

Request for Information 712764

Tidal Current Turbine for Coastal Microgrid Integration

Purpose

Pacific Northwest National Laboratory (PNNL) is requesting information from developers, owners, and/or manufacturers of tidal or river current energy turbines (CETs) capable of deployment and operation in the tidal channel adjacent to PNNL-Sequim’s Marine and Coastal Research Laboratory (MCRL). The information gained from this request for information (RFI) may inform the specification and eventual procurement of a CET, should PNNL decide to proceed with a procurement. The primary purpose for the CET would be to provide electricity via subsea cable to a microgrid on site as part of a potential demonstration project sponsored by the Washington State Department of Commerce. Responses to this RFI do not bind PNNL or any other party to any further action(s).

Background

PNNL operates the Department of Energy’s (DOE) only dedicated marine laboratory at the PNNL-Sequim campus. PNNL is leading research in the blue economy and marine energy applications and building collaboration between DOE and multiple partners in the state of Washington and beyond. With Washington State support, the Integrated Renewable Energy System (IRES) demonstration testbed will advance research by developing and testing renewable energy production, management, and use for multiple marine applications (e.g., ocean observations, underwater vehicles, aquaculture). It will also advance energy resiliency for coastal communities by developing an integrated renewable energy test platform that will model how multiple renewable energy resources could power shoreline businesses or communities (Figure 1). The test bed will demonstrate how different renewable systems can be integrated to reduce carbon emissions and contribute to a net zero emissions site and provide lessons, controls, and protocols that will help to expand energy options for shoreline and maritime businesses. The integrated system is expected to serve as a test bed for shoreline power and marine energy technologies for years to come.

Integrated Renewable Energy System for Shoreline Facilities

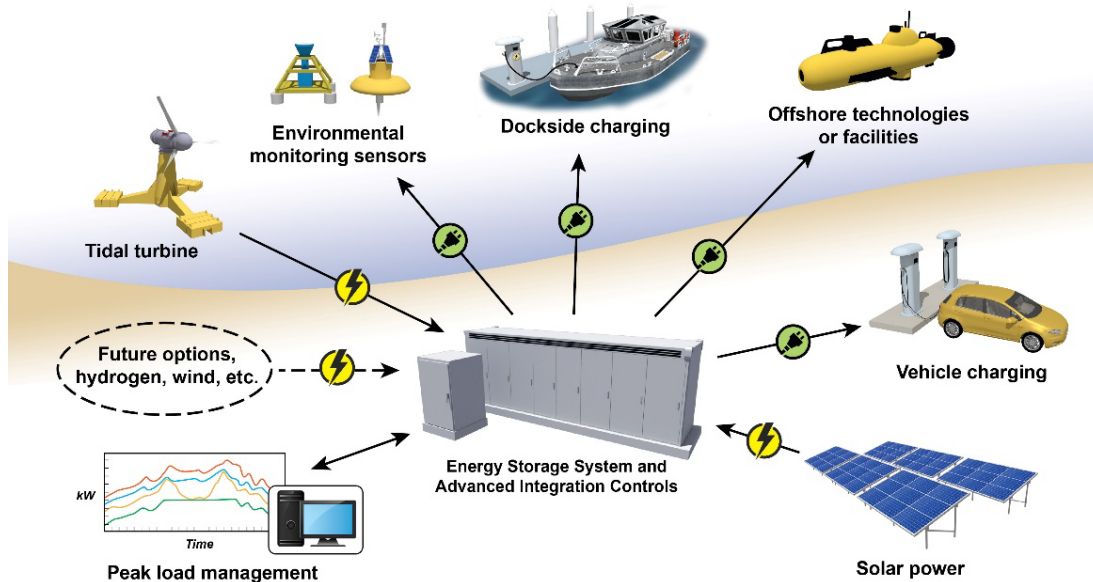


Figure 1: IRES demonstration testbed conceptual components

Request for Information 712764 Tidal Current Turbine for Coastal Microgrid Integration

PNNL-Sequim's MCRL is located on the western bank of the inlet to Sequim Bay, WA (Figure 2). The narrow inlet between the Strait of Juan de Fuca and Sequim Bay constricts flow during tidal exchange, generating currents capable of exceeding 2 m/s. The depth, flow speeds, size, and proximity to shoreside infrastructure make the inlet to Sequim Bay a suitable location for deploying small to medium-scale CETs.

