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Human Dimensions Research on Marine Hydrokinetic Energy Development in Maine

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ABSTRACT

Marine hydrokinetic (MHK) energy offers a promising new source of renewable ocean energy. However, regulatory uncertainty and social acceptance may constrain industry development. Our human dimensions research aims to understand the regulatory and permitting process for MHK development and the factors influencing community acceptability. Research has focused on Ocean Renewable Power Company's (ORPC's) Cobscook Bay Tidal Energy Project (CBTEP), the first functioning commercial MHK project in the U.S. Using observations, interviews, and focus groups we identified salient stakeholders and examined community perspectives of the CBTEP. We found an emphasis on direct benefits, indirect benefits, "hopeful" benefits, and potential costs associated with the project. Community stakeholders and fishermen generally perceived ORPC's approach as effective; they noted the company's accessibility and their efforts to engage them early and often. Analysis of a community mail survey administered in two Cobscook Bay communities will be used to support or add to these qualitative findings. Through observations and interviews with regulators and developers we identified institutional factors important for supporting regulatory and permitting decisions including a commitment to interagency coordination, "learning by doing," and an emphasis on early proactive engagement with developers. We also identified institutional challenges that may hamper MHK development. These included knowledge gaps and uncertainties, conflicting agency cultures, and high financial costs and long timeframes associated with baseline data collection. Lessons learned from this study can assist regulators, policymakers, and developers move new renewable ocean energy development forward in a way that is socially acceptable and environmentally responsible.

INTRODUCTION

Development of renewable ocean energy is a complex process that affects or is affected by numerous individuals, groups, and organizations. Understanding who the stakeholders are and how they are (or may be) affected is necessary to assess and enhance social acceptability of renewable energy. As a concept, social acceptance considers constraints beyond public opinion to include political and regulatory dimensions [1, 2]. While public acceptability is widely recognized as a potentially significant barrier to renewable energy development [3], regulatory uncertainty is also identified as a significant obstacle to widespread commercialization of ocean energy [4, 5] and a barrier to development of new wave and tidal technologies in the U.S. [6]. This suggests that the engagement and support of both community and policy stakeholders is necessary to move ocean renewable energy forward in a way that is socially acceptable and environmentally responsible.

Our human dimensions research focuses on community and policy aspects of MHK development in the U.S., and specifically Maine. Objectives are to: 1) identify and characterize key stakeholders associated with MHK development, 2) examine community perceptions of tidal power, and 3) document the process for permitting and regulating MHK devices. To date, research has focused on Ocean Renewable Power Company's (ORPC's) Cobscook Bay Tidal Energy Project (CBTEP) located off the coast of Eastport and Lubec in Maine, USA. In 2012, ORPC received a pilot project license for the CBTEP and installed the first functioning commercial MHK project in the U.S.

METHODOLOGY

Community and stakeholder engagement research

To identify community stakeholders and their perceptions of tidal energy development, we conducted 38 interviews with fishermen, local business owners, municipal leaders, teachers, and tribal representatives. We held three focus groups with fishermen and community members in the Cobscook Bay communities of Eastport and Lubec, and implemented a public opinion mail survey. The

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survey was administered in multiple mailings [7] to a random sample of property owners in Eastport and Lubec (n = 1,345).

Policy research To better understand the regulatory and permitting process for MHK development in the U.S., we conducted 15 semi-structured interviews with federal and state regulators and industry developers. In addition, we conducted numerous informal interviews and discussions with key industry and agency stakeholders, reviewed relevant documents, observed public meetings and agency-developer consultations, and attended technical conferences.

Data analysis Interview transcripts, public meeting transcripts, and field notes were entered into a QSR-NVivo 10 database for coding and qualitative analysis. For qualitative analysis, we used a modified grounded theory approach [8,9] that focused on identifying emerging themes, patterns, and relationships in the data. Survey data are being analyzed using SPSSv22.

