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Environmental Studies Program

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RE: Environmental Studies Ideas for BOEM's Fiscal Year 2024–2025 Studies Development Plan
Submitted via to BOEMEnviroStudies@BOEM.gov

Offshore wind is at a critical point of development, and the American Clean Power Association (ACP) appreciates the Bureau of Ocean Energy management's (BOEM) call for suggested areas of study to ensure public research resources are used for the greatest benefit.[1] With new leases being offered and auctioned nationally each year, offshore wind developers are making large investments in supporting research and data collection in the ocean for responsible offshore wind development. Many projects are scheduled for construction within the next half decade and are in the process of developing studies for monitoring to assess possible impacts and any need for mitigation. Future projects and management decisions can be informed by these efforts. ACP recommends that priority questions around offshore wind are best assessed through ongoing collective research efforts being organized by entities such as the Responsible Offshore Science Alliance (ROSA) and the Regional Wildlife Science Collaborative for Offshore Wind (RWSC).[2][3] We recognize BOEM's ongoing involvement with these entities and look forward to further collaboration.

ACP submits the following study ideas for consideration by BOEM's Environmental Studies Program (ESP) as it formulates its FY2024-FY2025 Studies Development Program. Please note that we have followed the framework of BOEM's ESP program by identifying the "problem" that the proposed study is intended to resolve, i.e. the "Problem Statement." Thank you for your consideration of these suggested subjects of research.

Sincerely,

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[1] American Clean Power Association represents the renewable energy industry in the United States, bringing together over 1,000 member companies, 120,000 members, and a national workforce located across all 50 states. By uniting the power of wind, solar, storage, and transmission companies and their allied industries, we enable the transformation of the U.S. power grid to a low-cost, reliable, and renewable power system. Additional information is available at http://www.cleanpower.org.

[2] https://www.rosascience.org/

[3] https://rwsc.org/science-plan/

Study Topic/Goal	Explanation	Potential Approaches	Region
Subtopic 1: Marine Mammals			
Marine Mammals Goal I: Understand the distribution and abundance of marine mammal species relative to prey distributions and activities associated with development and operations within a BOEM offshore wind energy area.	**<u>Problem Statement:</u>** Ongoing research into the impacts of anthropogenic activities on marine mammal populations and recent reports by NOAA suggest that activities associated with development of a BOEM offshore wind energy area (WEA) may cause ecosystem type changes leading to changes in the distributions and abundances of sea turtles and marine mammals, particularly North Atlantic right whales (Christiansen, Daewel, Djath, & Schrum, 2022; Hayes, Josephson, Maze-Foley, Rosel, & Turek, 2021; Ryan et al., 2022; Tyack et al., 2022). An important component in this hypothesis is that such changes could be driven by changes in both physical and biological oceanographic factors (e.g., hydrodynamics, primary and secondary productivity). Evaluation of this hypothesis is complicated, especially given recent evidence indicating that "climate change covariates" are contributing to shifts in North Atlantic right whale distribution prior to installation of an offshore wind farm (Meyer-Gutbrod et al., 2022). To inform adaptive management efforts on this issue, it is necessary to identify the drivers of changes in oceanographic factors within both a WEA and non-WEA and their relative influences on the distribution and abundance of marine mammals.	**<u>Potential Approaches</u>** Approaches would adopt an experimental-control paradigm in which identical data collection efforts would be conducted in a WEA and a non-WEA to control for factors independent of WEA activities. The visual observation modality would be expanded to include thermal-infrared sensors. Passive acoustic platforms (fixed and mobile) would be modified and augmented with a suite of sensors (e.g. upward looking sonar) to collect basic oceanographic data (e.g., nutrient density, dissolved oxygen level, taxonomic composition). All data would be integrated into a centralized data system operating advanced analytics, modeled after systems successfully implemented under NSF's Ocean Observation Initiative (https://www.nsf.gov/geo/oce/programs/ooi/). The resultant suite of sighting, acoustic and oceanographic data would be processed to develop models to elucidate the relative potential effects of offshore wind energy development on marine mammal and sea turtle distributions and relative abundances. Basic approaches would:	National

