Northwest National Marine Renewable Energy Center: Vision, Progress & Goals

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Director, NNMREC

BOEM Meeting, Portland
12 April 2012
Outline

- Overview of Northwest National Marine Renewable Energy Center
- NNMREC Open Ocean Test Facility, Newport Oregon
- NNMREC Plans for Grid Connect Test Facility
US DOE 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
The Northwest National Marine Renewable Energy Center (NNMREC)

- A partnership between Oregon State University & the University of Washington funded by the U.S. Department of Energy
- Develop a full range of capabilities to support wave and tidal energy development
- Center activities are structured to:
  - Facilitate commercialization of marine energy technology,
  - Inform regulatory and policy decisions,
  - Close key gaps in scientific understanding,
  - Educate the first generation of marine renewable energy engineers and scientists.

Funding for NNMREC is provided by DOE, OSU, UW and multiple partners
OSU’s Leading Efforts in Wave Energy Research

Environmental
- Sediment Transport
- Electromagnetic Fields
- Benthic Ecosystems
- Acoustics
- Site Characterization

Technical
- Testing/Demonstration
- Forecasting
- Survivability/Reliability
- Advanced Materials
- Device/Array Optimization

Social
- Fisheries/Crabbing
- Outreach/Engagement
- Existing Ocean Users
- Local/State Economies

Testing/Demonstration
Forecasting
Survivability/Reliability
Advanced Materials
Device/Array Optimization
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
In 2011 NNMREC tested five different small scale technologies in our facilities.
Newport Open Ocean Test Facility

- 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
Wave Resource Worldwide
Grid-Connected Site: The Oregon Advantage

- 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 support
- Oregon Wave Energy Trust
- Site accessibility
- NNMREC’s “one stop shopping” for testing
- Oregon State University research leadership
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
Test Facility Structure

- Bury cable from shore to test site
- Develop shore-side data acquisition system, grid emulator and load bank
- Shore-side infrastructure; connect to grid

Figure 6 – Shore MOTB Concept, 1nm by 1nm Offshore Area
Newport, OR

- Proximity to current test site; City leaders have vision of marine science & engineering hub
- Strong relationship with fishing community
- Shallowest port of those considered
- Good proximity to OSU’s ship operations, HMSC and Corvallis
- Good proximity to NSF’s OOI effort
- Slowly increasing water depth
Our Process

- Goal: Eligibility for USDOE funding this year (2012)
- Meet with smaller groups of community leaders to identify issues of concern and interest in each area
- Prepare preliminary development plans for sites
- Meet with larger community group to vet local options
- Select site
- Prepare Development Plan
- Apply for funding
BACKUP SLIDES
Ocean Sentinel MOTB

- Based on 6m NOMAD design, working with AXYS Technologies
- Initial average power rating 100kw average
- Load bank: power processing & dissipation
- Data transmission via umbilical & wireless telemetry
Wave Energy Devices
Wave Energy Devices
Clatsop County, OR

- Camp Rilea, Oregon’s only DoD facility located here (National Guard)
- Shortest distance to Portland and Columbia River
- Potentially less impact on commercial fishing
- Longest transmission distance: 8.9NM to 75m depth
- Slowly increasing water depth
Reedsport, OR

- Proximity to OPT project—possibility for shared infrastructure (cable and on-shore assets)
- City leaders appear to be receptive to dual use
- Moderate proximity to very good deep water, all weather port (Coos Bay)
- Good proximity to maintenance location (Winchester Bay)
- Rapidly increasing water depth
Coos Bay, OR

- Proximity to possible Principle Power off-shore wind project—possibility for shared infrastructure (cable and on-shore assets)
- Very close proximity to very good deep water, all weather port
- Shortest transmission route
- Longest driving distance from PDX
- Rapidly increasing water depth
- Best site for deployment and maintenance
NOAA Buoys for Wave Data
## Average Power at Buoys

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- Newport OR
- North Oahu
- East Oahu
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Seasonal Average Power

- 46001 Alaska Offshore
- 46083 Alaska Nearshore
- 46002 Oregon Offshore
- 46050 Oregon Nearshore
- 51001 Hawaii Offshore
- 51201 Hawaii Nearshore A
- 51202 Hawaii Nearshore B
- 46059 California Offshore
- 46013 California Nearshore