Unsolicited Request for Renewable Energy Research Lease

Northwest National Marine Renewable Energy Center at Oregon State University

October 29, 2013

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PROJECT OVERVIEW

The Northwest National Marine Renewable Energy Center (NNMREC) was established through the U.S. Department of Energy (DOE) Water Power Program to support wave and tidal energy development for the United States. NNMREC's suite of test facilities, collectively known as the Pacific Marine Energy Center (PMEC), provide a range of ocean renewable energy testing opportunities, from laboratory scale through open ocean testing. NNMREC at Oregon State University (OSU) currently provides non-grid connected wave energy testing off the coast of Oregon at the PMEC North Energy Test Site (PMEC-NETS), and is now developing a utility scale grid connected wave test facility, the South Energy Test Site (SETS), the subject of this BOEM lease application. As the first of its kind in continental North America, the PMEC-SETS will play an integral role in advancing wave energy from early-stage ocean testing through final demonstration for commercialization. PMEC-SETS will serve as an integrated test center to evaluate wave energy converter (WEC) performance and environmental interactions, as well as a training ground for future jobs in the ocean energy industry.

The PMEC-SETS project would be located approximately five nautical miles off the coast of Newport, Oregon, in an area characterized by a predominantly sandy bottom with water depths ranging from 32 to 41 fathoms (58 – 75 meters). The exact location has not yet been determined, as site assessment activities and further consultation with agencies and stakeholders will be used to inform the location and configuration of the project structures. However, NNMREC-OSU has selected an area of interest for project site, which was identified by the Newport community through an extensive stakeholder engagement process.

Primary project components would include test berths (where WEC devices would be anchored and moored), marine transmission cables, and an onshore control center to transfer power to grid. The test berths would be located on the Outer Continental Shelf (OCS) and occupy an area of approximately 2-square nautical miles. A total of four grid-connected test berths are planned, each with its own buried subsea cable to transmit energy, as well as performance and environmental data, from the test berth to an onshore control center. Central Lincoln Public Utility District (CLPUD) would handle the grid-interconnect; power transmission and purchase options are being explored with the CLPUD and Bonneville Power Association (BPA).

The general site selection process was completed in January 2013, and final site selection and project design are now underway. The submittal of this lease request to the Bureau of Ocean Energy Management (BOEM) is the first step in the regulatory process, and NNMREC-OSU plans to initiate the Federal Energy Regulatory Commission (FERC) Licensing Process once BOEM issues a Determination of Competitive Interest for the lease request. The precise sequence of the overall regulatory process will depend on a variety of factors, but NNMREC-OSU aims to complete the regulatory process in [redacted]

Upon completion of the regulatory process, the project would enter the installation phase, which NNMREC-OSU expects to begin in late [redacted]. The transmission cables and test berths would likely be installed at the same time, but it is possible that the some infrastructure would be

installed in phases. NNMREC-OSU aims to commence operations at PMEC-SETS [redacted] with deployment of the first WECs at the facility. Based on experiences of other renewable energy test facilities, such as the National Renewable Energy Laboratory (NREL) and the European Marine Energy Center (EMEC), PMEC-SETS is expected to operate for up to [redacted] years.

Purpose & Need

Full-scale ocean testing for WECs is necessary to evaluate the technology, optimize energy extraction, and research potential environmental impacts. In 2012, the NNMREC-OSU became home to the nation's first non-grid connected ocean test facility capable of testing a variety of WEC technologies while monitoring interactions with the local ecosystem, the North Energy Test Site (NETS) of PMEC. While the PMEC-NETS is a critical step forward, the lack of grid emulation for WECs above 100kw average power produced is a limitation for devices advancing through technology readiness levels (TRLs). While WECs can be tested "self-contained" at NETS, that mode of testing will not fully provide developers an understanding of WEC performance under grid connection—which is necessary for commercial demonstration of WEC technologies.

PMEC Vision:

Leverage NNMREC expertise and industry partnerships to develop a full scale, grid-connected ocean energy demonstration center that can accommodate multiple devices of various technology types and scales.

The overall purpose of SETS is to demonstrate the viability of wave energy off the northwest coast of the U.S. by providing a fully functional ocean test facility for prototype and utility scale WECs connected to the electrical grid. In addition to serving as an integrated test center to evaluate WEC performance and environmental interactions on a commercial scale, SETS will also function as training ground for jobs in the ocean energy industry.

