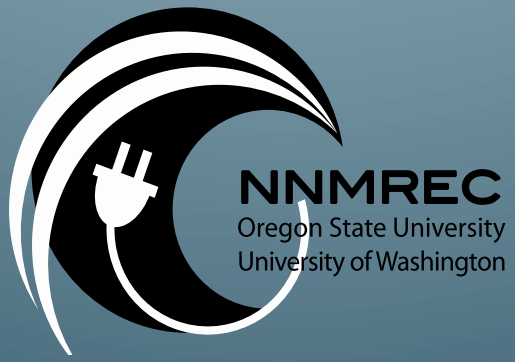
Pacific Marine Energy Center

Belinda Batten

Director, Northwest National Marine Renewable Energy Center



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Outline

- Wave Energy and Oregon
- Overview of NNMREC and mission
  - Research and Education
  - Testing Scaled Devices
  - Pacific Marine Energy Center—PMEC
- Full Scale Testing—Oregon's Role

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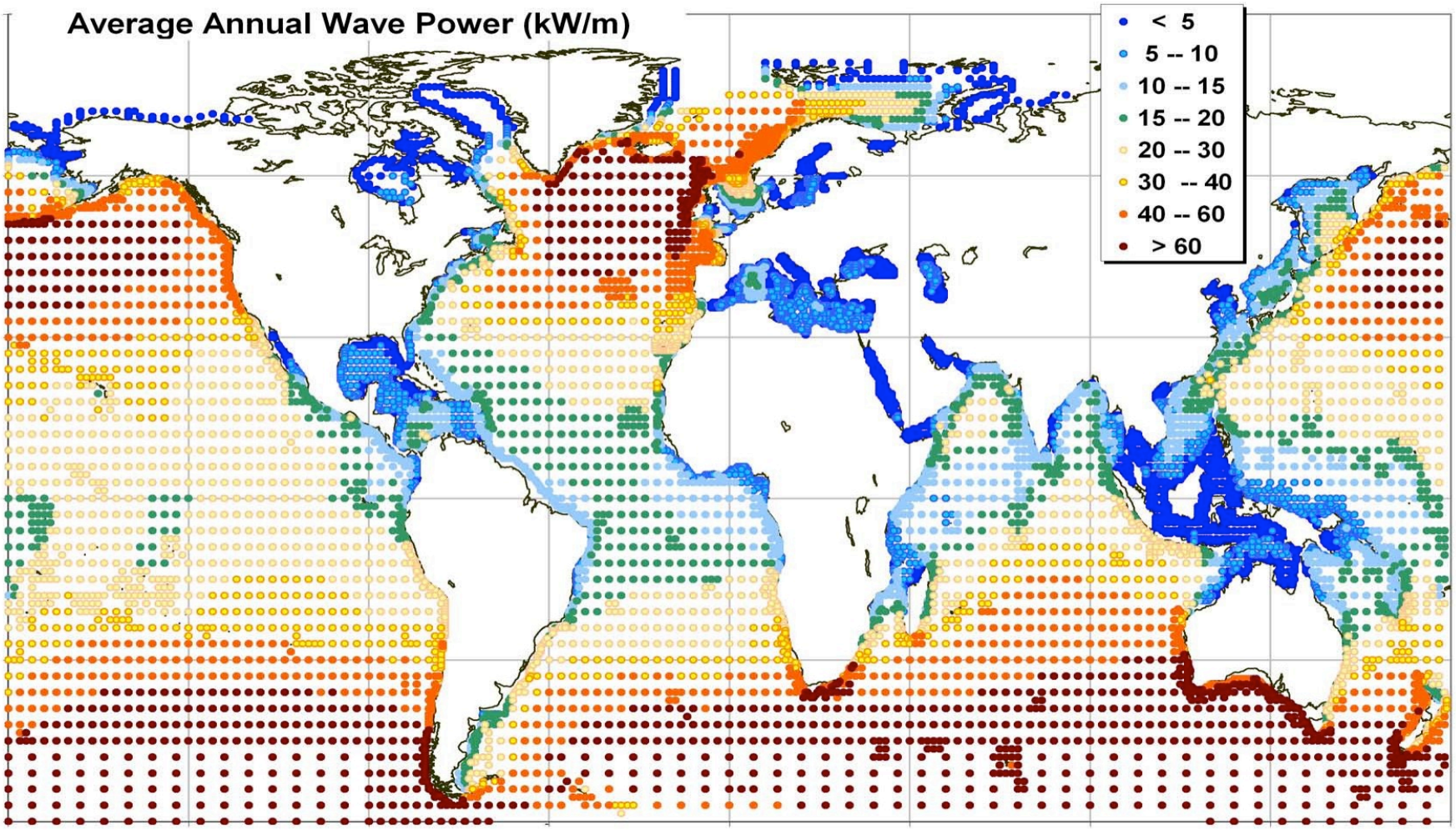
Wave Resource Worldwide



