Marine Policy 57 (2015) 9–17

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Deep waters: Lessons from community meetings about offshore wind resource development in the U.S.

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ARTICLE INFO

Article history:
Received 27 January 2015
Received in revised form
3 March 2015
Accepted 3 March 2015
Available online

Keywords:
Sustainability science
Common-pool resources
Environmental communication
Social science
Citizen-engaged
Gulf of Maine

ABSTRACT

Meeting the United States' offshore renewable-energy goals for 2030 necessitates deploying approximately 9000 wind turbines along U.S. coastlines. Because siting bottom-mounted turbines in most nearshore coastal zones is either impractical or politically difficult, turbine developers are testing floating-platform turbine technologies for deeper waters. Deepwater, floating-platform turbines have the advantages of being sited in the highest quality winds farther offshore, movable if desired, and located beyond the horizon, out of sight from shore. This paper reports on conversations with 103 coastal stakeholders at community meetings regarding development and testing of floating turbines off the coast of Maine, U.S.A. Using naturalistic field methods, this essay reports common questions and concerns of commercial lobstermen, fishermen, and coastal civic leaders. Early-stage conversations suggest that once coastal community members understand the benefits and impacts of wind farm development on their quality of life, many share specific preferences for where offshore developments could be located. Citizens' remarks are sophisticated, nuanced, and innovative and include robust ideas for pairing turbine siting with fishery conservation. Findings imply that when looking to site offshore turbines in public, multiple-use ocean spaces, developers, planners, and coastal communities should engage early and often in two-way conversation rather than one-way outreach.

1. Introduction

Coastal energy infrastructure in the United States is facing formative change. To move the U.S. economy toward domestic and clean energy sources and to mitigate climate change, President Obama's Comprehensive Energy Plan[1] on the U.S. Outer Continental Shelf (February, 2009) seeks to support the establishment of an offshore wind energy industry [14,15,18]. Reaching the goal set by the U.S. Department of Energy and Interior of 54 GW of wind energy by 2030 will require the construction, deployment, and maintenance of nearly 9000 wind turbines in the oceans and Great Lakes with 6 MW turbine technology [14]. Siting thousands of turbines requires that developers, government offices and agencies, resource-dependent communities, and coastal publics work together to locate these technologies in public waters and submerged lands. Typically, these waters function as coastal and marine common-pool resource zones accessed by many types of users and user groups.

Commercially owned wind turbines are granted long-term commercial leases on submerged public lands managed by state and federal agencies. With higher quality wind resources farther offshore (Fig. 1), turbines are likely to be located disproportionately in federal waters within the Exclusive Economic Zone (EEZ), which extends beyond 5.6 km, or 3 nautical miles (nmi), from state shores (except in Texas, Western Florida, and Puerto Rico where the EEZ begins 16.7 km, or 9 nmi, from shore). Locating turbines in federal waters invokes the newly re-organized (ca. 2011) Bureau of Ocean Energy Management—formerly the Bureau of Ocean Energy Management, Regulation, and Enforcement formerly the Minerals Management Service—to coordinate federal regulatory agencies' policies via interagency consultations for determining environmental impacts and make long-term lease decisions [5,15]. As for all federal lands, development in U.S. submerged lands requires that social and environmental impacts are examined according to the National Environmental Policy Act (NEPA). This process includes avenues for public participation.

In the President's Climate Action Plan (June, 2013), President Obama committed to accelerating clean-energy permitting by increasing renewable energy development on these public lands. However, siting wind-farm developments involves satisfying large numbers of stakeholders: 123 million people live (39% of the nation's population) in coastal counties (U.S. Census Bureau, 2011; NOAA,

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[1] Authorized by the Energy Policy Act of 2005; Obama Administration's Goals for Offshore Renewable Energy is 10 GW in outer continental shelf and great lakes by 2020.

