Environmental Studies Program: Ongoing Study

Study Area(s): Western, Central, and Eastern Gulf of Mexico

Administered By: Gulf of Mexico OCS Region

Title: Offshore Renewable Energy Feasibility Study Across Technology Types for the U.S. Gulf of Mexico (NSL #GM-17-09)

BOEM Information Need(s) to be Addressed: A variety of renewable energy technologies are available and evolving with possible opportunities for offshore renewable energy activities in U.S. federal waters. BOEM needs to assess the range of these technologies in the context of how they may be applied for the Gulf of Mexico OCS to inform development activities within the Bureau's purview under the Energy Policy Act of 2005 (EPAct). These regulations provide a framework for issuing leases, easements and rights-of-way for OCS activities that support production and transmission of energy from sources other than oil and natural gas. This study will help inform BOEM's strategic long-term plans related to possible OCS alternative-leasing activities in the Gulf of Mexico and will also address renewable energy potential in State waters through coordination with interested Gulf States.

Total BOEM Cost: $300,000 **Period of Performance:** FY 2017–2019

Conducting Organization(s): National Renewable Energy Laboratory

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Description:

Background: A variety of technologies currently exist or are under development for utlizing marine resources to generate renewable energy in offshore waters. During the last 25 years, offshore wind has developed into a major part of the European energy sector, utilizing increased turbine sizes and cutting edge technologies, including floating substructures in deeper waters. In the United States, several commercial offshore wind projects are currently in their planning phases and the first 30 MW pilot scale project will begin transmitting power in late 2016. A host of other marine renewable energy technologies are in various stages of research, development, and testing, including wave, tidal, ocean currents, ocean-based solar, ocean thermal gradients, and deep water source cooling. Offshore wind energy technologies have significantly evolved since a previous study in the Gulf of Mexico: "Assessment of Opportunities for Alternative Uses of Hydrocarbon Infrastructure in the Gulf of Mexico" (OCS Study – BOEMRE 2011-028), and new data show that Gulf States have an abundance of offshore wind resource between 7 m/s and 8 m/s (NREL 2016). Wave power devices extract energy directly from the motion of ocean waves, with a variety of technologies proposed to capture that energy, and some undergoing demonstration testing. Ocean currents also contain an

enormous amount of energy that can potentially be captured and converted to a usable form with submerged water turbines that may be deployed on the OCS in coming years. Recent innovations in offshore renewables also include offshore solar power plants, and the expansion of ocean thermal energy conversion (OTEC) projects.

Objectives: The goal of this study is to provide a comprehensive survey across the various types of offshore renewable energy technologies and to perform an assessment of their technical, economic, and environmental feasibility in the Gulf of Mexico to inform the Bureau's strategic planning.

Methods: This study will be performed through Inter-Agency Agreement with DOE's National Renewable Energy Laboratory (NREL). Available technologies and concepts for generating offshore renewable energy will be reviewed, including assessing current state of the science and potential for future advances. Renewable energy types to be explored in this survey include offshore wind, wave, tidal, ocean currents, ocean-based solar, ocean thermal gradients, and deep water source cooling. Current applications and developments will be considered based on global experience, including in Europe, Asia, other parts of the U.S. and anywhere that offshore renewables projects are in use or under development. In addition to existing technologies, this comprehensive survey will consider new information and evolving renewable energy designs and technology innovations. This inventory of offshore renewable technologies will include identification and quantification of marine resource potential, applicable locations/depths, existing infrastructure needs, environmental impacts, possible grid connection options, availability of local supporting infrastructure, and long-term outlooks for expansion. This inventory will then be considered in direct application to specific considerations for the Gulf of Mexico to determine the most likely avenues for future offshore renewable energy projects in the region. This study will contribute to the creation of an interactive and web-enabled digital atlas for Gulf of Mexico renewable marine energy resources, including a geo-referenced database such as for wind data, tidal and current, wave climate, and more. Recommendations for priority research needs related to assessing renewable energy potential will also be identified which could help inform feasibility of different technologies in the Gulf moving forward.

Coordination will actively occur with interested Gulf States and educational materials materials produced to share the results of this study. Specific possible outputs include:

- Breakdown of resource capacity and energy potential by technology type
- Geo-spatial assessments of where technologies may be feasible by technology
- Present cost of energy estimates using existing models by technology type
- General assessments of technology readiness and time phasing
- General assessment of the advantages of Gulf infrastructure, opportunities to leverage existing supply chains, and future job creation potential

General assessment of levelized avoided cost comparisons and local challenges for grid integration

Current Status: The Inter-Agency Agreement was signed in April, 2017. A Post-Award Meeting was held via webinar on May 5, 2017 with presentations by NREL PIs and participation from interested federal, state, local, and coordinating entities.

Final Report Due: April 1, 2019

Publications Completed: -

Affiliated WWW Sites: -

Revised Date: June 30, 2017