

Beneficial Impacts from Offshore Renewable Energy Development

Effect of the Horns Rev 1 Offshore Wind Farm on Fish Communities Follow-up Seven Years after Construction



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Ecological and economic cost-benefit analysis of offshore wind energy

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ABSTRACT

Wind energy has experienced dramatic growth over the past decade. A small fraction occurred offshore, but as the best wind resources become developed onshore, there is an increasing focus on the development of offshore winds. Like any form of power production, offshore wind has both positive and negative impacts. The potential negative impacts have stimulated a great deal of research to the first offshore wind power proposals in the U.S. and have delayed the development of offshore wind farm in the U.S. Here we discuss the costs and benefits of offshore wind energy and compare these to estimates for onshore wind and conventional electricity production. We review cost estimates for offshore wind based on publicly reported projects from 2000 to 2008 and compare these to estimates for onshore wind and conventional power. We develop functions for offshore wind based on publicly reported projects from 2000 to 2008 and compare these to estimates for onshore wind and conventional power. We discuss the limitations of the analysis. We use this analysis to inform a discussion of the costs and benefits of conventional, onshore and offshore wind energy usage.

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1. Introduction

Over the past 10 years, the onshore wind industry in the U.S. has grown dramatically and as a result developers, citizens and the U.S. wind industry have been active in the development of an offshore wind industry. Several companies have developed plans for offshore wind projects and the U.S. Mineral Management Service (MMS) is in the process of reviewing these applications and making recommendations to the industry while the state of Texas has approved plans for at least one and possibly several additional offshore wind farms. Lawmakers, government agencies, corporations, non-governmental organizations and private individuals are debating whether or not to support or participate in the development of an offshore wind industry, and the relative level of support and encouragement to give this new industry. In making these decisions, it is important to balance the economic costs and benefits of the wind energy's most realistic competitors. The decision is made more difficult by the fact that onshore and global environmental costs of wind energy competes with both onshore wind energy and conventional fossil-fueled electricity. Onshore wind power and natural gas fired power are the two fastest growing segments of the electricity market. Coal power is the largest current producer of electricity in the U.S. Offshore wind will thus displace either coal, natural gas or onshore wind.

Given the uncertainties associated with global climate change, it is difficult to compare the societal costs and benefits of fossil-fueled energy. However, one way to develop a comparison of these costs would be to include the value of carbon offsets in the costs of conventional power. This assumes that the costs of carbon emission credits are equal to their ecological value which would occur if carbon offsets represent a reduction of the specified amount of carbon from the atmosphere. It is perhaps less difficult to compare the costs of offshore wind energy since they both have similar societal costs. In this case, one could simply compare the ecological costs of onshore and offshore wind. There are several reasons why developers or lawmakers might prefer offshore wind power over fossil-fueled power. Offshore wind power could be less expensive than its competitors, either at a local or national scale, it could be less expensive than its competitors, or it could have less severe social and environmental impacts than its competitors. In this paper, we seek to address the question, "Is offshore wind power preferred over investments in fossil-fueled power?" We focus primarily on coal-fired power as a representative of fossil-fueled power since it is the largest source of electricity in the U.S. and it is both the most expensive and a major source of greenhouse gases.

Information Needs

- BOEM needs to evaluate environmental effects – both detrimental and beneficial – of renewable energy activities on the Outer Continental Shelf (OCS).
- Extensive reviews have focused on the detriments of development; we need to investigate and quantify the range of positive environmental effects to provide balanced support to decision-making.

Background

- National Environmental Policy Act (NEPA) analyses should consider beneficial effects (40 CFR 1508.8) of activities that “encourage productive and enjoyable harmony between man and his environment; [and] promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man...”
- To that end, BOEM should identify those activities which will promote a healthier environment as well as identify those that may do harm.

Objectives

- Provide a synthesis of beneficial effects of offshore wind energy development for incorporation in NEPA analyses

*A 200 megawatt project would create \$1.3 billion in economic activity over a five year period, generating \$5.6 million in state tax revenue. Maryland stands to gain **\$17 million in annual public health benefits** as a result of reduced fossil fuel use for electricity production.
--National Academy of Sciences.*

*The... projects planned as part of The Crown Estate's Round 3 development could provide up to **70,000 jobs** over the coming years. --renewableuk.com*

Methods

- Synthesize and evaluate the potential beneficial effects to the environment from offshore wind development along the Atlantic OCS. It may:
 - Include onshore and European development;
 - Draw from existing evaluations of various forms of energy production including coal-fired and nuclear power plants and evaluate these avoided consequences; and
 - Quantify potential health benefits and other societal gains.

Additional Information

- Dr. Lorrie Rea's October 3, 2012 letter to Director Beaudreau outlined the committee's recommendation to investigate and quantify the range of positive environmental impacts of offshore renewable energy.
- Director Beaudreau's April 22, 2013 response pledged to consider including additional studies, such as this one in order to develop objective information and support informed decisionmaking.



Questions and Discussion