Technology developers and policy-makers alike have determined that a full-scale grid connected ocean test facility is needed to achieve industry commercialization and fully reap the benefits of this clean, renewable energy resource. The interest and value in this type of test center has been documented in numerous reports reflecting industry and stakeholder interests. In particular, the U.S. Department of Energy's (DOE) technology roadmap for wave energy indicates a demonstration center as necessary step in commercializing this energy sector. Fulfilling this need is the primary purpose of PMEC-SETS. PMEC-SETS will provide standardized testing and power analysis at an accredited facility, along with demonstration of power on the grid, standardized fault testing, and interconnection and grid synchronization data.

AREA REQUESTING TO LEASE

TECHNICAL EVALUATION OF CANDIDATE SITES

As a first step in a comprehensive evaluation of potential sites for the PMEC-SETS (or Proposed Project), NNMREC-OSU conducted a feasibility study of candidate sites in 2011. This study involved analyzing and establishing site evaluation criteria, which were then applied to identify candidate sites. Utilizing resources from NNMREC-OSU and the Oregon Wave Energy Trust (OWET), industry feedback on requirements for an optimal grid connected ocean test site was gathered to inform the site evaluation criteria. Applying both the objectives of SETS and needs identified by industry, the following initial site criteria were established:

- Within 50 nautical miles of nearest deep water port;
- Within 15 nautical miles of nearest service port;
- Water depth 60-100 meters;
- Shore landing within 5 miles to 115kv transmission line;
- Soft bottom;
- Leverages existing industry activity.

These initial criteria were used to screen locations off the coast of Oregon, and four sites were identified for further evaluation: Warrenton (Camp Rilea), Newport, Reedsport, and Coos Bay. Additional information about each candidate site was collected and reviewed for each of the following criteria:

- Proximity to facilities for deployment;
- Proximity to port for service vessels capable of conducting onboard maintenance;
- Proximity to facilities for dockside repair;
- Logistical resources for staff, developers, researchers;
- Energy resources;
- Potential environmental effects;
- Potential effects to human uses;
- Proximity to interconnection points;
- Access to utilities for energy off-take.

In addition, NNMREC-OSU developed cost estimates to evaluate how each site may affect the cost of deployment and operation. Each site was evaluated to assess opportunities to leverage existing and future activities and investments, and site assessment analysis was shared with local stakeholders and other interested parties to gather additional input. Technical evaluation of candidate sites was completed in December 2011 and documented in a report, *Feasibility Study for a Grid Connected Pacific Marine Energy Center* (provided in Appendix E).

STAKEHOLDER COORDINATION & CONSULTATION

Recognizing that community input and support are crucial to a successful project, NNMREC-OSU initiated an extensive outreach program during the technical evaluation of candidate sites. In coordination with Oregon Sea Grant, NNMREC-OSU conducted outreach in the areas being considered

for the project site (Warrenton, Newport, Reedsport, and Coos Bay) to share information about PMEC-SETS and gather feedback from the communities. In 2012, a series of public forums were held for members of the public to learn more about SETS and to identify issues of concern and interest in Newport, Reedsport and Coos Bay. Warrenton was treated somewhat differently, as the Oregon Military Department would have been the project lead had that community been selected as the location for PMEC-SETS.

Results of the outreach process were used to narrow the candidate sites to the two communities that demonstrated the most interest in and best matched the criteria for PMEC-SETS (Reedsport and Newport). In fall 2012, Reedsport and Newport each formed a Community Site Selection Team to develop proposals for the PMEC-SETS. Representatives from all stakeholder groups were directly involved in the preparation and approval of the proposals for the PMEC-SETS, including the Fishermen Involved in Natural Energy (FINE), ocean users, tribal representatives, the Central Lincoln People's Utility District (PUD), Lincoln County, the Cities of Newport and Toledo, the Ports of Newport and Toledo and the public at large.

Throughout 2012, NNMREC-OSU kept BOEM apprised of the selection process. In fall 2012, NNMREC-OSU began engaging with both BOEM and FERC in fall 2012 to share information about PMEC-SETS and to prepare for the regulatory process. NNMREC-OSU held conference calls with representatives from both agencies in November and December 2012. In early 2013, NNMREC-OSU formed a Stakeholder Advisory Team comprised of all the federal and state agencies involved in the PMEC-SETS authorization process, as well as non-governmental organizations, to collectively explore the project and to identify key regulatory and environmental considerations. Since first convening the group in January, NNMREC-OSU held meetings in March and May, and periodically scheduled will follow to ensure all parties remain engaged as the project proceeds.

