Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Tidal Flow Characteristics and Associated Biological Use of Cook Inlet (AK-23-01)
Administered by	Alaska Regional Office
BOEM Contact(s)	TBD
Procurement Type(s)	TBD
Conducting Organization(s)	TBD
Total BOEM Cost	TBD
Performance Period	FY 2023–2025
Final Report Due	TBD
Date Revised	February 22, 2023
Problem	BOEM would benefit from an improved understanding of potential tidal renewable energy areas within the Cook Inlet Outer Continental Shelf (OCS). This information would be used to inform future planning decisions for regarding renewable and conventional energy development, facilitate engineering design, and provide information regarding biophysical interactions that would be used to support environmental analyses.
Intervention	This study will synthesize and make existing information more readily accessible, identify additional 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 contemporary biological resource use in the Cook Inlet OCS based on existing historical and modeled information.
Outcome	This study would characterize tidal flow, tidal energy, and biological use and productivity at up to four areas in Cook Inlet to identify potential renewable energy sites, potential impacts, and inform design parameters for potential future installations.
Context	Cook Inlet Planning Area and adjacent State of Alaska waters in Cook Inlet

BOEM Information Need(s): Information is needed to understand tidal renewable energy potential within the Cook Inlet OCS to inform decisions for planning, support environmental analyses for potential tidal renewable and conventional energy development, and facilitate appropriate engineering design. Information from the study would inform a potential future Request for Interest, aid in site selection, and provide information about biological vulnerabilities to tidal energy technologies to inform impact analyses and help guide mitigation during the National Environmental Policy Act (NEPA) process.

Background: There is growing interest from utilities in potential tidal renewable energy development in Cook Inlet (NREL 2021a). Tidal renewable energy systems are designed to extract the kinetic or potential

energy flow and convert it into electricity. 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) (Kilcher *et al.* 2021). Semidiurnal tidal currents in Cook Inlet create strong frontal convergence zones known as rips (Haley 2000). Current velocities within the rips exceed 8 knots (Nelson and Whitney 1996). 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 (Moulton 1996; Okkonen 2005). Little information has been published to-date regarding the characterization of tidal current energy in Cook Inlet. However, U.S. Department of Energy laboratories have recently been investigating the renewable energy potential of Cook Inlet, Alaska, though further work is needed (Branch *et al.* 2021; NREL 2021b). In 2021, BOEM initiated the *Feasibility Study for Renewable Energy Technologies in Alaska Offshore Waters* (AK-21-x07). The goal of that effort is 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.

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 the large-scale hydrokinetic energy potential specific to Cook Inlet, Alaska to help guide design of potential future installations.
- Inform refinements of Cook Inlet tidal energy models 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 following the approach outlined by Kilcher *et al*. (2016) to facilitate in-depth analysis and identification of additional information needs. Researchers will conduct a field campaign to collect measurements needed to characterize tidal flow, tidal energy, and biological resource use and productivity of up to four tidal renewable energy sites.

Specific Research Question(s):

1. What information is available regarding the tidal flow, energy dynamics, and biological observations throughout the water column?
2. What is the biological use and productivity of the selected sites and of current rips in the proximity?
3. What are the design parameters for large-scale renewable energy components and structure?

Current Status: Planned new start

Publications Completed: N/A

Affiliated WWW Sites: http://www.boem.gov/akstudies/

References:

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