	Opportunity: Over the past ten years, visual surveys for sea turtles, and visual and passive acoustic surveys for marine mammals, have been conducted in and around the RI-MA WEA. These observational techniques provide important data on the seasonal occurrence and relative abundance of marine species. Modeling a possible relationship between changes in marine animal occurrence and oceanographic factors requires a multi-disciplinary data collection effort that includes oceanography (physical and biological) and multi-taxonomic biology, coupled with advanced modeling tools. This approach was successfully applied off California and was referred to as the Wind to Whales Project (Croll et al., 2005; Fossette et al., 2017). (Harris et al., 2018; Harwood, King, Schick, Donovan, & Booth, 2014) Similar concerns have driven ongoing projects attempting to model the consequences of anthropogenic factors on marine mammal populations (Harris et al., 2018; Harwood et al., 2014) and assess the relative risks to marine mammals from offshore human activities (Southall, Clark, Ellison, Mann, & Tollit, 2014; Southall et al. submitted). (Southall, Clark, Ellison, Mann, & Tollit, 2014).	1. Explore the influence(s) of offshore wind infrastructure and the effects of wind energy operations on the level and extent of mixing within the water column, and the ensuing changes in nutrient density, oxygen level, and plankton composition and productivity relative to individual turbines and field of turbines. 2. Model the relationship between changes in plankton and the availability of vertebrate prey species (sand eels, clupeids, mackerel) to top predators relative to individual turbines and a field of turbines, and a non-WEA control area. Develop models to predict the impacts of these changes on marine mammal and seabird foraging opportunities, and the associated changes in their geographical distribution.	
Marine Mammals	**Problem Statement:** Pile driving noise, ship vessel strikes and operational noise continue to impose impact	**Potential Approaches** The initial approach would adopt an experimental-control paradigm in which	National

Goal II: Reduce vessel strike and noise risks to protected marine mammal species under low visibility weather conditions	production (IPF) uncertainty during site characterization, construction and operations of offshore wind projects. Risk mitigation depends on monitoring for protected species, which in turn depends on either seeing or hearing those species. Presently, visual monitoring and acoustic monitoring depend on two traditional methods; visual detection-recognition in the visible spectrum and passive acoustic detection and recognition of species-specific sounds. Existing visual methodologies employed by protected species observers (PSOs) are limited by low visibility conditions (i.e., daylight and weather dependent sighting conditions) that together with an observer's eye height above the water (HoE), determine the visual monitoring area. Existing acoustic methodologies employed by PSOs are limited by ambient noise conditions (i.e., signal to noise ratio), number and distribution of acoustic sensors, and detection-recognition-confirmation processing time. Improvements in detection probability of individual marine mammals, in combination with SMAs and DMAs, could further reduce uncertainty for offshore wind industry and regulators with respect to these two IPFs. **<u>Opportunity:</u>** A number of technologies are becoming increasingly available for improving marine mammal monitoring under low visibility conditions, expanding the monitoring area, and quantifying detection uncertainty and potential biological risk. Technologies such as shipboard/ship-launched	identical data collection efforts would be conducted in a WEA and a non-WEA, so as to control for factors independent of WEA activities. 1. Development and testing of new and hybrid marine mammal and sea turtle detection-monitoring systems 2. The visual observation modality would be expanded to include thermal and thermal-infrared. Traditional passive acoustic platforms, both fixed and mobile, would be expanded to include suites of sensors that collect basic oceanographic data (e.g., nutrient density, dissolved oxygen level, taxonomic composition). All data would be integrated into a centralized IoT-type data system operating advanced analytics. 3. The resultant suite of visual sighting, passive acoustic and oceanographic data would be used to develop models predicting the relative potential effects of offshore wind energy development on factors that are known or assumed to influence marine mammal and sea turtle distributions and relative abundances. 4. Research the feasibility of a multi-modal, integrated sensor network and the effectiveness of new detection technologies (e.g., thermal-infrared) to supplement or replace Protected Species Observers and conventional detection methodologies and equipment. Hybrid systems – see SSI	

	thermal-infrared imaging systems are in various stages of development. Several recent tests of these technologies and ongoing applications under non-WEA conditions suggest similar overall detection rates and detection ranges for large whales as compared to PSOs. This supports the conclusion that these technologies could be useful complementary additions to PSO- and PAM-based monitoring programs (Smith et al. 2020, Zitterbart et al. 2020). In addition, a significant reduction in risk of missed detection is available when presently independent observation techniques are integrated into a multi-modal detection-recognition, risk prediction system. These multi-modal integration options can be deployed in different combinations on aerial, vessel-based and underwater platforms to increase probability. An integrated suite of visual, acoustic and oceanographic data collection methodologies are needed to develop reliable models for predicting the relative potential effects of offshore wind energy development on marine mammal and sea turtle occurrences and distributions. Options to increase the probability of near-real-time detection and the monitoring area (thereby indirectly reducing biological risk uncertainty) include a) increasing the number of observers by expanding the "observer" concept to include autonomous platforms, b) expanding the light spectrum to include thermal-infrared, c) increasing the number of and types of acoustic sensor platforms, and d) integrating the resultant multi-	5. Review of monitoring objectives, regulatory requirements, developing technologies and feasibility for implementation 6. Joint studies with NMFS would facilitate acceptance for Project use.	

