

Information Synthesis & Socioeconomic Studies

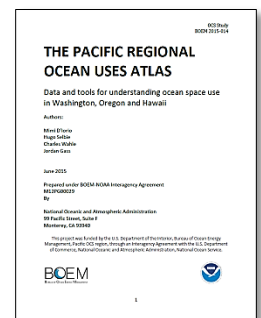
Completed (2015) — Pacific Regional Ocean Uses Atlas

This partnership between BOEM and the National Oceanic and Atmospheric Administration documented patterns of existing and emerging ocean uses in OCS areas off the states of Washington, Oregon, and Hawaii through participatory mapping workshops. The project also identified potential areas of conflict and/or compatibility between proposed renewable energy areas and other ocean uses. The atlas documents a full range of human activities and sectors in the ocean to support offshore renewable energy planning.

Report (BOEM 2015-014): <https://www.boem.gov/2015-014/>

Project Information: <https://marinecadastre.gov/oceanuses/>

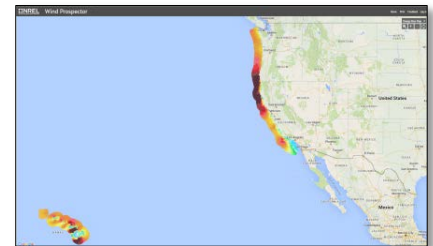
Hawaii Data & Resources: <https://data.noaa.gov/dataset/ocean-uses-hawaii-proua>



Completed (2015) — Pacific Offshore Time Series Wind Resource Analysis

This study by the U.S. Department of Energy/National Renewable Energy Laboratory (NREL) addressed time-series analysis of wind speed data along the coasts of Washington, Oregon, California, and Hawaii, scaled to BOEM's aliquot grid (a unit of leasing). Average wind speed is provided by month, by hours of the day, and for a long-term (17-year) time series. Data are available through Wind Prospector, NREL's web-based GIS application, which provides easy access to wind resource datasets and supports resource assessment and exploration associated with wind development.

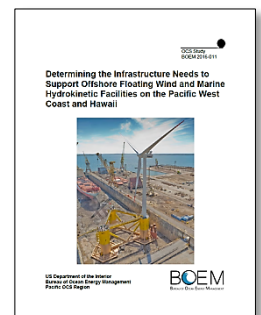
Data: <https://maps.nrel.gov/wind-prospector/>



Completed (2016) — Determining the Infrastructure Needs to Support Offshore Floating Wind and Marine Hydrokinetic Facilities on the Pacific West Coast and Hawaii

This study by ICF International evaluated the current infrastructure and vessel requirements and capabilities existing on the Pacific West Coast of the U.S. and the Hawaiian islands of Oahu, Maui, and Kauai to support the burgeoning offshore renewable energy industry. Understanding the infrastructure needs of the offshore renewable industry will help to identify the port-related requirements for offshore floating wind development and marine hydrokinetic industries and assess the utilization of the available marine equipment and facilities along the U.S. West Coast.

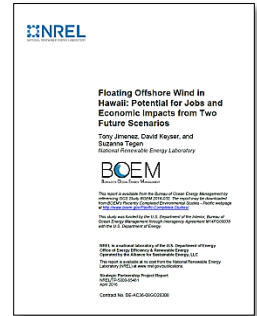
Report (BOEM 2016-011): <https://www.boem.gov/ESPIS/5/5503.pdf>



Completed (2016) — Floating Offshore Wind in Hawaii: Potential for Jobs and Economic Impacts from Two Future Scenarios

This study by the U.S. Department of Energy/National Renewable Energy Laboratory conducted an analysis of the employment and economic potential for floating offshore wind in Hawaii. The study examined two scenarios: 400 MW of offshore wind installed by 2050 and 800 MW of offshore wind installed by 2050. The results of this analysis can be used to better understand the general scales of economic opportunities that could result from offshore wind development.

