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STUDY TITLE: Protocols for Baseline Studies and Monitoring for Ocean Renewable Energy.

REPORT TITLE: West Coast Environmental Protocols Framework: Baseline and Monitoring Studies.

CONTRACT NUMBER: M10PC00092.

SPONSORING OCS REGION: Pacific.

APPLICABLE PLANNING AREA(S): Oregon – Washington, Northern and Southern California.

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KEY WORDS: West Coast; ocean; renewable; energy; wave; tidal; offshore; wind; environmental; baseline; effects; monitoring; study; protocols.

BACKGROUND: In order to effectively manage coastal and offshore renewable energy projects, a significant amount of environmental data needs to be collected in baseline and pre-construction studies, and in operational monitoring. Currently, no standards exist to ensure that data collection methodologies produce scientifically valid and comparable data. Standard protocols and formats for the collection and comparison of data clearly are needed for offshore renewable energy. In order to ensure that these protocols are accepted by both regulatory agencies and developers alike, and to reduce potential conflicts, it is important that these protocols be developed in a fashion that takes into account input from stakeholders.

OBJECTIVES: The overarching goal of this project is to provide a clear, consistent process for regulators and industry to follow when designing environmental baseline and post-installation monitoring studies for wave, tidal and offshore wind projects along the U.S West Coast, thus reducing time and uncertainty associated with project development. The study objectives are to develop and execute a collaborative process to design a suite of protocols for the collection of data in baseline studies and operational monitoring for offshore renewable energy projects. The project involves developing and validating a *Protocols Framework* that: 1) Identifies key environmental issues to guide development and adoption of protocols for collecting baseline and monitoring data for wave, tidal, and offshore wind projects; 2) Is expandable to include protocols for other offshore renewable energy resource technologies, sites, and conditions; and, 3) Is applicable to California Current large marine ecosystem (LME) focus, but also applicable to other LMEs.

DESCRIPTION: The *Protocols Framework* has been developed and evaluated by leading scientists and stakeholders (*i.e.,* regulators, agencies, environmental and non-governmental organizations, ocean users, and industry representatives). This tool is predicated on prioritizing environmental interactions likely to be the focus of ocean energy monitoring; therefore, the project team conduction an integrated analysis of expert science-based opinion, regulatory requirements, and stakeholder importance to identify the high priority issues. The interactions were screened by separate sub teams for wave, offshore wind, and tidal energy, and from three different perspectives—scientific expert opinion, regulatory requirements, and stakeholder opinion—resulting in a total of 1,296 possible integrated rankings. Each interaction was ranked as high, medium, low, or no interaction. The rankings for each perspective were integrated and scored based on a set of objective criteria, as described in the report.

To further validate and demonstrate the application of the *Protocols Framework,* it was applied to case studies of commercial scale wave, tidal and offshore wind energy facilities, based on real and hypothetical projects. The project team evaluated all stressor–receptor interactions and developed a simple set of criteria to select a set of interactions that would provide the most meaningful test and evaluation of the *Protocols Framework* for each technology type. Each case study applied the framework as it is intended for use in the context of an ocean energy project, and generated a table that detailed how the framework was applied, accompanied by a narrative describing the case. Specific information about the technology and site was used to assess the spatial and temporal overlap of the stressors and receptors in order to estimate exposure. Application of scientific and regulatory thresholds allowed for an assessment of the information needs for baseline and effects monitoring. At this point, monitoring protocols to evaluate specific interactions were selected. In some cases, several existing protocols were found that address the information needs; the advantages and disadvantages of the existing protocols were compared to help select the best protocol for a particular situation.

On May 2, 2012, the project team distributed the *Protocols Framework* Draft Report to over 200 key stakeholders for feedback on the utility of the tool and its future adoption. The project team will use the stakeholder feedback to evaluate options for future applications of the tool and to inform the Final Report. The final report was submitted to BOEM on July 23, 2012.

SIGNIFICANT CONCLUSIONS: Of the 144 possible stressor–receptor interactions, the number of integrated priorities ranked medium or high totaled 41 for wave energy, 29 for tidal energy, and 32 for offshore wind energy. The greater number of high-priority interactions for wave energy reflects the diversity of wave energy conversion technologies being developed and the uncertainty associated with the related environmental stressors. Across technologies, the environmental stressor with the largest number of high- and medium-priority rankings was the presence of static devices, reflecting the variety of new interactions that could occur when new structures are introduced in open waters. Moving devices had more interactions for wave and tidal energy, whereas moving devices for offshore wind energy would be likely to interact only with bats and seabirds. Noise, vibration, and electromagnetic fields (EMF) were important across all three of the energy technologies, due largely to the uncertainty of effects associated with these stressors. Across the three energy technologies, the environmental receptors with high-and medium-priority rankings tend to favor groups with special regulatory status, including resident and migratory fishes, seabirds, and marine mammals.

The project team believes, and subject matter exports agree, that while the priority interactions identified include those most likely require monitoring, the relative importance of the issues may change depending on the specific technology and location, the acquisition of new or more accurate data or changes within the regulatory regime. Similarly, the ability of the tool to deliver

specifically applicable protocols or information needs depends on the specificity of the data available about the technology and its characteristics, as well as populations, communities, and habitats at the project site. Given the strong variability in physical and biological conditions, users should expect to fine-tune or adapt a selected protocol to the existing conditions at his/her project site.

STUDY RESULTS: The primary outcome of this project is a *Protocols Framework* that screens ocean renewable energy technologies and environmental site characteristics to identify needed baseline and effects information and applicable monitoring protocols. Design and application of the *Protocols Framework* has demonstrated that it can successfully screen many potential environmental interactions to 1) identify those that require substantial baseline and/or effects monitoring and 2) provide specific protocols to guide the monitoring. Application of the tool involves nine-steps, beginning in Step 1 with describing the technology and the site where it is to be deployed. Steps 2 through 5 focus the defining the scope of environmental interactions. Descriptions of the technology and project site (from Step 1) are used to identify the high priority stressor/receptor interactions (Step 2), describe the spatial and temporal scale of the stressor (Step 3), and define exposure due to overlap of stressor-receptors (Step 4). Step 5 involves applying the scientific and regulatory thresholds to assess the levels or durations of effects. Next, the information needed to establish baseline conditions (Step 6) and measure the effects of a stressor on a receptor (Step 7) is identified. Finally, protocols to collect the baseline (Step 8) and effects (Step 9) information are identified. The case studies verified the proof of concept and demonstrated the utility of the framework for hypothetical and actual projects.

STUDY PRODUCT(S): Pacific Energy Ventures, LLC. 2012. West Coast Environmental Protocols Framework: Baseline and Monitoring Studies. Draft report for the U.S. Department of Interior, Bureau of Ocean Energy Management, Pacific OCS Region, Camarillo, CA. Report No. BOEM 2012 – 2013, 309 pp.

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