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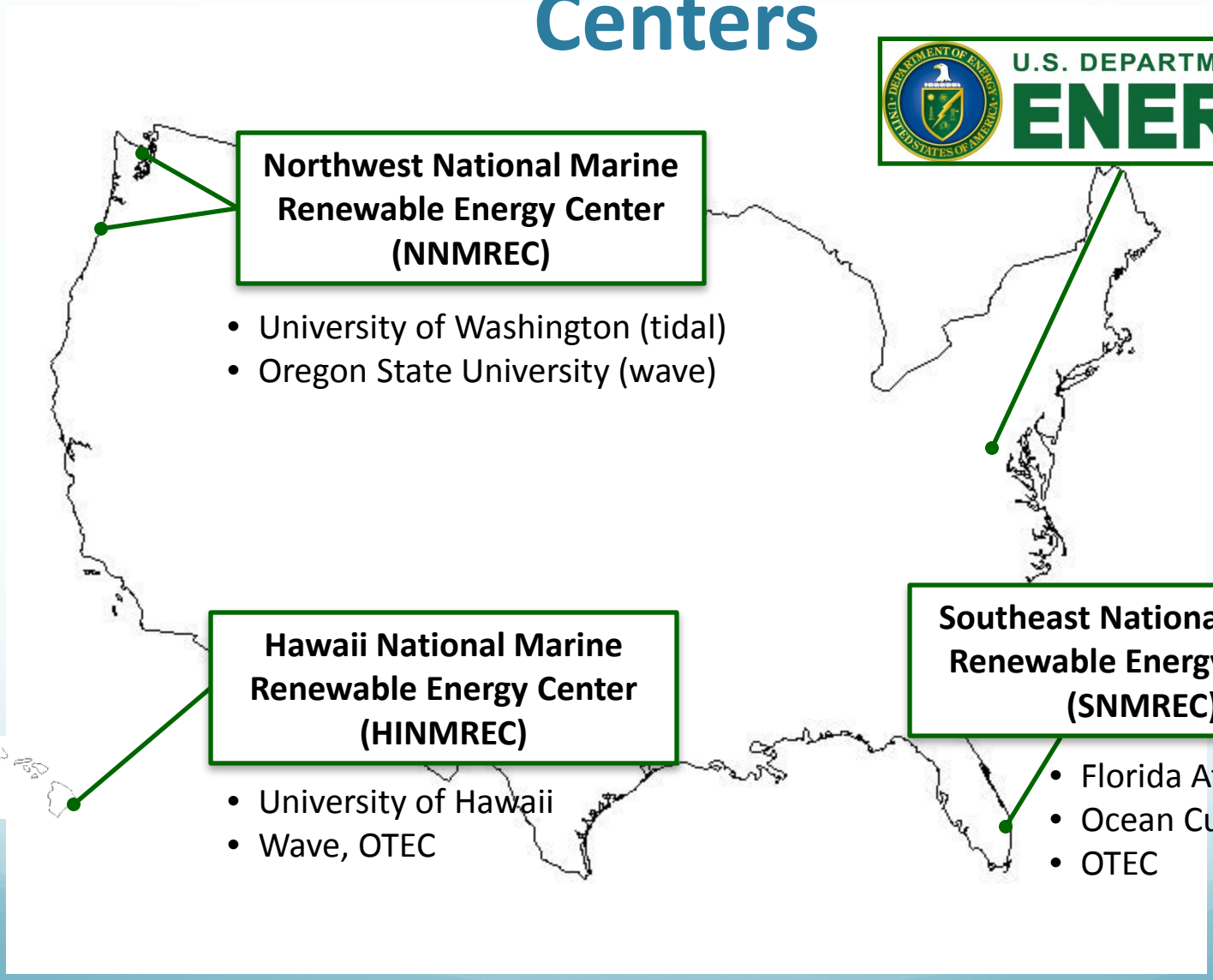
National Marine Renewable Energy Centers



Northwest National Marine Renewable Energy Center (NNMREC)

- University of Washington (tidal)
- Oregon State University (wave)

Hawaii National Marine Renewable Energy Center (HINMREC)

- University of Hawaii
- Wave, OTEC

Southeast National Marine Renewable Energy Center (SNMREC)

- Florida Atlantic University
- Ocean Current
- OTEC

U.S. DEPARTMENT OF ENERGY

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NNMREC Mission and Objectives

NNMREC's mission is to facilitate the development of marine energy technology, inform regulatory and policy decisions, and to close key gaps in scientific understanding with a focus on student growth and development.

NNMREC's Project Objectives:

- Develop facilities to serve as integrated test Center for wave & tidal energy developers
- Evaluate potential environmental and ecosystem impacts
- Optimize devices and arrays
- Improve forecasting
- Increase reliability and survivability