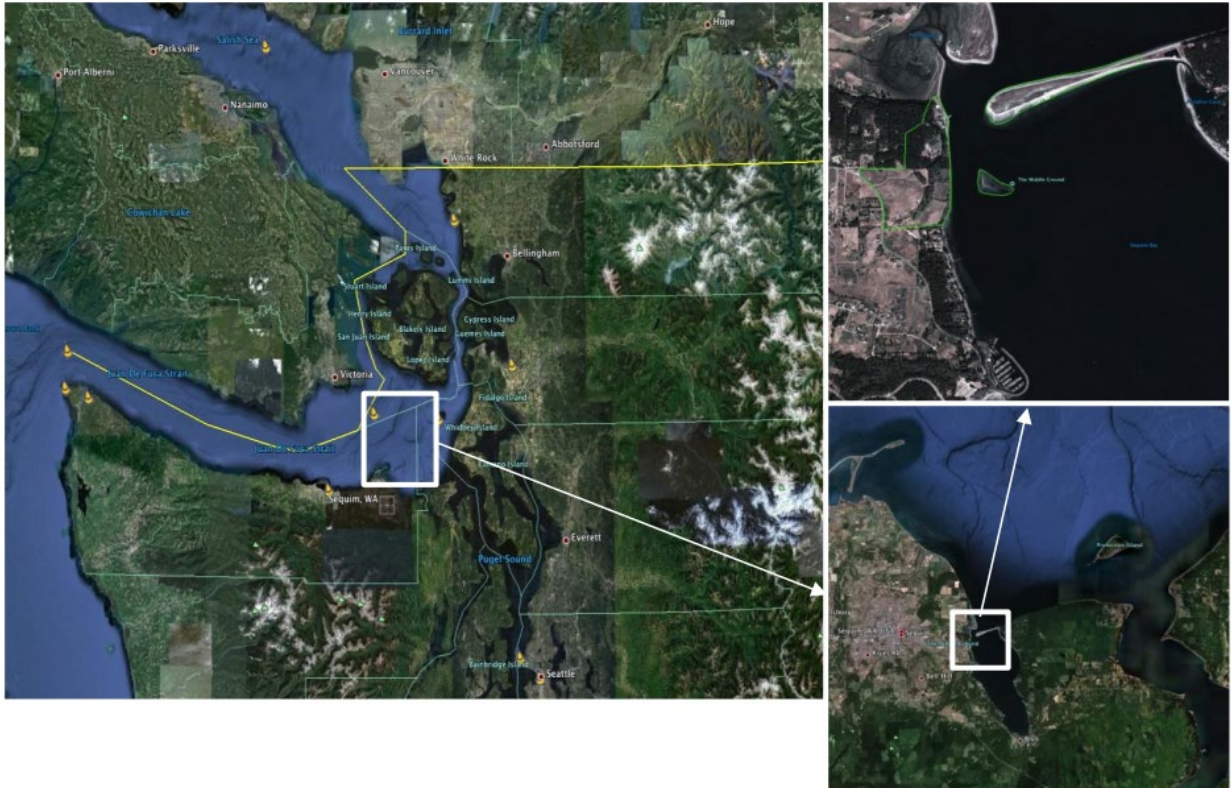


Figure 2: Location of MCRL in Washington State

There are limited areas within the inlet where turbines are likely to potentially be deployed. These correspond to locations with sufficient depth, adequate resource intensity (speed), and close proximity to the MCRL (formerly known as MSL) facility. Four representative stations have been selected for consideration: three close to Travis Spit and one close to The Middle Ground (Figure 3). Constraints on the maximum dimensions of turbines that are technically feasible to potentially deploy at the site can be determined by considering clearance distance between the top of a turbine at low water conditions and the surface for those mounted to the seabed or down from the surface for those mounted from surface platforms. A reasonable turbine top to surface clearance for bottom mounted systems is 3 m, determined from consultation with the United States Coast Guard to allow sufficient clearance for vessels passing overhead. A reasonable turbine top to surface clearance for surface mounted systems is 1 m to ensure a turbine does not ingest air. An additional constraint for surface mounted systems is maintaining clear access to the vessel navigation lane west of The Middle Ground, as indicated on [NOAA navigation chart 18471](#).

