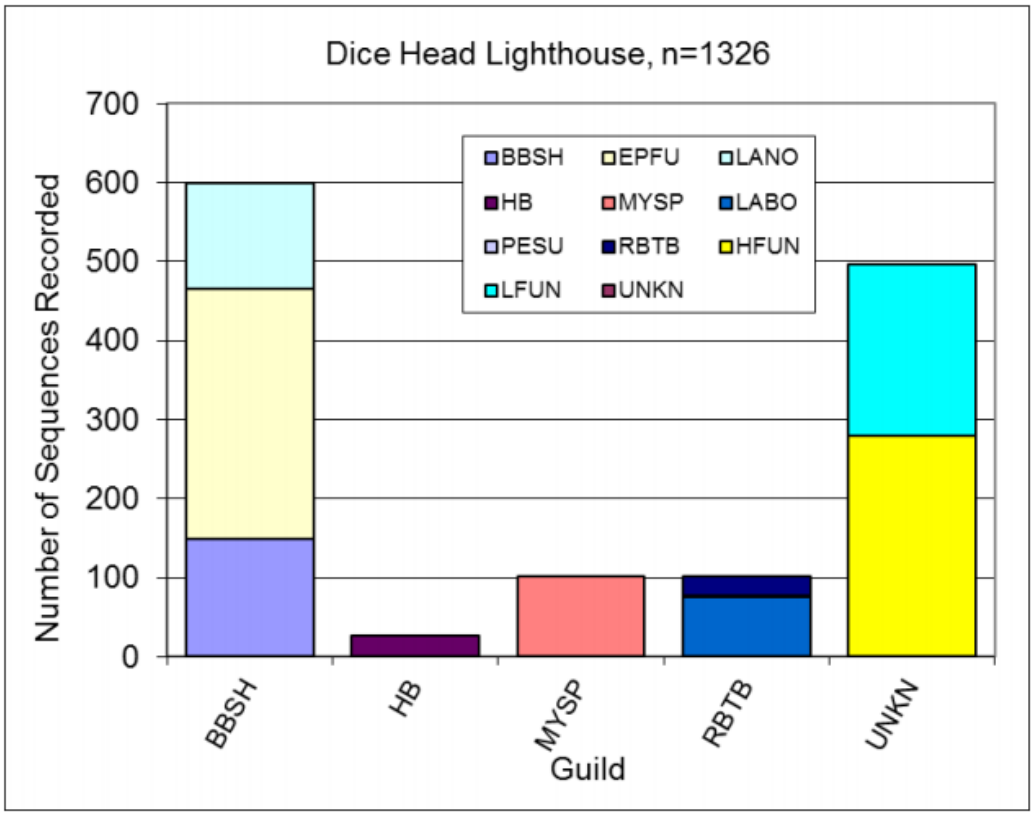


Figure 6. Number of sequences recorded by guild. BBSH, HB, PESU, LFUN, EPFU, MYSP, RBTB, UNKN, LANO, LABO, and HFUN refer to big brown/silver haired bat, hoary bat, tri-colored bat, "low frequency unknown", big brown bat, Myotis, Eastern red/tri-colored bat, "unknown", silver-haired bat, Eastern red bat, and "high frequency unknown", respectively.

Bat fatality rates at terrestrial windpower sites are typically highest during the fall migratory period. The 2012 surveys conducted at the Dice Head lighthouse only documented bat activity during the summer

residency period, from May to mid-July. In order to measure activity during the more vulnerable fall migratory period, the 2013 acoustic survey period was extended into mid-October. Similar to the 2012 data, bats in 2013 were found to be present on most nights from May–July; this activity likely represents the local foraging of resident bats. Both the nightly range in activity levels and variability among survey nights are typical of this type of survey. A comparison of monthly detection rates suggests that *Myotis* species and big brown bats are most active during the months of June and July, followed by declining monthly detection rates from August to mid-October. Conversely, the migratory tree bats, including the hoary bat, red bat, and silver-haired bats had relatively low monthly detection rates from May–July, but recorded the highest monthly detection rate in August. The largest night of bat activity was recorded on 29 August, and was well above the overall nightly average call rate of 8.8 sequences per detector-night. Eighty-five of the 103 calls recorded on 29 August were identified as big brown bat calls, and 84 of those big brown calls were recorded within 1 hour of sunset. This large pulse of activity was most likely a bout of foraging driven by possibly ideal conditions.

Fish Monitoring

Vemco acoustic receivers were deployed in Penobscot Bay by NOAA researchers from the Maine Field Office of the Northeast Fisheries Science Center. NOAA researchers have recently retrieved the receivers, and UMaine is coordinating with NOAA to examine tag hit distributions in the vicinity of the turbine (e.g., analysis of detected acoustically tagged sturgeon and salmon).

Conclusion

UMaine has conducted environmental monitoring of the VolturnUS 1:8 turbine deployed off of Castine for almost one year. No bird collisions or marine mammal haul out has been observed during this time. Only one bird was observed perching on the turbine, and after bird deterrent was installed, no birds have perched on the unit since August 2013. No bird or bat carcasses were observed floating or on the turbine. From monitoring conducted to date, it appears as that environmental impacts have been negligible.