NNMREC-OSU continues to work with Oregon Sea Grant to maintain ongoing communication and coordination with the Newport community, and the fishing industry in particular. The near-term focus of the outreach program is to collaboratively inform final project design, consider regulatory process options, identify baseline study needs, and develop environmental monitoring plans and mitigation measures to facilitate safe and compliant technology testing. These efforts are part of the overall outreach process that NNMREC-OSU has implemented to engage with all stakeholders throughout the development and life of the PMEC-SETS project.

Site Selection

Following the 2011 feasibility study, and in conjunction with the Community Site Selection process, NNMREC-OSU coordinated with industry partners, including the OWET, the EMEC, Aquatera, and Ecology and Environment, Inc., to develop a Conceptual Design for PMEC-SETS (see Appendix H). The development of the preliminary project plan provided the technical analysis of the four communities that, together with the community outreach process, resulted in the selection of Reedsport and Newport as final candidates for PMEC-SETS.

In developing their proposals for PMEC-SETS, the Community Site Selection Teams considered the technical criteria for SETS, community resources, economic development, marine traffic, marine debris and salvage aspects, and environmental resources. The community teams submitted their proposals in December 2012, and in January 2013 NNMREC-OSU selected Newport for the PMEC-SETS (see Appendix F: Newport Community Site Proposal for PMEC). The decision was based on a combination of community input and preferred site criteria, including physical and environmental characteristics, marine and on-shore cable routes, port and industry capabilities, impacts to existing ocean users, permitting challenges, stakeholder participation in the proposal process, and support of the local fishing communities.

Coordinates and OCS Lease Blocks

Initially recommended by FINE based on their broad knowledge of the local marine environment, the area selected by the Newport community, or study area, is located approximately five nautical miles off the coast of Newport on the OCS. The study area is roughly 4.5 square nautical miles, and the SETS project site would occupy about 2-square nautical miles within that; however, site-specific surveys, as well as further agency and stakeholder consultation, are needed to determine the exact location. Therefore, NNMREC-OSU is requesting a research lease for the four OCS-blocks containing the study area.

While the actual project site will be much smaller than the area contained in the four lease blocks, this approach will help ensure that there are sufficient options as the optimal location and configuration of the project structures is determined. Once the precise site is identified, NNMREC-OSU will coordinate with BOEM to remove those aliquots not encompassed by the project site from the lease.[1] NNMREC-OSU is requesting a research lease for the OCS-blocks listed in Table 1 below and depicted on the map in Figure 1.

TABLE 1. OCS BLOCKS REQUESTED FOR RENEWABLE ENERGY RESEARCH LEASE

Protraction Diagram Name	Protraction Diagram Code	Project Structure	Block Number	Aliquots
Newport Valley	NL 10-10	WEC Berth	6481	All
Newport Valley	NL 10-10	WEC Berth	6531	All
Salem	NL 10-11	WEC Berth	6501	Excluding H, L, O & P
Salem	NL 10-11	WEC Berth	6451	Excluding D

[1] NNMREC-OSU anticipates that this may be accomplished by amending the lease request to include only those OCS blocks (and/or aliquots) encompassed by the final project site; alternatively, it may be addressed in the final lease terms and conditions.

Map of Area Requested to Lease

A map of the project site is shown below in Figure 1. The GIS Shapefile for this map is included with this lease request as an attachment.