Report (BOEM 2016-032): <https://www.boem.gov/2016-032/>



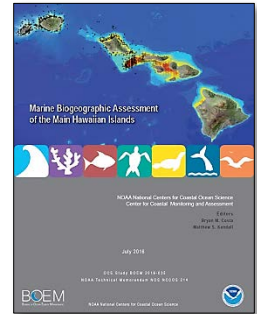
Completed (2016) — Marine Biogeographic Assessment of the Main Hawaiian Islands

This study by the National Oceanic and Atmospheric Administration, working with Hawaiian partners, assembled and synthesized information about physical and biological resources offshore the main Hawaiian Islands, including physical oceanography, bathymetry, marine mammals, seabirds, sea turtles, fish, and corals. The assessment will help to characterize the distribution and abundance of marine resources in state and federal waters, identify knowledge gaps, support spatial planning for development of offshore renewable energy, and contribute to ecosystem-based management of marine resources.

Project Details: <https://coastalscience.noaa.gov/projects/detail?key=163>

Data Products: <https://data.nodc.noaa.gov/cgi-bin/iso?id=gov.noaa.nodc:155189>

Report (BOEM 2016-035): <https://www.boem.gov/ESPIS/5/5555.pdf>



Ongoing (to be completed 2018) — Synopsis of Research Programs that can Provide Baseline and Monitoring Information for Offshore Energy Activities in the Pacific Region

This study by the U.S. Geological Survey is identifying ongoing or completed research programs that have produced databases containing information on species and habitats sensitive to offshore energy activities in the Pacific Region. It is evaluating the capability of these programs to provide baseline and monitoring data to understand and mitigate potential impacts of conventional energy development offshore southern California and renewable energy development offshore southern California, Oregon, Washington, and Hawaii.

Study Profile: <https://www.boem.gov/pr-14-dmi/>

Ongoing (to be completed 2018) — Environmental Sensitivity and Associated Risk to Habitats and Species on the Pacific West Coast and Hawaii with Offshore Floating Wind Technologies

This study by ICF International is identifying and characterizing potential impact-causing factors to the marine environment related to offshore floating wind energy development. The study will develop an environmental sensitivity and relative risk model to assess impacts on biological and habitat resources from offshore floating wind technology.

Study Profile: <https://www.boem.gov/pc-14-05/>

Cultural & Archaeological Studies

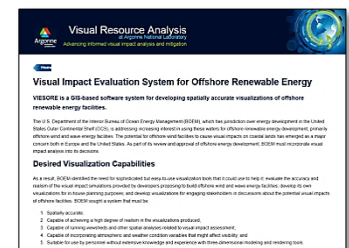
Completed (2014) — Renewable Energy Visual Evaluations

This study by the University of Arkansas and Argonne National Laboratory developed a GIS-based landscape-visualization tool to assess the potential viewshed effects from offshore renewable energy facilities. Visualizations included wind energy structures, lighting, and meteorological conditions.

Journal Article: <http://visualimpact.anl.gov/offshorevitd/docs/OffshoreVITD.pdf>

Overview: <http://visualimpact.anl.gov/viesore/>

Webinar: <https://www.boem.gov/Science-Exchange-5/>



Completed (2017) — Maritime Cultural Resources Site Assessment in the Main Hawaiian Islands

This study assessed maritime cultural resources in Hawaii and was a collaborative effort between BOEM, the National Oceanic and Atmospheric Administration, a Native Hawaiian project facilitator, and an inter-island consultative working group made up of representatives from the main Hawaiian Islands. The study developed an inventory of submerged cultural resources on the Hawaii OCS, an inventory of terrestrial historic properties on the eight main Hawaiian Islands that could be within view of offshore renewable energy sites, and a best-practices tool for characterizing Native Hawaiian cultural landscapes. The overarching goal of this effort was to help facilitate federal decision-making processes in support of offshore renewable energy development.