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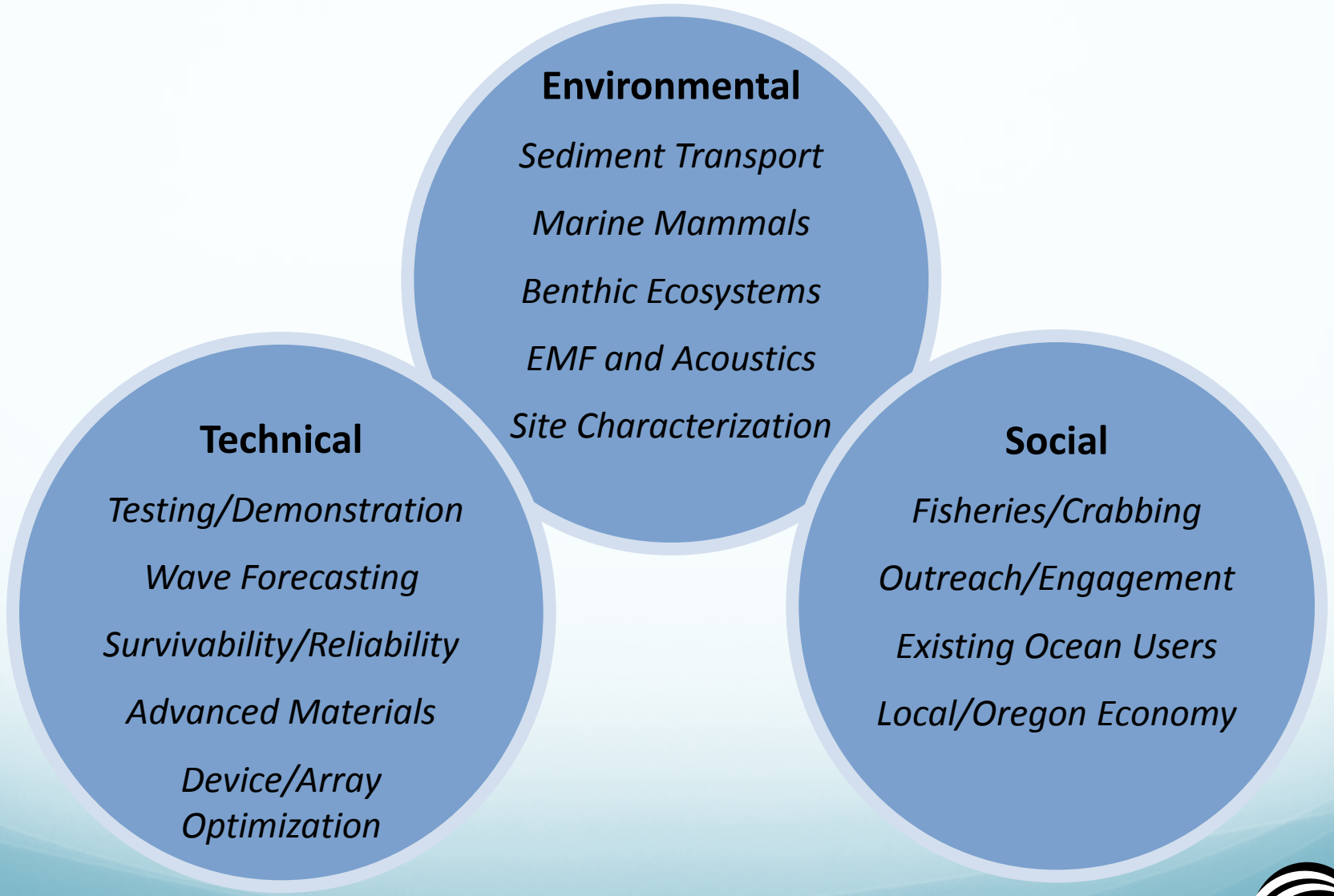
Research & Education



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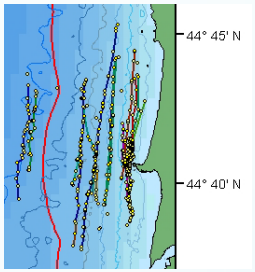
Environmental Studies at HMSC

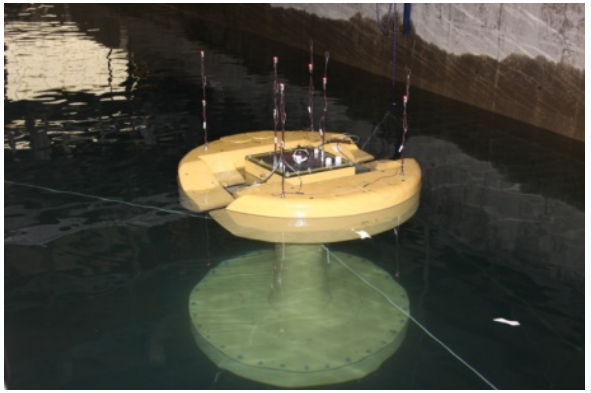
- **NNMREC Environmental "Seed Projects"**
  - Seabird colony gap analysis and at-sea distributional information
  - Sound propagation model development and calibration
  - Population dynamics of mysid shrimp in relation to natural and artificial structures in habitats targeted for wave energy development

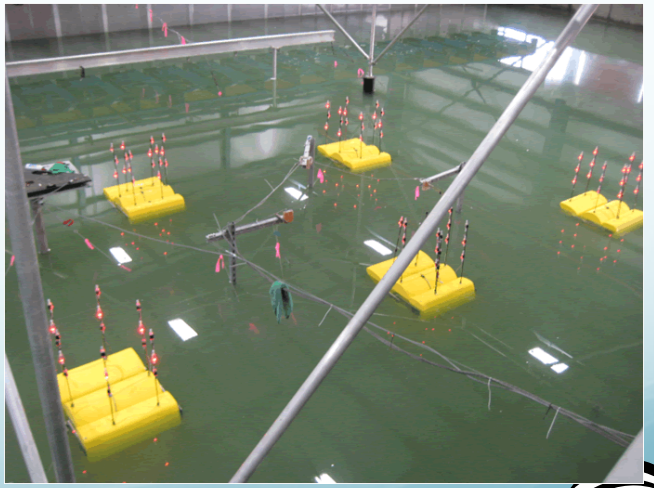


- **OWET Collaborations**
  - Benthic community baseline characterization
  - Gray whale distribution and movement patterns