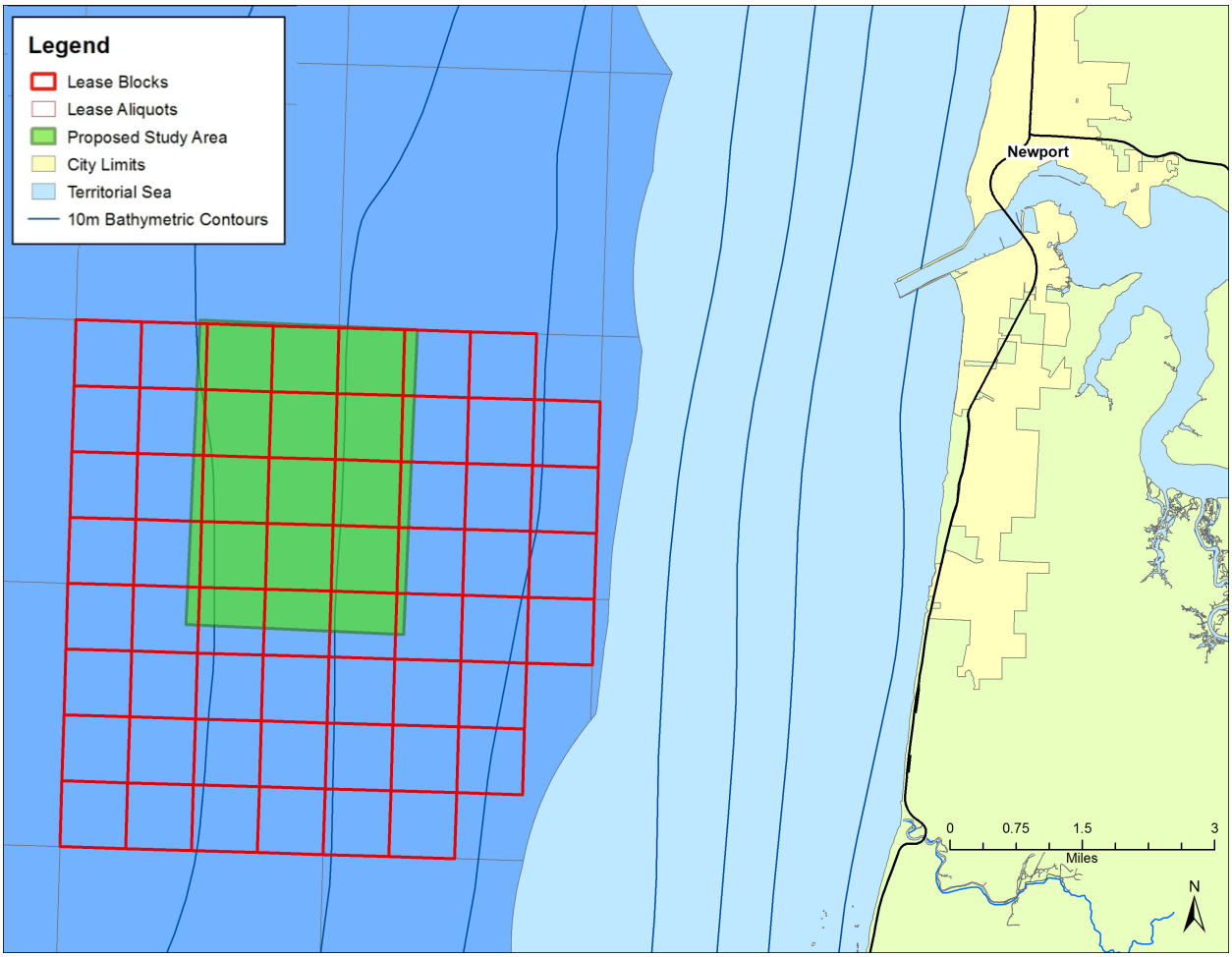


FIGURE 1. MAP SHOWING OCS BLOCKS IN THE AREA REQUESTED TO LEASE.

SITE CHARACTERIZATION

NNMREC-OSU will begin site characterization of PMEC-SETS with the procurement of a desktop study for cable routes. The study will provide important information concerning the most practical alternative cable routings, and cable design requirements. The study also will provide a comprehensive review of available site and cable route data including site-specific factors, such as the physical and geophysical environment, terrestrial considerations, environmental permitting, human factors, and infrastructure considerations. The desktop study will help to identify the specific location of the SETS within the study area. In conjunction with the cabling study, other site characterizations activities include baseline studies that are being developed in conjunction with the SETS Stakeholder Advisory Team.

BASELINE STUDIES

NNMREC-OSU's goal is to design baseline studies in a way that informs the final location and configuration of PMEC-SETS *and* optimizes the development and implementation of the post-installation monitoring. To that end, the baseline studies are designed to characterize: 1) habitat utilization by important species and populations, including those with protections under state and federal environmental statutes; and 2) ambient signatures of two environmental stressors, electromagnetic fields and sound and noise. The preliminary baseline studies, including methodologies, locations, and timing, are described below. All survey dates are approximate and subject to change based on weather and ocean conditions and other logistical factors. In addition, sampling methods and/or frequencies may be modified slightly per coordination with and input from agencies (i.e., NMFS, USFWS, ODFW); however, the study activities will not vary significantly from what is described and considered in this document.

