

## Environmental Studies Program: Studies Development Plan | FY 2023–2024

Title	Tidal Flow Characteristics and Associated Biological Use of Cook Inlet (AK-23-01)
Administered by	Alaska Regional Office
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Procurement Type(s)	Inter-agency Agreement
Conducting Organization(s)	Department of Energy
Total BOEM Cost	TBD
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Final Report Due	TBD
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PICOC Summary	-
<i><u>Problem</u></i>	BOEM needs an improved understanding of the potential renewable tidal energy areas within the Cook Inlet Outer Continental Shelf (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.
<i><u>Intervention</u></i>	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.
<i><u>Comparison</u></i>	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.
<i><u>Outcome</u></i>	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.
<i><u>Context</u></i>	Cook Inlet Planning Area and adjacent State of Alaska waters in upper Cook Inlet

**BOEM Information Need(s):** Information is needed to understand renewable tidal energy potential within the Cook Inlet OCS to inform decisions for planning, support environmental analyses for potential tidal renewable as well as conventional energy development, and facilitate appropriate engineering design. Information from the study could inform a future Request for Interest, aid in site selection, and provide information about biological vulnerabilities to tidal energy technologies to 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. 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 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). Very 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 2021). In addition, BOEM initiated the *Feasibility Study for Renewable Energy Technologies in Alaska Offshore Waters* (AK-21-x07) in 2021. 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 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 outlined 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.

**Specific Research Question(s):**

1. What are the tidal flow, energy dynamics, and biological observations throughout the water column?
2. What is the biological use or 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?
4. How can current models be enhanced to characterize renewable tidal energy?

**Current Status:** N/A

**Publications Completed:** N/A

**Affiliated WWW Sites:** N/A

## References:

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