**Request for Information 712764
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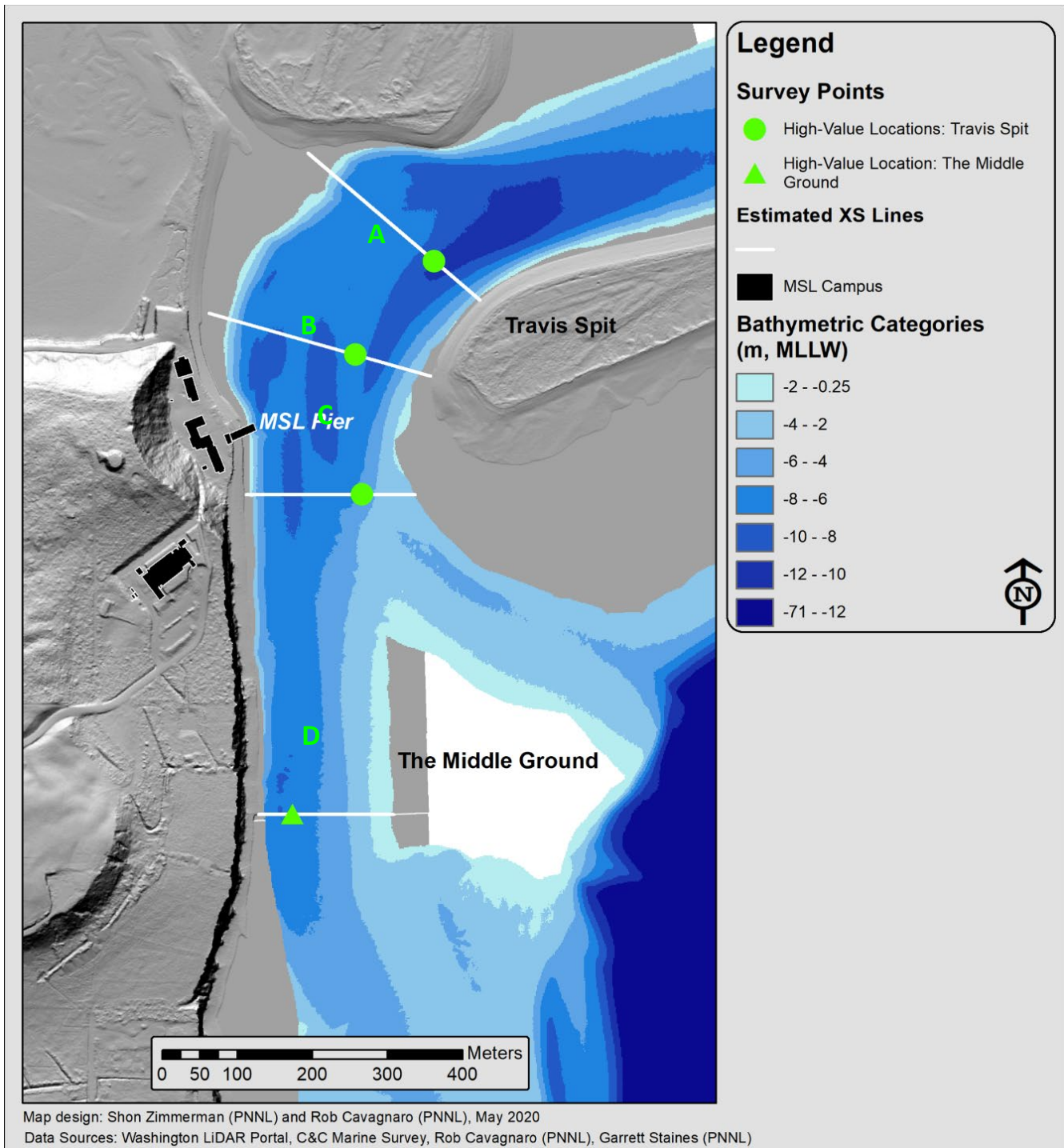


Figure 3: Prospective CET deployment locations with depth zones referenced from mean low low water (MLLW)

The mixed semidiurnal tidal cycle at the site has a range of 1-3 m. Extensive modeling and measurement campaigns of the velocity in the inlet make the tidal energy resource well-characterized. Depth-averaged speeds are capable of exceeding 2 m/s at peak flow (Figure 4). Speed exceeds 0.8 m/s averaged over depth greater than 25% of the time through the main channel of the inlet (Figure 5).

