

**STUDY TITLE:** Energy Market and Infrastructure Information for Evaluating Alternate Energy Projects for OCS Atlantic and Pacific Regions

**REPORT TITLE:** Energy Market and Infrastructure Information for Evaluating Renewable Energy Projects for OCS Atlantic and Pacific Regions, Volume I: Technical Report and Volume II: Appendices

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**SPONSORING OCS REGION:** Gulf of Mexico

**APPLICABLE PLANNING AREA:** Atlantic and Pacific OCS Regions

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**KEY WORDS:** renewable energy, alternative energy, electricity market, electricity generation, electricity transmission, wind power, wind energy, wave power, wave energy, ocean current energy, ocean current power, ports, transmission lines, substations, state planning, community impacts, socioeconomic impacts.

**BACKGROUND:** On August 8, 2005, the Energy Policy Act of 2005 (§388) amended the Outer Continental Shelf (OCS) Lands Act to grant the Secretary of the U.S. Department of the Interior (Secretary) discretionary authority to issue leases, easements, or rights-of-way (ROW) for previously unauthorized activities that: (i) produce or support production, transportation, or transmission of energy from sources other than oil and gas; or (ii) use, for energy-related or other authorized marine related purposes, facilities currently or previously used for activities authorized under the OCS Lands Act. On March 20, 2006, the Secretary delegated to the Bureau of Ocean Energy Management (BOEM) (formally the Minerals Management Service) the new authority that was conferred by the Energy Policy Act. The BOEM published the final rule for "Renewable Energy and Alternative Uses of Existing Facilities on the OCS" in the Federal Register on April 29, 2009.

The offshore renewable industry is new and rapidly evolving. BOEM issued the first five exploratory leases for placing data collection devices for offshore wind energy projects

on June 23, 2009. This report provides background information on the new industry (electricity generation, transmission, and distribution), examines factors affecting getting the power from the offshore generation site to the onshore electrical grid, describes the technologies that might provide the power, and discusses the infrastructure needed to manufacture, install, and maintain the technologies. Within each discussion, we identify how the offshore renewable energy industry differs from the offshore oil and gas industry.

**OBJECTIVES:** This report has two objectives: 1) to provide an overview or primer of energy markets and 2) to collect and synthesize information to support socioeconomic portions of environmental assessments and other types of BOEM decision documents related to renewable energy (wind, wave, and current) in the Atlantic and Pacific Outer Continental Shelf regions. The electricity market is very different from the petroleum-based industry that BOEM manages under the Outer Continental Shelf Lands Act. The renewable energy projects discussed in this report are the first of their kind to operate in federal waters. These are “frontier” lease areas with no past data on which to base the estimated impacts of future actions.

**DESCRIPTION:** To provide a context for the study, the report begins with a brief summary of the current status of U.S. offshore renewable energy at the federal and state levels, including legislative activity and proposed projects. Because of the rapid developments in this area (such as the first license issued to the Cape Wind project on October 6, 2010), this section should be viewed as a snapshot in time based on information available in 2010. The technologies for harvesting energy from offshore wind, waves, and ocean currents are briefly reviewed.

This report provides an introduction to electricity generation, transmission, and distribution; trends in the electricity market; factors affecting the delivery of power from an offshore generation site to the onshore electrical grid; the regulatory agencies involved; and the role of renewable portfolio standards, incentives, and power purchase agreements in getting proposed projects into commercial operation. It also examines the infrastructure needed for the electricity market, which includes power plants, substations, and transmission lines. Electricity generated in federal waters must transit through state waters and coastal zones in order to reach the onshore electricity grid. Therefore, this report provides a synopsis of factors that might be of concern to each state; this report also describes the areas that each state has identified as suitable for offshore renewable energy projects (if it has done so). The report includes a review of the technologies that might provide the power and infrastructure needed to build and deploy those technologies (i.e., ports, shipbuilding and repair, vessels, submarine electric cable manufacturing). The report examines the potential community impacts through two case studies; a wave park off the Oregon coast and a wind park off the Massachusetts coast.

**SIGNIFICANT CONCLUSIONS:** The study finds that the transmission and integration of offshore renewable energy into the onshore electricity grid is the largest impediment to offshore renewable energy development at this time. The general maritime infrastructure (e.g., ports, shipbuilding and repair, and vessels) required by the offshore

renewable energy industry is already available. The extent to which it will be necessary to manufacture specialized installation vessels (rather than retrofitting existing vessels) will depend on the pace at which the energy farms are put into operation. The effects of renewable energy development on jobs in certain areas will depend on whether a sufficient number of projects become close enough to reality that companies are willing to invest in new manufacturing plants (e.g., turbines, marine electric cable, etc.). If this happens, the number of jobs created to support the entire supply chain could be substantial.

**STUDY RESULTS:** A concise compendium describing the formative state of an emerging industry including: national and state information, a précis of technologies and projects, onshore infrastructure (electrical substations, transmission lines, ports and harbors, vessels, shipbuilding and repair facilities, and submarine electric cable manufacturing), and two illustrative community impact case studies.

**STUDY PRODUCTS:** ERG. 2013. Eastern Research Group, Inc. Energy market and infrastructure information for evaluating renewable energy projects for OCS Atlantic and Pacific Regions. Prepared for the United States Department of the Interior. Bureau of Ocean Energy. Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2013-0113. Volume I: Technical Report. 335 pp.

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GIS files for each coast and state with power plant, substation, and transmission lines as well as east and west coast ports.