OBSERVATIONS

Community and stakeholder engagement research Key stakeholders identified include fishermen, community members, tribes, regulators, developers, and scientists. Stakeholder characterization was facilitated using an existing framework [10] that characterizes salient stakeholders using attributes of power, urgency, and legitimacy [11]. Fishermen and regulators are definitive stakeholders, with legitimacy, power, and urgency in the process. Tribes are considered dominant stakeholders; they have legitimacy and power, but their interests are, at this time, not viewed as urgent. Scientists are considered to have urgency and power. The developers viewed their stakeholder engagement strategy as open and transparent. Community stakeholders, regulators, and fishermen generally perceived the developer's approach as effective; they noted the company's accessibility and their efforts to engage them early and often.

Qualitative analysis of interview transcripts, meeting transcripts, and field notes identified major themes in the ways fishermen and other community members expressed their views on tidal power and the CBTEP (Table 1). These themes served as constructs for the community mail survey (Table 2). The survey also explored perceptions of tidal power research and trusted sources of information and collected socioeconomic and demographic information. Results of the mail survey will be used to examine the broad applicability of our qualitative findings and to draw additional conclusions about community perceptions and stakeholder engagement.

Table 1. Community perceptions of tidal power

Qualitative Theme	Exemplary Quotation
Direct benefits	"It's provided work in a time where this area needs work"
Indirect benefits	"A restaurant that normally closes in the winter, but that stayed open and prospered all winter, that's the spinoff"
Hopeful benefits	"It'd be nice if I had cheaper electricity."
Potential costs	"What I am afraid of is losing bottom [for fishing]."
Perceptions of developer	There is a "great deal of public outreach by developers"

Table 2. Creating survey questions from qualitative data

Qualitative Theme	Survey Item
Direct benefits	I think ORPC's project will increase local employment
Indirect benefits	Local businesses benefit economically from ORPC's project
Hopeful benefits	I think ORPC's project will reduce my winter heating costs
Potential costs	I think ORPC's project will limit commercial fishing areas
Perceptions of developer	ORPC has kept the community well informed of their plans

Policy research The regulatory and permitting process for tidal energy development in the U.S. mandates involvement by an array of federal and state agencies. Major laws structure the decision-making process and power and authority shift depending on the project and unique characteristics of the site. Regulators emphasized interagency coordination and early proactive engagement with developers. There was general recognition that agencies should work together and with developers to streamline the permitting process. Regulatory change at the federal and state level was a noted outcome of coordination and "learning by doing." A "learning by doing" approach was based on the assumption that because MHK devices are a new technology, regulators do not really know what the impacts are or what protective measures should be prescribed until the technology is deployed and monitored. Four key challenges to the MHK permitting and regulatory process emerged from our research: 1) significant knowledge gaps and uncertainties related to environmental impacts, 2)

long timeframes and high costs of baseline data collection and monitoring of devices, 3) timing of agency involvement and the need for more proactive engagement, and 4) tensions between the new MHK pilot licensing process and an agency's traditional standard procedures [12].

CONCLUSIONS

Numerous and diverse stakeholders affect or are affected by the process of tidal energy development in the U.S. Our human dimensions research contributes to a better understanding of who is affected, how they are affected, and how they are engaged in the process of tidal energy development. Outcomes of our research represent a critical first step towards informing the design of more effective stakeholder engagement processes in Maine and beyond. Importantly, there is significant uncertainty regarding the potential environmental and socio-economic costs and benefits of emergent MHK technologies. Our research identifies "learning by doing" as a viable and adaptive approach to move tidal energy forward in an efficient and responsible manner despite limited information. Given the nascent nature of MHK development, it will be important to track changes in stakeholder salience, community acceptability, and the regulatory and permitting process as new information emerges. Our approach offers a research framework for understanding stakeholder engagement, social acceptability, and regulatory uncertainty that can be applied in other renewable energy contexts.

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