Developer Scaled Testing Support

In 2011 NNMREC tested five different small scale technologies in our facilities





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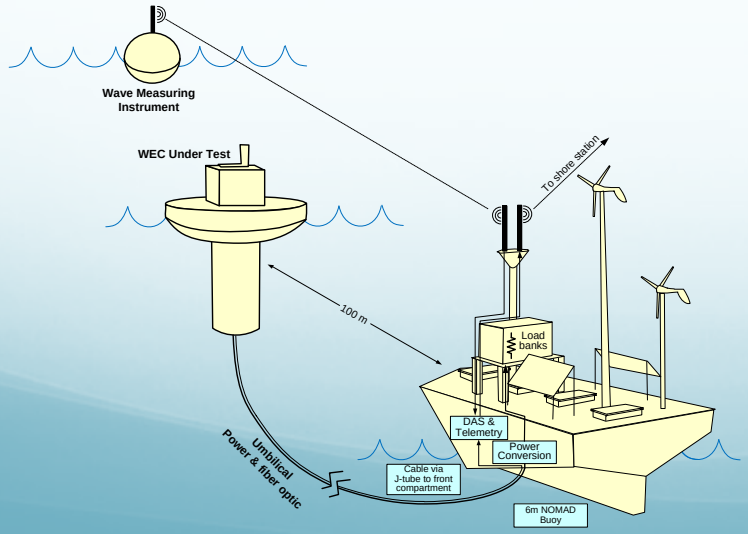
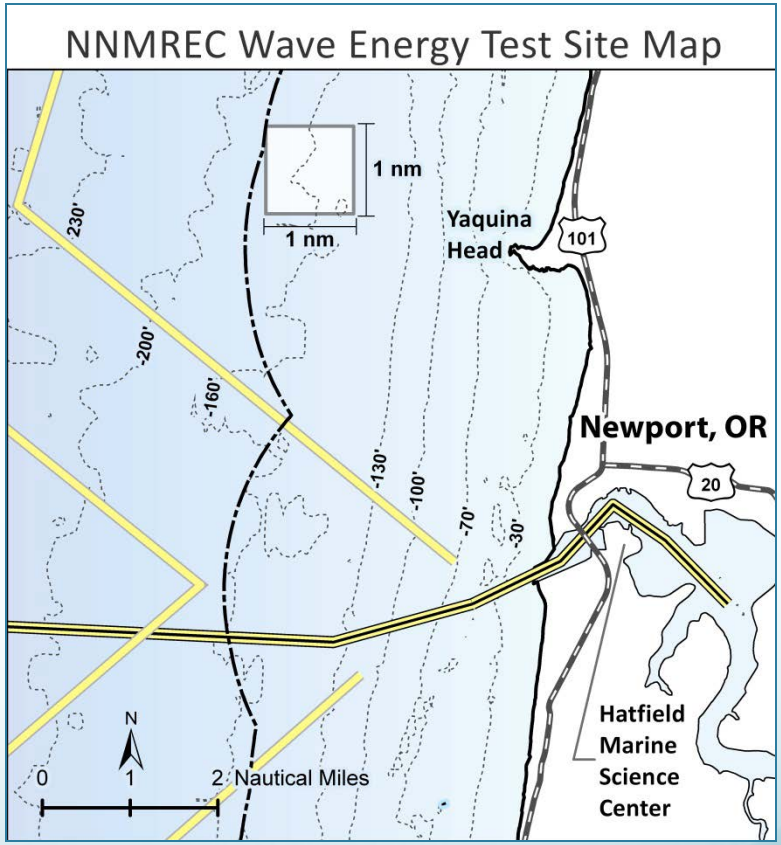
Newport Open Ocean Test Site

- **Permitted Open-Ocean Test Site**
- **Available Year round**
- **2 devices can test concurrently**
- **Testing Scenarios:**
  - Self-contained testing
  - Connected to ship
  - Connected to Ocean Sentinel