Associated monitoring equipment would be deployed to collect data to be used in physical and environmental studies. Most monitoring equipment would be deployed within the 2-square-nautical-mile area of interest for the PMEC-SETS facility. This equipment may include acoustic wave and acoustic Doppler current profilers, wave riders (wave measurement buoy accelerometers), acoustics data logger recovery devices, acoustic hydrophones, plankton collection plates, water quality monitoring devices (e.g., dissolved oxygen, temperature, salinity), fish tag receivers, and electromagnetic frequency monitoring equipment. However, some equipment may be deployed within a 5-nautical-mile (9.3-kilometer) radius from the area of interest to collect reference samples for comparative analyses. In all cases, equipment would be held in place by a temporary mooring and would be either floating or settled on the seafloor, without the need for fixed structures on the seafloor.

SEDIMENTARY HABITAT & INFAUNAL INVERTEBRATES

The objectives of the sedimentary habitat and infaunal invertebrate study are to characterize and describe the presence and abundance of benthic fish and invertebrate species in the area and correlate their current distributions with measureable physical factors at the site. Because NNMREC-OSU will have conducted surveys at least three times per year for two years prior to installation of the PMEC-SETS facility, the range of variability in species composition and abundance at the site will be

determined and seasonal and inter-annual patterns will be described. These data will serve as the baseline for future monitoring studies after installation.

Sampling stations will be established at 30, 40, 50, and 70 m depth along four cross-shelf transects that are spaced ~two minutes of latitude (2 nautical miles) apart in the project area for a total of 16 box core stations. At each station a single box core will be taken (three years of data at PMEC-NETS indicated high similarity between replicate cores at a station). Sediment will be characterized and collected, and infauna will be identified and enumerated. Initial sample dates are planned to occur in June, August and October 2013.

Analysis of 2013 box core data will inform whether bi-monthly sampling needs to continue at the site or if patterns are consistent with observations from the PMEC-NETS and temporal sampling frequency can be reduced. As such, additional sampling may be conducted beyond the first year of studies to further characterize baseline conditions.

Demersal Fish/Epifaunal Invertebrates and Crabs in Sedimentary Habitats

To understand the populations of demersal fish, epifaunal invertebrates and crabs in sedimentary habitats, sampling stations will be established at 30, 40, 50, and 70 m depth along three or four cross-shelf transects that are spaced ~two minutes of latitude (two nautical miles) apart in the project area for a total of 12-16 trawl stations. Sampling 12-16 stations will require two days in each season. Sampling trips are planned for June and December 2013 and February, April, June, August, and October 2014.

Bottom trawls will be conducted with a beam trawl 2 meters wide by 70 centimeters high with a 3-millimeter (mm) mesh liner the entire length of the net and a tickler chain. Trawls will be conducted along-shore for 10 minute tows; a constant speed of ~1.5 knots will be attempted, covering a distance of ~200 to 600 m for a total area swept of ~400 to 1200 m^2. A meter wheel on the sled of the trawl will provide actual measures of the distance the trawl was on the bottom. Sea stars, crabs, and elasmobranchs captured in the trawl will be identified, measured, and thrown back alive. All other collected fish will be retained for laboratory analysis where they will be identified, weighed, and measured. Gut contents of English sole, butter sole, Pacific sanddab, and speckled sanddab will be preserved for later identification. All mysid and crangonid shrimp will be sorted by species and biomass determined. Note: The beam trawl is designed to fish the bottom, with minimal incidental catch in the water column during launch and retrieval.

At the start of the first trawl day in each sampling month, nine modified (escape ring closed) crabs pots will be dropped along the 60 m depth contour. These will be left out to soak for 24+ hours and retrieved at the end of the second trawl day. All collected crabs will be sized, sexed, and released.