Study Fact Sheet: <https://www.boem.gov/PC-13-01-Fact-Sheet/>
First Report (BOEM 2017-021): <https://www.boem.gov/BOEM-2017-021/>
Second Report (BOEM 2017-022): <https://www.boem.gov/BOEM-2017-022/>
Third Report (BOEM 2017-023): <https://www.boem.gov/BOEM-2017-023/>

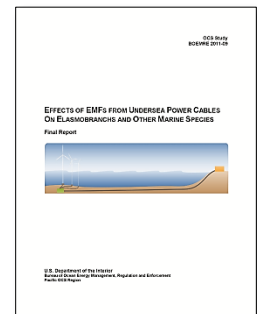


Biological Studies

Completed (2011) — Effects of EMF from Transmission Lines on Elasmobranchs and Other Marine Species

This study by Normandeau Associates synthesized data and information about subsea power-transmission cables and the sensitivity of marine organisms to electromagnetic fields (EMF) produced by the cables. It produced a database of information about potentially affected species of elasmobranchs (sharks and rays), other fishes, marine mammals, sea turtles, and invertebrates. It also recommended future research priorities and potential mitigation measures.

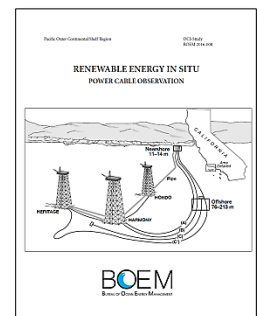
Report (BOEMRE 2011-09): <https://www.boem.gov/ESPIS/4/5115.pdf>



Completed (2016) — Renewable Energy *in situ* Power Cable Observation

This study by the University of California, Santa Barbara measured the strength and variability of electromagnetic fields (EMF) along subsea power transmission cables in the Santa Barbara Channel, which are similar to cables used for offshore renewable energy inter-device electrical connections. It also compared fish communities in cable versus natural habitats and determined the potential effectiveness of cable burial as a mitigation measure to decrease EMF.

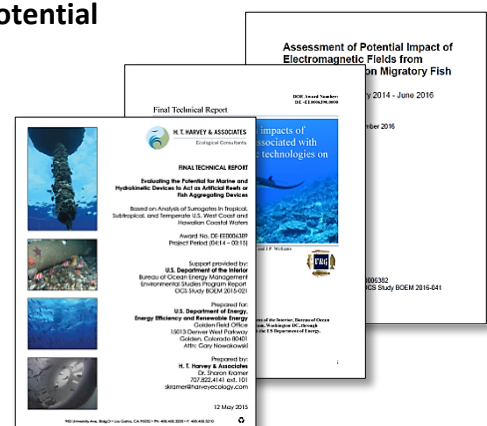
Report (BOEM 2016-008): <https://www.boem.gov/ESPIS/5/5520.pdf>
Webinar: <https://www.boem.gov/Science-Exchange-3/>



Completed (2016) — Using Ongoing Activities as Surrogates to Predict Potential Ecological Impacts from Marine Renewable Energy

BOEM and the U.S. Department of Energy partnered on this study to identify and analyze data from ongoing projects and activities (surrogates) with stressors and receptors similar to those expected from marine renewable energy projects. Two reports examined potential impacts of electromagnetic fields from operating power cables, and one examined mooring configurations of offshore aquaculture facilities and oceanographic buoys as entanglement hazards for marine mammals.

First Report (BOEM 2015-021): <https://www.boem.gov/2015-021/>
Second Report (BOEM 2015-042): <https://www.boem.gov/2015-042/>
Third Report (BOEM 2016-041): <https://www.boem.gov/2016-041/>



Completed (2016) — Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy Projects on Seabirds on the Pacific OCS

This BOEM-directed study, conducted and primarily funded by the U.S. Geological Survey, developed a comprehensive database to evaluate 81 marine bird species in the California Current System (CCS) in terms of their collision and displacement vulnerability from offshore wind energy infrastructure. It used existing and newly analyzed at-sea behavioral information (e.g., avian habits and activities, flight-height, and flight characteristics) and population metrics to identify species-specific vulnerabilities at the population level. The vulnerability assessment results can now be combined with recent marine bird at-sea distribution and abundance data for the CCS to help address seabird conservation during the siting and operation of offshore wind energy development projects.