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Ocean Sentinel MOTB

- Moored north of Yaquina Head

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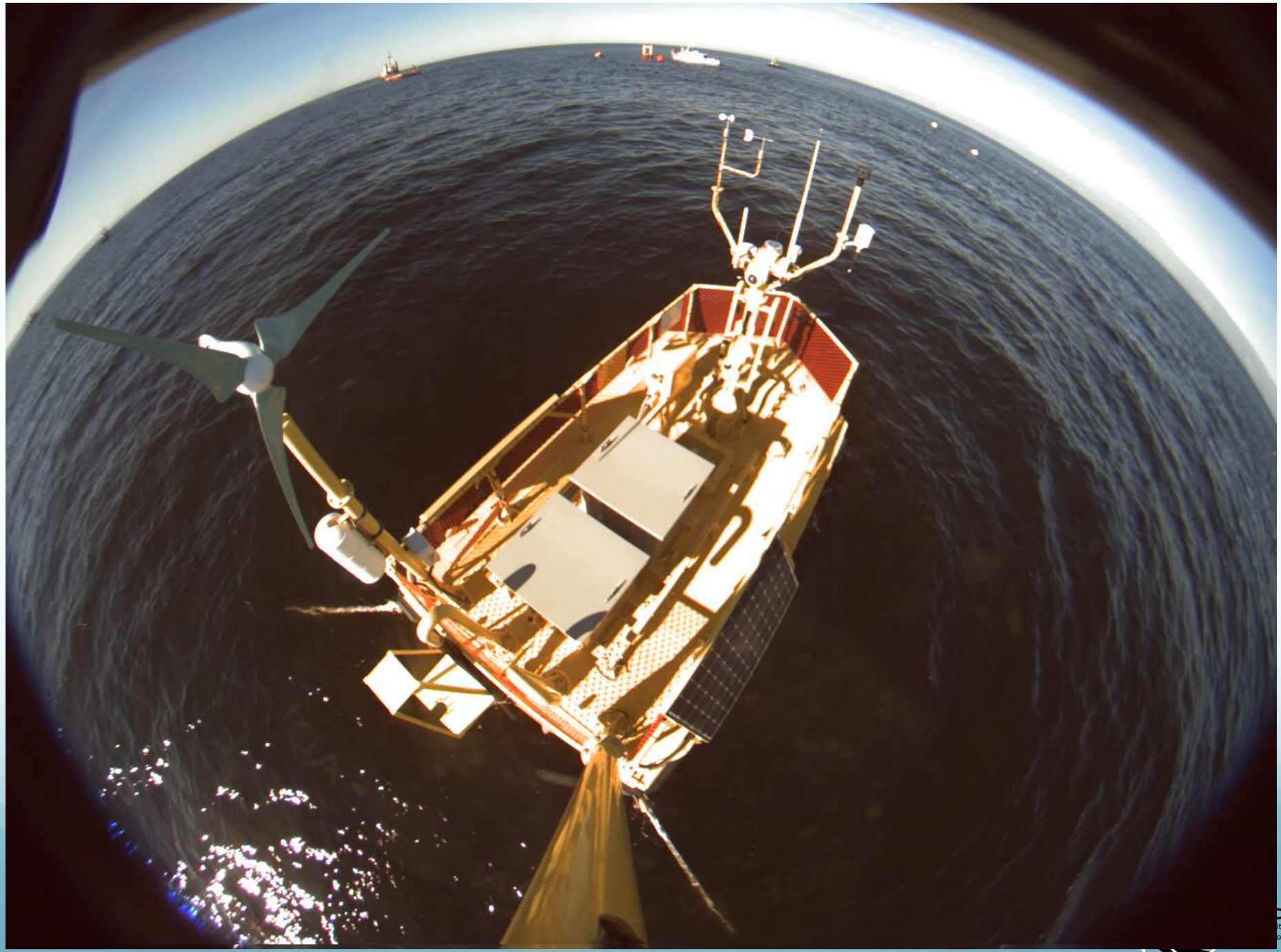
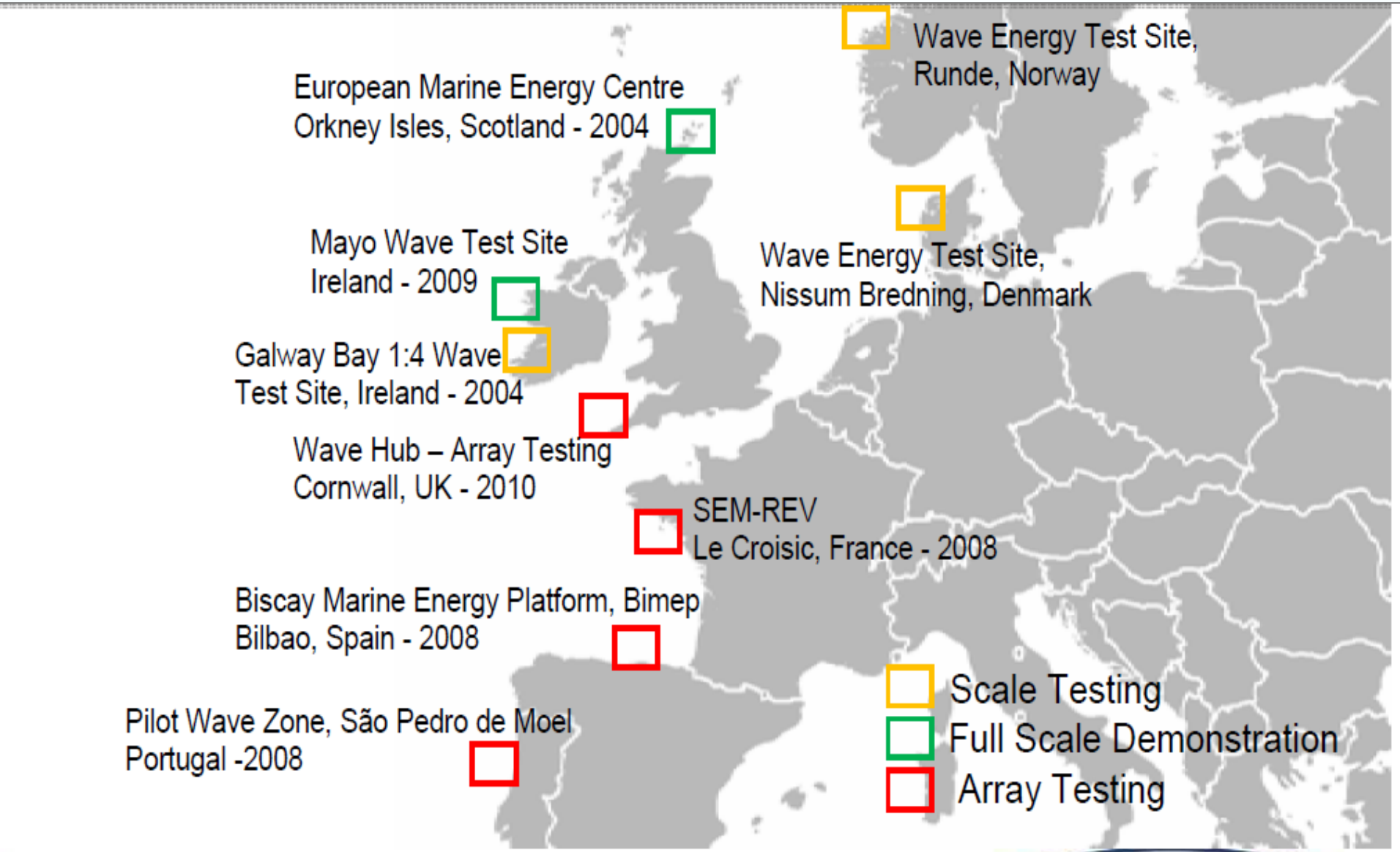
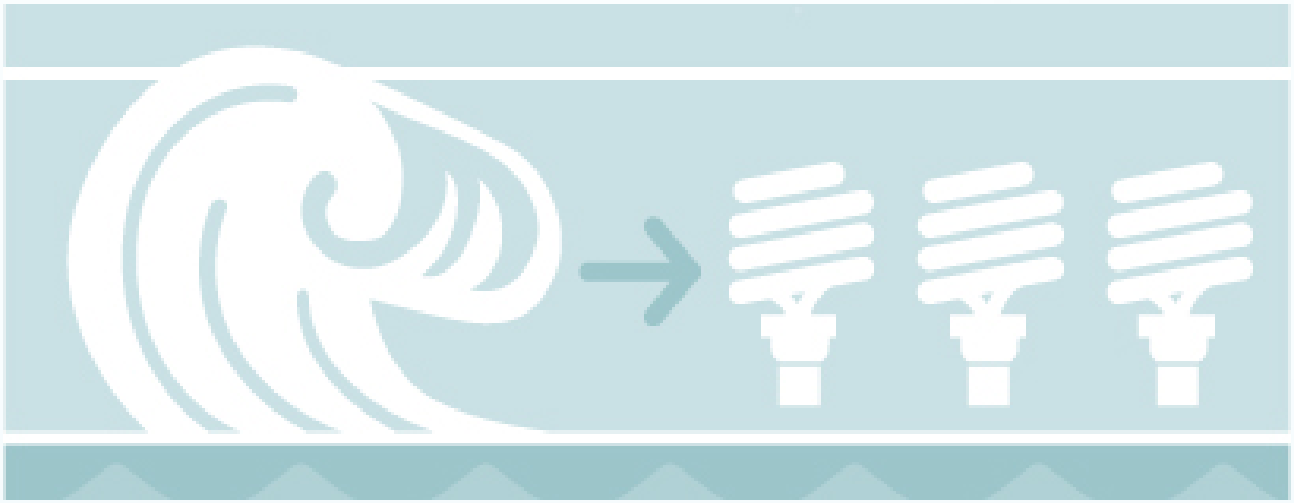