Birds & Mammals

Given the variability in the distribution and abundance of birds and mammals that are highly mobile, more frequent sampling is required to detect spatial and temporal patterns in species composition and abundance. NNMREC-OSU will attach two acoustic recording devices on the Ocean Sentinel (instrumentation buoy) during summer of 2013. One device will be in the frequency range for

monitoring bats and the other for birds. NNMREC-OSU will conduct strip transect bird and mammal surveys within and adjacent to the SETS site. Surveys will occur 1-2 times per month and will be conducted from sunrise to mid-day. An observer will be on board to conduct strip transect surveys during each cruise for benthic and epifaunal sampling described above, plus one additional survey during months when the other sampling is not occurring. The sampling should occur for 12 months, so every attempt will be made to conduct monthly surveys over the winter.

All sightings of mammals and sea turtles made from any sampling vessel outside of the jetties will be recorded on a standard observation form. When possible, a photo will be taken of the observed marine mammal. Opportunistic sightings of seabirds are of little value, as there are 10s to 100s at times as soon as you leave the jetties; thus, seabirds will be quantified with a dedicated trained observer as indicated above.

Passive Acoustics

NNMREC-OSU is beginning monitoring to obtain background acoustic levels at the PMEC-SETS site. The overall objective of the acoustic study is to obtain continuous and adaptive long-term passive measurements of ambient sound levels across a broad frequency range. This work is currently underway and not completed; however, preliminary results from the PMEC-NETS indicate that the ambient noise levels in and around the project site are relatively high due to breaking waves, wind, vessel traffic, marine mammals and fish. NNMREC researchers also expect the SETS to be noisier than the NETS because it is closer to ship traffic entering and exiting Yaquina Bay.

Autonomous drifting underwater hydrophone (ADUH) recordings will be collected at the study area beginning in 2013 on at least a quarterly basis. The hydrophone system will sample continuously at 32 kHz with a 13 kHz cutoff and a target depth of 10m below the sea surface. The instrument package will be deployed upstream of the predominant current, recovered and redeployed for a series of drifts through the area.

NNMREC-OSU will deploy two lander moorings equipped with upgraded (AUH) hydrophones to sample at 32 kHz with a 13 kHz cutoff. Continuous recording will occur in alternating 10 minute intervals on a 50% duty cycle. The moorings will be recovered and redeployed every 4 months. Moorings will be located “inshore” and “offshore” at TBD depths that span the bathymetric range of the PMEC-SETS project. In addition to ambient noise level measurements obtained from acoustic recordings by the hydrophones, a C-POD© will also be mounted on one of the lander systems. Acoustic detections and species identification from the C-POD instrument will provide important time series information regarding the vocal presence of marine mammals at frequencies above the 13 kHz cutoff of the hydrophones up to 180 kHz. Species common to the greater project area that will be monitored by the C-POD include Cuvier’s beaked whales, orca whales, false killer whales, short-finned pilot whale, common dolphin, Pacific white-sided dolphin, Risso’s dolphin, and harbor porpoise. The moorings will be recovered and redeployed every 4 months. Moorings will be located “inshore” and “offshore” at TBD depths that span the bathymetric range of the SETS.

Active Acoustics

The deployment of WEC devices in the PMEC-SETS facility will have effects of local waves and currents. In order to establish baseline conditions, it is necessary to measure these ambient waves and currents in the SETS facility area continuously for at least one annual cycle. This will be accomplished with landers or moorings that utilize acoustic Doppler Current profilers (ADCPs).

The ADCP for currents would operate in that range 300-400 kHz for the 58-75m depth range of PMEC-SETS. Two specific ADCPs are being considered for use in the site characterization. The Nortek AWAC's typical duty cycle would be for 40 minutes of every hour, and would ping at 1.5s intervals. Then for the other 20 minutes of every hour, it will ping at 1-2 Hz to sample for waves. The AWAC transmits at a sound power level of 195 dB re: 1µPa @ 1m. The TRDI ADCP would also sample at 1.5s intervals and would be on for 1 minute (40 pings), then off for 1 minute. The TRDI transmits at a sound power level of 216.3 dB re: 1µPa @ 1m. Pulse lengths may vary from 0.4 to 25 milliseconds. Batteries could need to be changed every 2-4 months depending on how many external battery packs are used. If necessary, a 600 kHz or 1 MHz AWAC may be mounted in a subsurface buoy mounted looking up at the sea surface from about 20 meters down, with the same duty cycle as above.