Request for Information 712764
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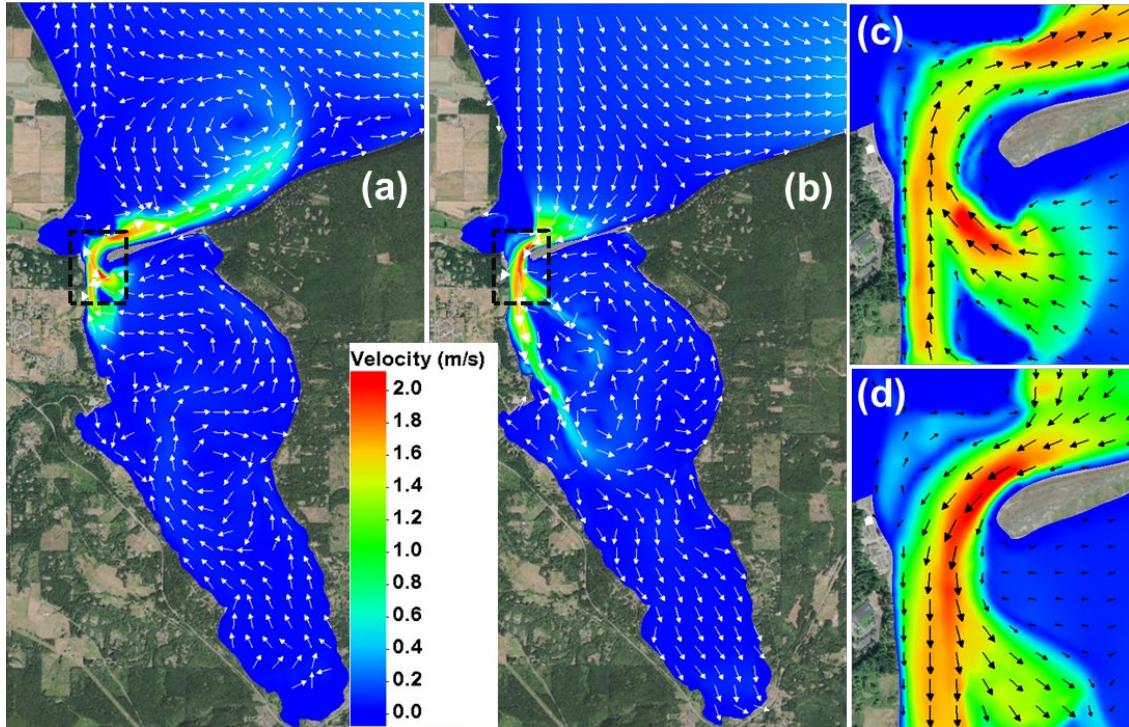


Figure 4: Depth-averaged tidal currents during peak ebb (a, c) and peak flood (b, d)