Report (USGS OFR 2016-1154, BOEM 2016-043): <https://pubs.er.usgs.gov/publication/ofr20161154>

Webinar: <https://www.boem.gov/Science-Exchange-6/>

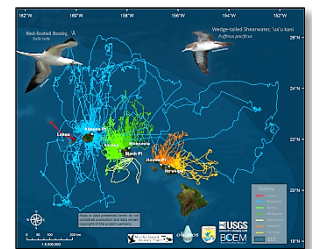


Ongoing (to be completed 2018) — Habitat Affinities and At-sea Ranging Behaviors among Main Hawaiian Island Seabirds

This study by the U.S. Geological Survey conducted field studies of at-sea habitat utilization and ranging behaviors for seabirds breeding within the main Hawaiian Islands. It also compiled and analyzed remotely sensed and modeled habitat data to examine habitat relationships to predict species' distributions and improve spatial vulnerability maps. Results will be used by BOEM to assess potential effects of offshore renewable energy development to main Hawaiian Island seabirds.

Study Profile: <https://www.boem.gov/pc-13-03/>

Project News & Maps: <http://www.werc.usgs.gov/Project.aspx?ProjectID=254>



Ongoing (to be completed 2018) — Visual Simulation of Whales and Renewable Energy Moorings and Cables

This study by the U.S. Department of Energy/Pacific Northwest National Laboratory will compile information about whale movements (e.g., dive depths and swimming speed) and create a three-dimensional video animation of how whales may move through a hypothetical offshore floating wind farm. This visual simulation will help characterize the risk of whale encounters with mooring lines and electrical cables used in offshore floating wind projects.

Study Profile: <https://www.boem.gov/pr-17-whl/>

Ongoing (to be completed 2020) — Pacific Marine Assessment Partnership for Protected Species (PacMAPPS)

This study is a partnership between BOEM, the National Marine Fisheries Service, and the U.S. Navy to conduct shipboard surveys of marine mammals, seabirds, and sea turtles in the Pacific. The data collected will help BOEM evaluate potential effects of proposed energy activities on protected species in an ecosystem-level context, including in areas of interest for renewable energy development (California, Oregon, and Hawaii) and for conventional energy decommissioning (California). Surveys of the Hawaiian Islands were conducted in 2017 and surveys of the California Current Ecosystem (Baja California, California, Oregon, and Washington) are scheduled for 2018.

Study Profile: <https://www.boem.gov/pc-17-04/>

Ongoing (to be completed 2021) — Atlas of Main Hawaiian Island Seabird Colonies

This study by the U.S. Geological Survey is developing a comprehensive up-to-date atlas of Hawaiian seabird colonies. It will be used to evaluate threats to colonies and adjacent high-use offshore waters, provide a reference to measure population trends, and best inform place-based conservation and restoration actions.

Study Profile: <https://www.boem.gov/pc-17-03/>

Physical Oceanography & Geology Studies

***Ongoing (to be completed 2018)* — Predicting the Consequences of Wave Energy Absorption from Marine Renewable Energy Facilities on Nearshore Ecosystems**

This study by the U.S. Geological Survey (USGS) is developing a statistical model that describes how wave energy may structure nearshore communities. Using 30 years of subtidal survey data from USGS, the National Park Service, and others, this study seeks ecosystem connections between nearshore communities and wave energy dynamics. The model will be used to predict nearshore ecosystem perturbations if wave energy conversion cause changes in modeled hydrodynamics.

Study Profile: <https://www.boem.gov/pc-13-05/>

For more information about BOEM-funded environmental studies:

Environmental Studies Program: <https://www.boem.gov/Studies/>

Pacific OCS Region Environmental Studies: <https://www.boem.gov/Pacific-Studies/>

Environmental Studies Program Information System (ESPIS): <https://marinecadastre.gov/espis/#/>

Renewable Energy Research: <https://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Renewable-Energy/Renewable-Energy.aspx>