Electromagnetic Fields

Monitoring electromagnetic fields (EMF) for marine renewable energy is a newly emerging application, and mission-specific instrumentation is needed. WECs and marine cables associated with the PMEC-SETS facility will produce EMF that may have an effect on marine life. Because there is a lack of scientific knowledge about EMF and its effects, baseline monitoring will be conducted as part of the Proposed Action to determine the ambient level of EMF.

NNMREC, in coordination with Science Applications International Corporation (SAIC) under an Oregon Wave Energy Trust (OWET) funded project, developed a prototype instrumentation system for measuring EMF associated with WEC devices. This 1st generation system uses a high definition wideband EM receiver, capable of detecting ocean wave/swell frequencies, as well as power line frequencies and harmonics (see Figure 1). The receiver has three electric field and three magnetic field channels, 32-bit resolution, and 1 kHz sampling. It also has separate compass, tilt sensors. ZongeANT2 induction coil magnetic field sensors are also included, which provide a frequency passband <0.1 Hz -> 1 kHz, noise ~ 50 ft./√Hz at 10 Hz, and flat response from 1 Hz -1 kHz within ±50 mdB. In addition, short-span electric field dipole receivers, silver-silver chloride electrodes, Polyamp PA3004 high gain differential preamps providing 66 or 86 dB gain, <1 nV/√Hzat1 Hz sensitivity, -180 dB noise relative 1V at 1Hz are included.

NNMREC has also developed an advanced, 2nd generation monitoring system to characterize ambient EMF and measure EMF during an energized WEC test. While both EMF systems have nearly identical sensing capabilities, the 1st generation instrumentation is designed only to carry out "spot measurements" of EMF on the seafloor for short periods of time to establish baseline field levels over a grid of survey locations on the seafloor. The 2nd generation system can also carry out sustained time series observations at fixed locations on the seafloor, while also accommodating higher sampling rates

(4 kHz vs 1 kHz), due to the addition of a seismic sensor and a modest improvement in the magnetic field sensor noise ceiling.

EMF surveys performed under the Proposed Action would likely be performed with 2nd generation system described above; however, it is possible that the 1st generation system would be used as well. The EMF study may comment in 2013; however, the EMF surveys may not start until 2014 because the survey equipment is being used in Hawaii. Regardless, baseline EMF surveys will be performed well in advance of installation and operations of the PMEC facility. The results of this study will be used to characterize the ambient EMF levels in the area and inform post-installation monitoring design for PMEC-SETS.

OBJECTIVES AND PROPOSED FACILITIES

As a full service, grid connected test facility, SETS will provide the opportunity to optimize WECs and arrays, refine deployment, retrieval, operations and maintenance procedures, increase system reliability and survivability, and learn about potential environmental effects. NNMREC will provide assistance through each stage of testing: Deployment; Testing Plans, Protocols and Procedures; Research and Monitoring Plans (including IP plans); Device Monitoring; Environmental Monitoring; Data Analysis; Demobilization; and Removal and Decommissioning. By offering numerous WEC testing options in conjunction with transmission and grid interconnection infrastructure, SETS will facilitate wave energy technologies' progress from early-stage, ocean testing through final commercial demonstration. A sample depiction of the PMEC-SETS is shown in Figure 2.

