

## Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Scenarios for Offshore Renewable Energy along the Central California Coast (PC-16-01)
Administered by	Pacific OCS Regional Office
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Procurement Type(s)	Cooperative Agreement
Conducting Organization(s)	California Polytechnic State University, San Luis Obispo
Total BOEM Cost	\$749,999 (includes Environmental Studies Program and Pacific Region funds)
Performance Period	FY 2016–2023
Final Report Due	May 1, 2024
Date Revised	November 1, 2023
Problem	Renewable energy development in California is on the horizon, and BOEM and California need to understand the potential affects from different development scenarios.
Intervention	Offshore wind analysis, power production, potential environmental affects
Comparison	Compare offshore wind modeling to buoy data and power output to other energy sources, both seasonally and temporally.
Outcome	Understanding of potential power outputs from different development scenarios and potential environmental effects
Context	Central California

**BOEM Information Need(s):** Understanding potential renewable energy development scenarios off California will aid BOEM in planning for leasing decisions, site and impact characterization, identification of cooperating agencies, and stakeholder outreach. This study will provide a foundation for the analysis required to prepare for future marine renewable energy development along the central coast of California through: 1) an understanding of the regional need for power generation; 2) delineation of feasible scenarios of offshore wind and wave energy projects for a specific planning area; 3) consideration of compatible activities that may be proposed with an offshore renewable energy project, such as desalination; and 4) the ability to understand, evaluate, predict, and monitor potential adverse impacts from offshore energy.

**Background:** California formally legislated through SB 350 (the Clean Energy and Pollution Reduction Act of 2015) the requirement that 50% of all electricity generated and sold come from renewable energy sources by December 31, 2030. California's ambitious plans for renewable energy and the untapped wind and wave resources off the coast of central California make this an ideal study area. The need for renewable energy sources in California will continue to grow as traditional sources of energy phase out of the power supply equation.

Researchers will determine information needs and evaluate scenarios, tradeoffs, and generating capacity of various facilities as well as information needed to conduct environmental reviews. The central coast of California (Morro Bay area to Point Conception, a span of ~120 km) is an ideal, real-world location for the aforementioned analysis for a number of reasons: 1) low-cost grid interconnection options, 2) strong commercial interest in developing offshore renewable energy facilities, 3) significant wave and wind resources in the region, and 4) offshore bathymetry is well suited for facility deployment.

Objective(s): The study objectives are:

1. To delineate and communicate feasible scenarios of offshore renewable energy facilities with the capacity to hook into existing coastal grid connections. Scenarios should primarily focus on wind energy, but may also include the potential for wave energy, or other offshore hybrid facilities.
2. To identify information and resources needed to evaluate and predict the impacts of potential proposals for offshore energy and/or other hybrid projects (e.g., desalinization). Potentially collect new data as needed to meet information needs for evaluating and predicting impacts.
3. The study may also assess the capacity of using hybrid facilities in the offshore environment [e.g., those facilities able to switch strategically between power generation (during high power demand periods – daytime) and desalination (during low-demand – night) for meeting regional power and freshwater demands].
4. Identify, analyze, and potentially collect information at locations outside the study area to compare with potential projects within the study area. They may include, but are not limited to, site facilities, surrogates (similar impact to a renewable project), and resource-specific (e.g., birds) information.

Methods: An interdisciplinary team will be formed to execute this study. Engineers will evaluate the potential offshore renewable energy technologies, economists will quantify financial costs and benefits of these technologies, and marine ecologists, social scientists, and ecological modelers will determine what information is needed to evaluate the environmental and social suitability and tradeoffs of specific proposals.

To achieve Objectives 1 and 2, engineers, physical oceanographers, and economists will work collaboratively to provide quantitative estimates of the generating capacity of various facilities, the percent capacity under which they may operate given the developable wind and wave fields in federal waters along the central coast, and the costs of implementation and value of the resulting electricity and water.

For Objective 3, marine scientists will collaborate with engineers, oceanographers, and economists to identify information needed to evaluate the ecological and social suitability of specific offshore energy proposals. Key information will include spatial data on the distribution of habitat, biological resources associated with those habitats, spatial information on existing ocean uses, and identification of potential stakeholders and their attitudes and opinions. The work will focus on identifying information needed rather than generating new information, but it will gather relevant existing datasets.

Specific Research Question(s):

1. How does wind off of the Central California Coast vary hourly, daily, and seasonally?

2. What is the best wind model data to utilize for predicting power potential off the Central California Coast?
3. What are potential scenarios off the Central California Coast to maximize power output?
4. What are potential environmental effects from offshore floating wind off the Central California Coast?

Current Status: The BOEM-California Polytechnic State University cooperative agreement was awarded September 13, 2016. Environmental data continue to be analyzed. Investigators analyzed the potential offshore power output, wrote a scenarios report, and submitted it for publication. The PIs are working on their final manuscript and final report for delivery in 2024.

Publications Completed:

Farr H, Ruttenberg B, Walter RK, Wang YH, White C. 2021. Potential environmental effects of deepwater floating offshore wind energy facilities. *Ocean & Coastal Management* 207:105611.

<https://www.sciencedirect.com/science/article/pii/S096456912100096X>

Wang YH, Walter RK, White C, Kehrl MD, Ruttenberg BI. 2021. Scenarios for Offshore Wind Power Production for Central California Call Areas. *Wind Energy*: 2646.

<https://doi.org/10.1002/we.2646>

Wang et al. 2018. Assessment of surface wind datasets for estimating offshore wind energy along the Central California Coast. *Renewable Energy* 133 (2019) 343-353.

Affiliated WWW Sites: None

References: None