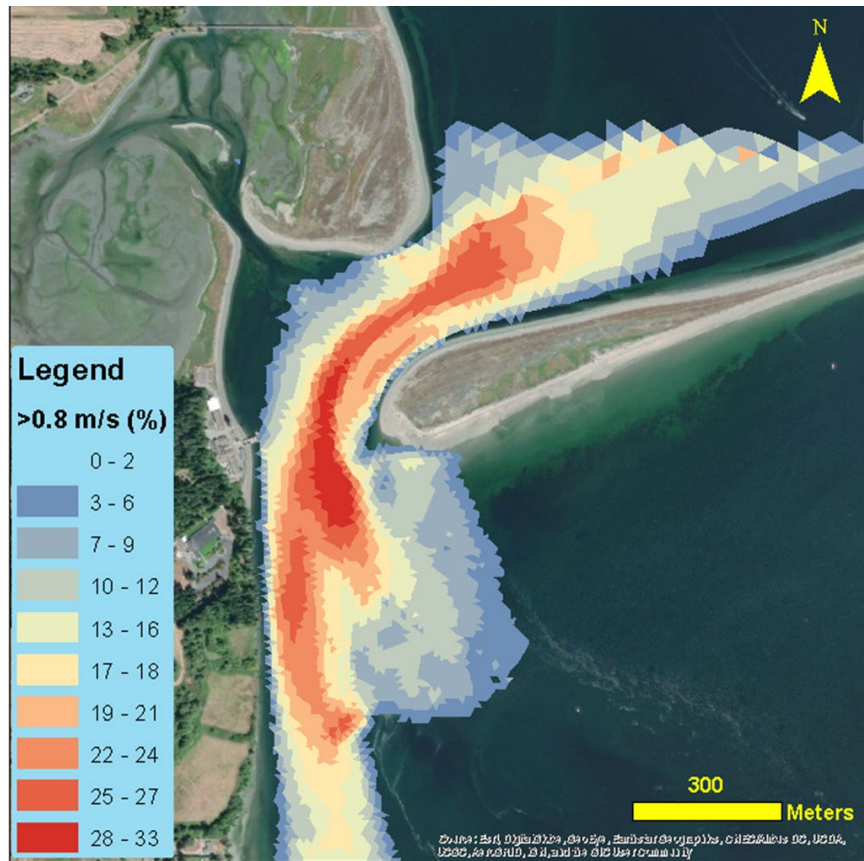


Figure 5: Depth-averaged exceedance above 0.8 m/s

Request for Information 712764
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To facilitate the development and use of marine energy and blue economy technology, PNNL is building a cabled power and research array consisting of subsea cables and a node in the vicinity of the prospective turbine locations shown. Two power extensions may be available to couple deployed turbines to the MCRL facility and IRES microgrid. Power extensions would be rated for 480 VAC 3-phase or 600 VDC and 20 A per line. Extensions include fiber optic lines returning to shore for monitoring and network connectivity.

Table 1. Quick Reference

| | |
|---|---|
| Maximum Depth Averaged Current Velocity | 2 m/s |
| Current Velocity more than 25% of the time through inlet | > 0.8 m/s |
| Maximum Bottom Mounted Turbine Height | < (MLLW Depth - 3m) |
| Minimum Surface Mounted Turbine Depth | 1 m |
| Approximate MLLW Depth at Deployment Site A | 10 m |
| Approximate MLLW Depth at Deployment Site B | 7 m |
| Approximate MLLW Depth at Deployment Site C | 5 m |
| Approximate MLLW Depth at Deployment Site D | 7 m |
| Available power/comms hookups from deployment site to shore | 480 VAC/600 VDC, 20 A per line Fiber optic cable |

Information Requested

PNNL is seeking information on products and capabilities around CET deployment and operation in the inlet to Sequim Bay.

1. Does your institution/organization produce, own, or has it designed a CET suitable for the characteristics of the site(s) described (e.g., depth, clearance requirements, current velocity)? If yes,
 - a. What are the turbine’s principal or characteristic dimensions?
 - b. What is its operating tip-speed ratio range and peak coefficient of performance?
 - c. What is its cut-in speed?
2. Which of the four described prospective deployment locations would your device be best suited for (see Figure 3)? Is there another location within the depicted region you would propose deploying and operating?
3. Is your CET configured for support from a surface-based platform or from a seabed platform?
4. Is or could your CET’s electrical output be compatible with the 3-phase 480VAC or 600VDC cable infrastructure described in this document?
5. What is the design life of your CET?
6. Are there components that require periodic inspection, maintenance, and/or replacement? What is the required maintenance interval?
7. What is a projected or estimated lead time from point of contract award to delivery of a CET meeting the described characteristics?
8. What is the estimated ROM in price (range) for applicably spec’d equipment if this project was put out for bid within the next 12 months?

Request for Information 712764 Tidal Current Turbine for Coastal Microgrid Integration

Request for Information Response Guidelines

This RFI will be open for feedback beginning on July 25, 2022. Final responses to this RFI must be submitted electronically to robert.cavagnaro@pnnl.gov no later than 4:00pm (PST) on August 26, 2022. Responses must be provided as attachments to an email. It is required that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as either a PDF or Microsoft Word attachment to the email. Only electronic responses will be accepted.

Please identify your answers by responding to a specific question by number. Respondents may answer as many or as few questions as they wish, as long as the response is no more than 20 pages.

PNNL may not respond to individual submissions; however, PNNL may publish a technical report of RFI responses that do not contain personally identifiable information or confidential, proprietary, or privileged information. All responses may be made publicly available, and submission of a response constitutes permission to publish it without attribution.

A response to this RFI shall not be viewed as a commitment of any type to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name
- Company / institution contact
- Contact's address, phone number, and e-mail address

Disclaimer and Important Notes

This is solely a request for information and not a funding announcement. A request for proposal (RFP) may be issued in the future based on or related to the content and responses to this RFI; however, PNNL may also elect not to issue an RFP. There is no guarantee that an RFP will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if PNNL chooses to issue an RFP regarding the subject matter.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. PNNL will review and consider all responses in their formulation of program strategies for the identified materials of interest that are the subject of this request. Respondents are advised that PNNL is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind PNNL or DOE to any further actions related to this topic.