

# Offshore Marine Energy Research Renewable Energy, PacWave and the Blue Economy









# **Pacific Marine Energy Center**

Jointly directed by OSU, UW & UAF

Responsibly advancing marine energy by expanding scientific understanding, engaging stakeholders, and educating the workforce of tomorrow







# **PMEC Strategic Themes**

Research & Development • Education • Testing

#### Technical

Testing and Demonstration Wave Forecasting Survivability and Reliability Device and Array Optimization Maritime Robotics

#### Environmental

Sediment Transport Marine Mammals Benthic Ecosystems EMF and Acoustics Site Characterization

#### Social

Fisheries and Crabbing Outreach and Engagement Existing Ocean Users Local and Oregon Economy International Competitiveness Energy Policy





## **Wave Powered Underwater Vehicle Charging**

#### *Objective: Co-Design of WECs for Underwater Vehicle Docking and Charging*

- Numerical modelling of coupled WEC- AUV system (Hydrodynamics, energy budgets, system control, etc.)
- Experimental modelling of docking, vehicle dynamic perception and overall autonomy in challenging conditions
- Completely open-source algorithm development and all data outputs







## **Wave Powered Autonomous Monitoring**



*Objective: Persistent Environmental Monitoring Near WEC, and Powered by WEC* 

- Deployment in Hawaii @ WETS
- 600 W for sensing, real-time processing, and underwater vehicle recharge demo
  - Too much for batteries (~10 car batteries/day to operate)
  - Too little to justify a cable to shore
- 82% sensor uptime over 3.5 months



UNIVERSITY of WASHINGTON

## **River Power for Remote Communities**

- Objective: Testing and deployment of an oscillating current energy system that harnesses vortex shedding and gallop
- 'Water Horse' Concept and support from Renerge, Inc.
- TRL 5: Has progressed from flume testing to tow testing to river testing.
- No submerged bearings or seals, rugged structure, inexpensive construction, debris resistant.
- Second prototype development underway, testing in 2021. Funded by WPTO.
- TRL 6-7 by end of WPTO project.







### **OWC Wave Power Grid Integration**

Objective: 'Software in the Loop' Grid Integration Validation



















#### **Timelines**:

- Final lease and Permitting: Q1 2021
- Construction Complete: Q3 2022
- Operations: Q2 2023
- Deployments: Q3 2023

#### **Project Overview**

- Pre-permitted and grid connection
- Four test berths (~7 miles offshore)
- ~ 20 MW total
- Five subsea power and data cables
- Utility Connection and Monitoring Facility (UCMF)



Request for Information (https://bid.oregonstate.edu/opportunity/view/23794)

#### PacWave South Overview



## **Coastal Stakeholder Views on Wave Energy**

Increase



For each power source listed below, indicate whether you feel [the

For each power source listed below, indicate whether you feel [the United States/Canada] should <u>reduce</u> or <u>increase</u> its use to meet the country's electric power needs over the next 25 years.









# **International Collaboration Opportunities**

- Future deployments at PacWave:
  - Request for Information
  - <u>https://bid.oregonstate.edu/opportunity/view/23794</u>
- TEAMER:
  - Next round of funding support open in March
  - <u>https://teamer-us.org/</u>
- Fulbright Scholar Program
  - Students and Faculty
  - http://www.fulbright.org.uk/
- DOE WPTO: Ireland and US MOU ?
  - Previously support PMEC PostDocs to study in Ireland
- Status of MARINET 2 ?
  - Previously supported PMEC PostDocs to study in Scotland







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