European Marine Energy Test Sites



US Grid-Connected Site



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Why a Grid-Connected Site in Oregon?

- Resource required for TRL 9; summer mild for TRL 5-7
- Environmental testing results can be leveraged along the US West Coast
- Proximity to manufacturers
- Strong state engagement; Oregon Wave Energy Trust
- Site accessibility
- Oregon State University research leadership: neutral voice of science

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Grid-Connected Site: Feasibility Study

- **Four sites considered: Clatsop County, Newport, Reedsport, Coos Bay**
- **Desired Site Characteristics**
  - 60m in depth, 80 – 100m optimal
  - Sandy or soft bottom preferred
  - Proximity to deep water port (min 30 – 35m depth)
  - Suitable on-shore location for monitoring
  - Proximity to Interconnection: Maximum desired cable length: 3 – 5 miles
  - Proximity to O&M facilities: 1 hr transit each way
  - Minimal negative effects on environment and prior use

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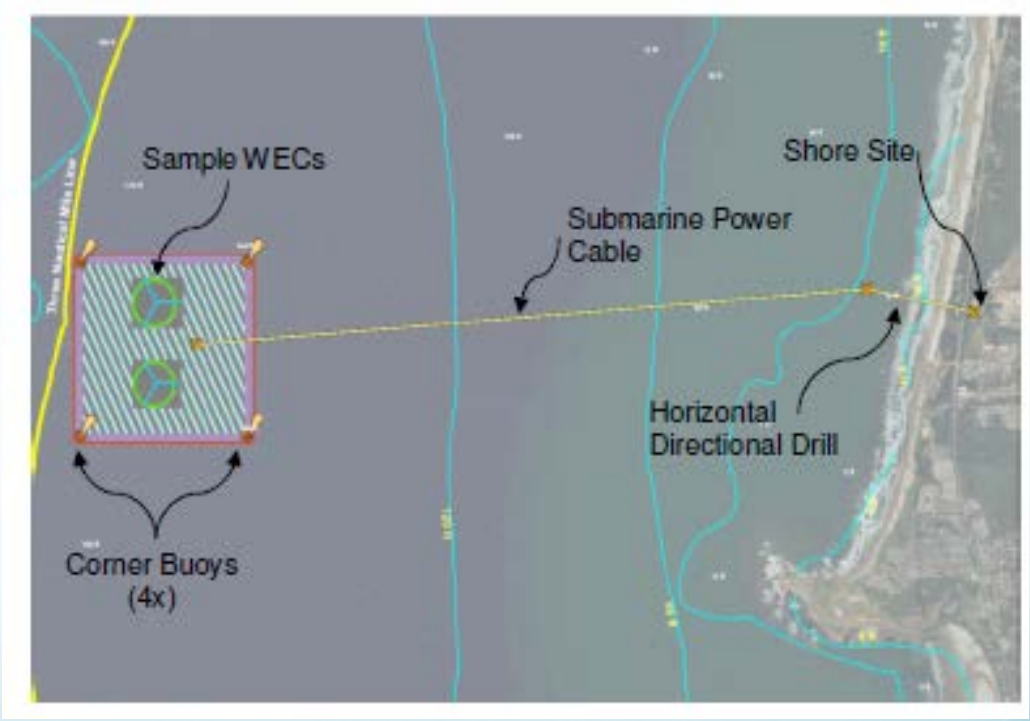
Pacific Marine Energy Center (PMEC)

- Shore-side infrastructure
- Bury cable to test site
- Attachment points to devices



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What does a test facility look like?

Devices at EMEC August 2012

And in the water…

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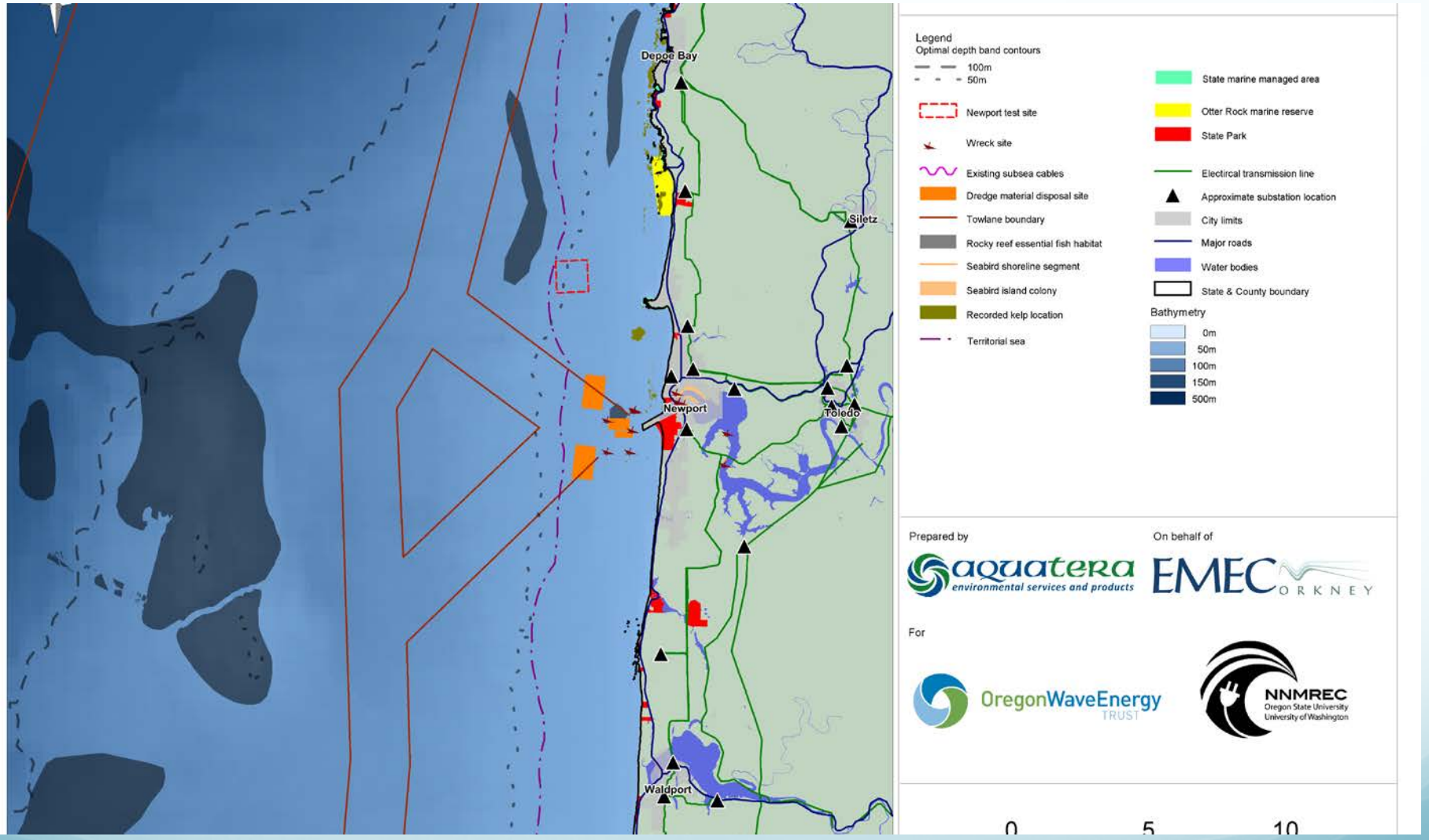
Newport, OR