http://dx.doi.org/10.1016/j.marpol.2015.03.004
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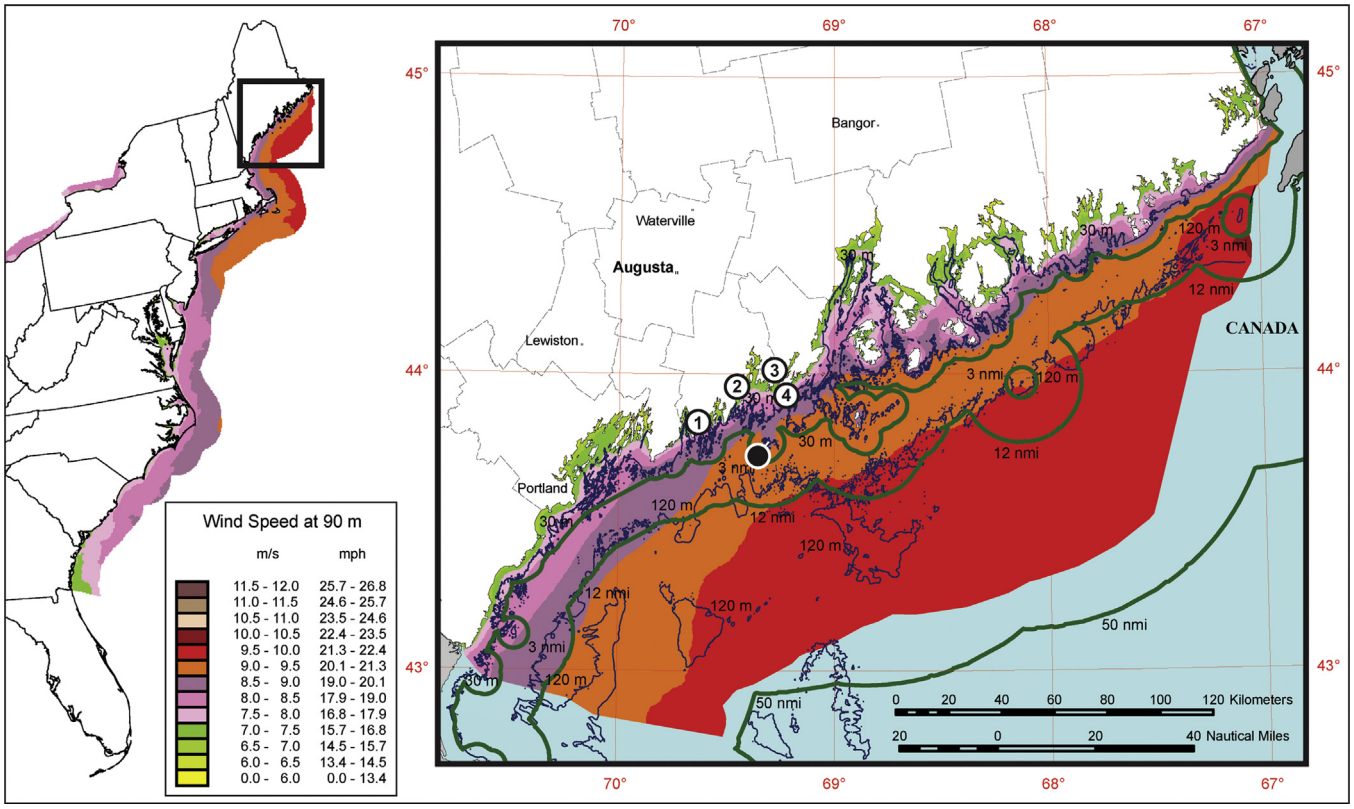

Fig. 1. Maps of annual average offshore wind speed at 90 m for the U.S. Eastern Seaboard and Maine (detail). Bold green contour lines show distance from shore in nautical miles (nmi); fine blue contours show water depth in meters (m). Black dot with white outline shows location of the University of Maine's Deepwater Offshore Floating Turbine original test site, near Monhegan Island. Circled numbers show locations of the coastal community meetings reported here: (1) Boothbay Harbor; (2) Bristol; (3) Friendship; (4) Port Clyde. Annual wind speed estimates were produced by AWS Truepower's MesoMap system and historical weather data. Maps courtesy of the U.S. Department of Energy WINDExchange program and the National Renewable Energy Laboratory (http://apps2.eere.energy.gov/wind/windexchange/windmaps/offshore.asp). (For interpretation of references to color in this figure legend, the reader is referred to the web version of this article.)

2012) and 13.6 million people (8% increase) are expected to move to a U.S. coastal county by 2020 [76,56]. Investing in research toward developing alternative turbine platform technologies can better align the interests of coastal communities to maintain their quality of place —especially in destination locales dependent upon tourism—with achieving federal goals of renewable energy capacity. In this shifting context of new national energy priorities, expedited permitting, existing federal regulatory policies, and the updated jurisdiction of a newly re-organized federal agency, how citizens are engaged in siting decisions for energy infrastructure that will affect lasting alterations to coastal and marine geography is a fundamental open question.

Collated from comments voiced at a series of public outreach meetings, this paper reports coastal community reactions to proposed testing and development of the first deepwater offshore wind turbine deployed in the U.S. for onshore power [53]. The University of Maine Sea Grant initiated the meetings to discuss the temporary installation of a single deepwater offshore floating research turbine in state waters. In 2011, researchers from the Advanced Structures and Composites Center, part of the University of Maine's College of Engineering, visited four coastal communities near the deployment site (Fig. 1) to discuss the research project over the course of eight meetings (two per community). The project is unique for two reasons: first, it constitutes the first offshore wind turbine deployed within U.S. waters to bring power to shore; second, it centers on prototype technology for a floating turbine platform that would enable turbine deployment farther offshore and in deeper waters (cf. [4]). (The research turbine entered the water in June, 2013 [53].) We present these local stakeholder reactions to an offshore wind pilot project as exemplars and as a guide for future projects and public conversations regarding commercial turbine siting conversations, both in the Gulf of Maine and elsewhere.

2. Offshore wind development and local public support

2.1. Lessons from precedents

Globally there are approximately 5.3 GW of installed offshore wind capacity; Europe accounts for 4.993 GW total wind installed capacity at the end of 2012 [55,16,64]. Industry trends include larger turbine sizes, increased distances to shore, and water depths [34,55]. At present there are no commercial-scale wind farms in operation in U.S. waters [57]. However, there are 11 projects in advanced stages of development (Table 1), having conducted baseline or geophysical studies, been awarded a lease, or obtained a power purchase agreement ([55]: xiii).

It is important not to gloss the negative aspects of offshore wind farm development. In addition to the visual disamenities of offshore wind, turbines are disruptive via noise and light, and permanently alter landscapes [25,40,42,46,54,70,75]. People want wind turbines out of sight, just as they do coal-fired power plants, natural gas plants, and waste incinerators. When wind farm developers anticipate public pushback to a proposed project, what seems to matter most is where the turbines will be located. Moving these technologies offshore, where fewer persons can see them, is typically offered as one solution to public opposition to turbines. Deepwater floating platform turbines capitalize on two key natural resources. First, there are much higher wind speeds wind farther out at sea (Fig. 1). Second,