	modality sensor data into a multi-sensor probability of detection IoT system. An important opportunity to explicitly reduce long-term, large-scale biological risk uncertainty is available by complementing a near-real-time approach with a long-term approach. This is accomplished by deliberately acquiring data at rates and scales and modalities that are matched to the spatial, temporal, and modality scales of an ocean region's physical-ecological system and the wind energy system that is being introduced into the physical-ecological system. The investment in this approach requires a relatively low-level, long-term commitment, thereby increasing the likelihood of gaining insights into fundamental ocean system phenomena while reducing the likelihood of unintended consequences.		
Subtopic 2: Environmental Justice			
Environmental Justice: Metrics to quantify positive social and health impacts resulting from the offshore wind industry, including those experienced in communities of color,	Problem Statement: Environmental Justice analysis in NEPA documents should consider potential positive and negative impacts and notbe limited only potentially negative impact- producing factors (IPFs) or to socioeconomic impact to one stakeholder group and/or community. Instead it should be broadened to positive socioeconomic and health impacts experienced in communities of color, indigenous, and low-income communities. Opportunity: Industry growth with the award of Federal OCS Lease Areas and increased state and local solicitation targets is equating to significant	Establish a secure database for the offshore wind industry to enter information regarding the development of each Project andthe associated realized benefits from lease execution through operations decommissioning. Plan for periodic compilation of the data to provide the public information on the growth and benefits to communities of color, indigenous, and low-income communities with details on how environmental risks to the communities are reduced.	National

indigenous, and low- income communities.	investments in the U.S. economy and to state and local communities. Such investments can lead to positive socioeconomic and health benefits.		
Subtopic 3: Fish and Fisheries			
Sturgeon: Understand use of lease/call areas by sturgeon to inform risk	Problem Statement: Atlantic sturgeon abundance and seasonal use of BOEM lease/call areas is poorly understood. Opportunity: Expand tagging/telemetry studies to better understand sturgeon use of potential OSW areas within sturgeon range would inform construction timing and potential impact-producing factors (IPFs) in advance of such activities.	Tagging studies using buoy mounted receivers or otherappropriate technology	Atlantic
Fish: Conduct studies of hearing of key commercial species such as sea bass, squid, groundfish	Problem Statement: Fishermen and fisheries' stakeholders are recognizing that auditory impacts to fish species in BOEM Call Areas area data gap. Opportunity: Reduce IPF uncertainty and fill adata gap with field studies for offshore wind construction and operations activities in a utility-scale offshore wind project.	Develop standardized field methods that could be implemented to validate model assessments and supplement fisheries monitoring efforts; Conduct laboratory and field studies.	National
Fisheries: Advance methods of measuring particle motion	Problem Statement: Fishermen and fisheries stakeholders are recognizing certain fish species are sensitive to particle motion and not pressure. Opportunity: Reduce IPF uncertainty and fill adata gap with field studies for offshore wind construction and operations activities in autility-scale wind project.	Further advance methods for measuring particle motion effectson fish; Develop and standardize field methods that could be implemented to validate model assessments	National
Subtopic 4: Noise Mitigation Strategy			

Conduct studies to further evaluate and demonstrate noise mitigation system (NMS) effectiveness	Problem Statement: There is uncertainty within lead federal agencies to demonstrated efficacy of NMS, resulting in overly conservative mitigation measures as observed in the Vineyard Wind Biological Opinion. In addition, agencies have recommended field measurements for sound produced during construction of unmitigated piles (e.g., Coastal Virginia Offshore Wind Project) that has increased stakeholder concerns on impacts to marine life without NMS. Opportunity: Reduce uncertainty of NMS efficacy and effectiveness and reduce overlyconservative mitigation measures that could impact project operations.	Conduct controlled lab and fieldstudies to further evaluate existing field measurements. Identify ways to improve field measurements of mitigated pilesduring construction of offshore wind turbines.	National
Subtopic 5: Climate Change			
Improved quantification of positive climate changerelated to offshore wind development.	Problem Statement: Cumulative positive impacts that offshore wind that provide and that offset the potentially negative impacts of climate change on ecosystems and ocean environment have not been considered fully inrecent NEPA analyses. Opportunity: Improve quantification of positive climate change benefits resulting fromoffshore wind development.	Develop metrics to assess benefits of climate change infuture BOEM NEPA analyses Conduct modeling efforts to compare scenarios of the fisheries harvest trajectories for key commercial species in U.S. Atlantic for the lifetime of offshore wind projects (or longeras statistically relevant): • No reductions in CO2emission • A cap at 2deg C • A cap at 1.5 deg C. (For example, WHOI has conducted a study examining future harvests of	National

		scallops and Rutgers has modeled fish distributions against different climate models that could inform future BOEM ESP studies(OceanAdapt)).	

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