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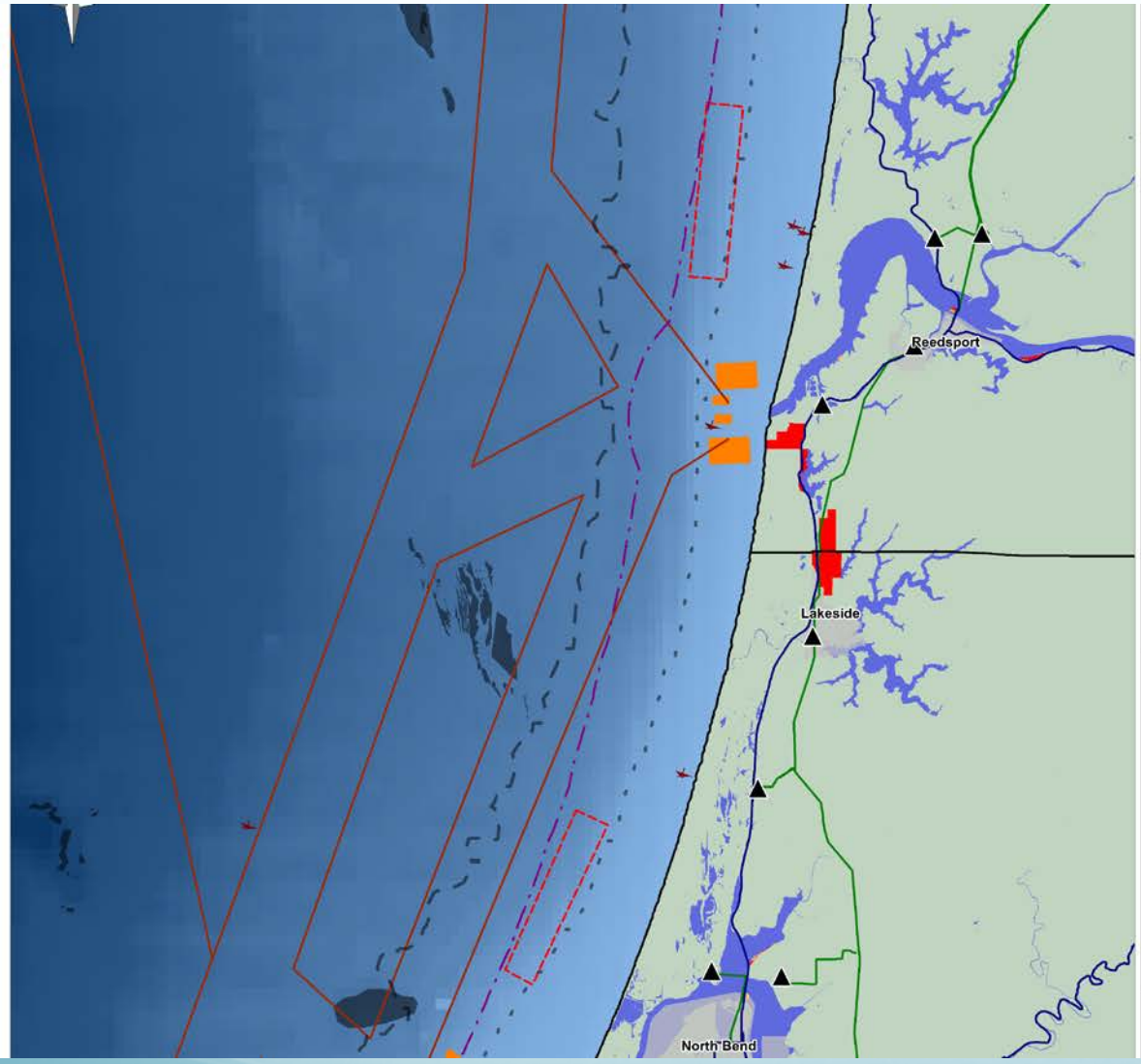
Reedsport, Oregon



Legend
Optimal depth band contours
100m
50m
OPT wave parks
Wreck site
Existing subsea cables
Dredge material disposal site
Towlane boundary
Rocky reef essential fish habitat
Seabird shoreline segment
Seabird island colony
Recorded kelp location
Territorial sea
State marine managed area
State Park
Electircal transmission line
Approximate substation location
City limits
Major roads
Water bodies
State & County boundary
Bathymetry
0m
50m
100m
150m
500m

Prepared by
aquatera
environmental services and products

On behalf of
EMEC
ORKNEY

For
OregonWaveEnergy
TRUST
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Site Selection Process

Action	Who	When
Feasibility Study	PEV/NNMREC	December 2011
Meetings in Communities	NNMREC	January – August 2012
Technical Site Development Plan	EMEC	June – October 2012
Town Hall Meetings	NNMREC/OWET	August 2012
Two Communities Selected	NNMREC/OWET/EMEC/Community Input	September 2012
Suitable Sites Proposed	Community Siting Committees	September 2012
Suitable Sites Analyzed	EMEC	September – October 2012
Site Selected	NNMREC	October – November 2012

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Thank you

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