BOEM Bureau of Ocean Energy Management

Tidal Flow Characteristics and Associated Biological Use of Cook Inlet

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Dr. Heather Crowley | Alaska Regional Office

BOEM Information Need

- Information is needed to understand renewable tidal energy potential within the Cook Inlet OCS to
  - inform decisions for planning for potential tidal renewable as well as conventional energy development,
  - facilitate appropriate engineering design.
- Information from the study could
  - inform a future Request for Interest,
  - aid in site selection,
  - inform NEPA assessments and help guide mitigation of biological impacts from tidal energy technologies.

PICOC Summary

Problem	BOEM needs an improved understanding of the potential renewable tidal energy areas within the Cook Inlet OCS to inform planning decisions for potential tidal renewable and conventional energy development, facilitate engineering design, and provide baseline information about biophysical interactions to support environmental analyses.
Intervention	This study will synthesize and make existing information accessible, identify information needs, and sample up to four identified tidal renewable energy sites in the Cook Inlet OCS and State of Alaska waters.
Comparison	The study would assess the potential for tidal renewable energy and resource use in the Cook Inlet OCS compared to existing historical and modeled information.
Outcome	This study would characterize tidal flow, tidal energy, biological use and productivity, and design parameters at up to four areas in Cook Inlet to identify potential renewable energy sites, potential impacts, and design parameters.
Context	Cook Inlet Planning Area and adjacent State of Alaska waters in upper Cook Inlet

Background

- Cook Inlet has the highest tidal renewable energy potential in the United States and has a theoretical resource of 160 terawatt hours per year (TWh/yr).
- Semidiurnal tidal currents in Cook Inlet create strong frontal convergence zones with current velocities exceeding 8 knots. These tidally induced rips could produce tidal energy, but they also serve as migratory pathways for salmon returning to their spawning streams, forage sites for sea birds, and areas for diverse fish catch by fishers.
- U.S. Department of Energy laboratories have recently been investigating the renewable energy potential of Cook Inlet, Alaska, though further work is needed.
- BOEM initiated the *Feasibility Study for Renewable Energy Technologies in Alaska Offshore Waters* (AK-21-x07) in 2021 to identify areas of high potential for developing renewable energy across Alaska, which will help to inform selection of study sites for this project focused on Cook Inlet.

Study Objectives

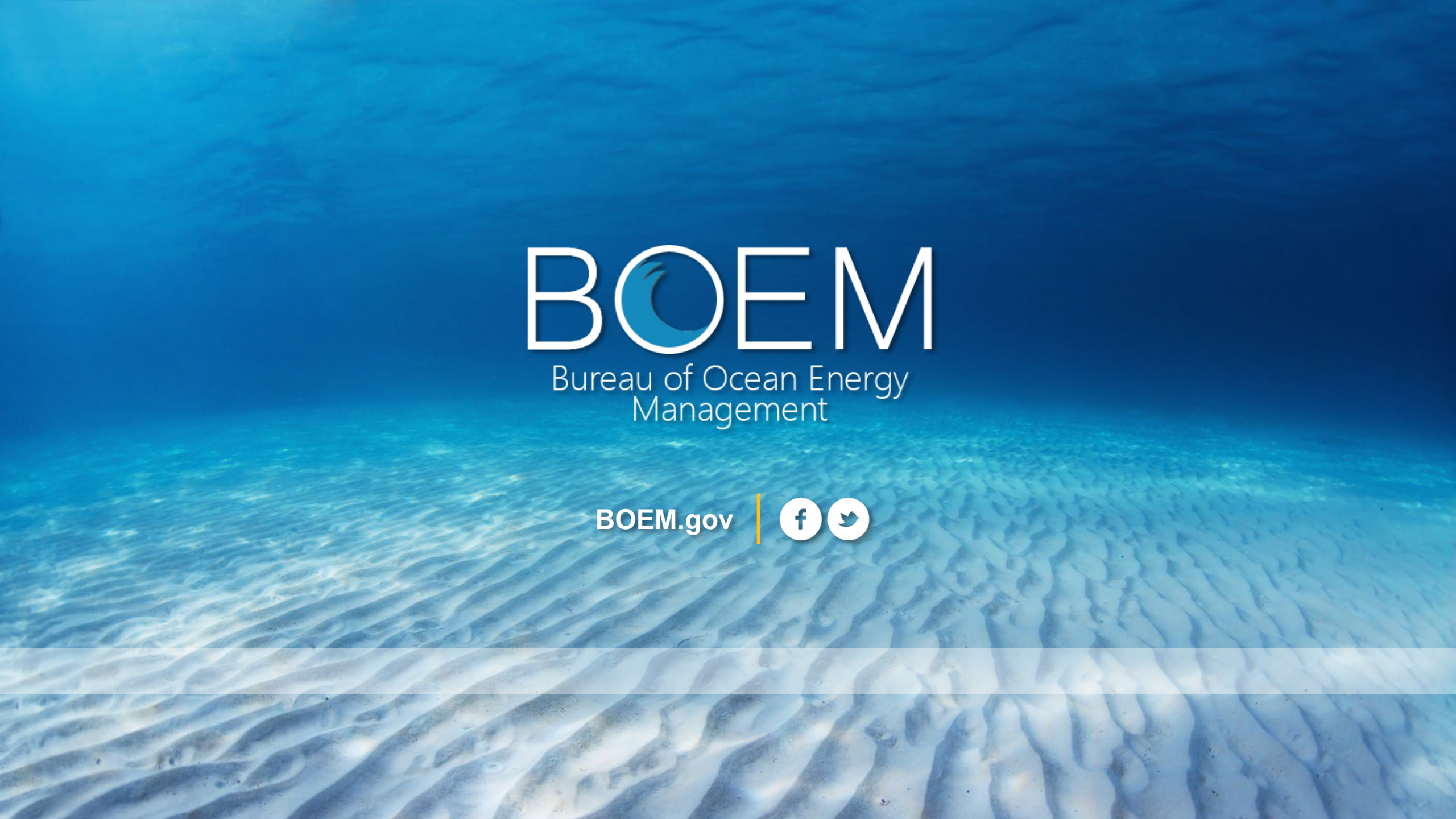
- Collate and synthesize available data on the physical qualities and quantities of the tidal energy and flow in Cook Inlet, Alaska, as well as the biological use and productivity of tidal renewable energy areas of interest, including the nearby current rips.
- Collect detailed physical oceanography data necessary to characterize the tidal flow, energy, and design criteria parameters throughout the water column at designated sites in Cook Inlet, Alaska.
- Evaluate design parameters for large-scale hydrokinetic energy potential specific to Cook Inlet, Alaska.
- Inform modeling refinements of Cook Inlet tidal energy to validate large-scale renewable energy potential.

Methods

- Researchers will identify and gather existing, relevant, and readily available physical oceanographic and biological datasets and information for up to four potential tidal renewable energy site locations.
- The datasets will be organized into a common framework for review, synthesis, and identification of specific information needs to guide development of field plans and inform modeling needs, following the approach used by Kilcher *et al*. (2016).
- Researchers will conduct a field campaign to collect measurements needed to characterize tidal flow, tidal energy, design parameters, and biological resource use and productivity of up to four tidal renewable energy sites.

Research Questions

- What are the tidal flow, energy dynamics, and biological observations throughout the water column?
- What is the biological use or productivity of the selected sites and of current rips in the proximity?
- What are the design parameters for large-scale renewable energy components and structure?
- How can current models be enhanced to characterize renewable tidal energy?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