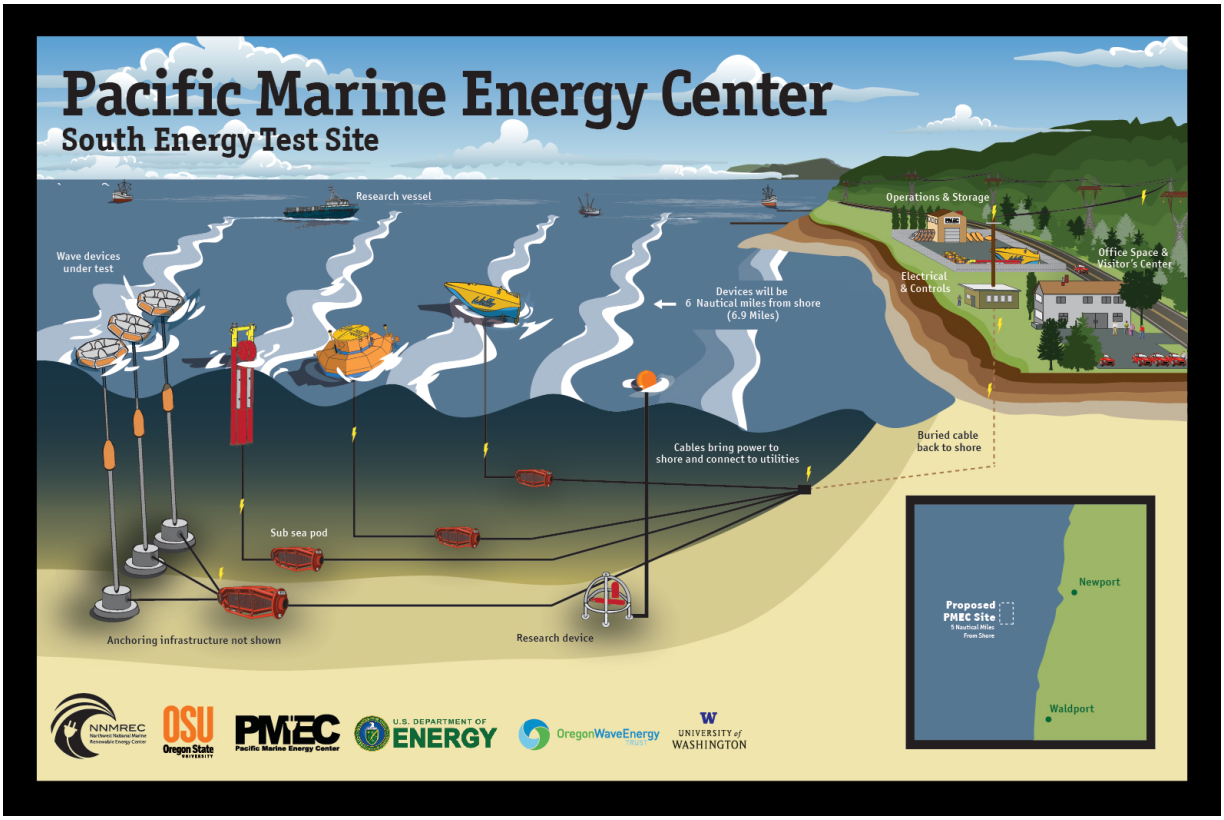


FIGURE 2: SAMPLE DEPICTION OF PMEC-SETS FACILITY

OFFSHORE FACILITIES

Primary project components would include the test berths (WECs, moored and anchored to the ocean floor), marine transmission cables, and an onshore control center to transfer power to grid. A total of four grid-connected test berths are planned, each with its own buried subsea transmission line. It is anticipated that each berth could test up to five WECs of the same type to enable array testing; however, no more than ten WECs would be deployed at SETS at one time. The maximum capacity of

SETS is anticipated to be 10 MW; the cables will vary in capacity with the largest cable expected to be 5 MW. Final project design and analysis will determine the capacity of each test berth and marine transmission cable.

WAVE ENERGY CONVERSION DEVICES

Over the lifetime of the PMEC-SETS, a number of types of WEC devices are expected to be tested. Because wave energy generation is in the early stages of development, a wide variety of technology designs are currently being conceptualized, designed, and tested. The U.S. DOE's Marine and Hydrokinetic (MHK) Technology Database, which also includes tidal, current, and thermal devices, lists over 250 different MHK technologies. [2] This lease request does not describe every possible WEC technology type or category known; instead, it focuses on those general WEC technology types that are reasonably expected to be tested at PMEC-SETS, including four types of WEC devices capable of operating in water depths of approximately 60 meters.

More specific technical details regarding the devices expected to be tested will be developed during the regulatory process. To this end, NNMREC-OSU is working with OWET to gain information directly from developers interested in testing at PMEC-SETS. Such details will be included in the technical and environmental documentation developed to support lease review, approval and issuance. A general description of the anticipated types of WEC designs is provided below; examples are included in Appendix G.

- **Pitching/surging/heaving/sway devices** are any of several device designs that capture wave energy directly without a collector by using relative motion between a float, flap, or membrane and a fixed reaction point. The float, flap, or membrane oscillates along a given axis depending on the device and mechanical energy is extracted from the relative motion of the body part relative to its fixed reference.
- **Oscillating water columns** (OWC) are partially submerged structures in which water enters a chamber through a subsurface opening. Wave action causes the captured water column to move up and down like a piston, forcing the air trapped above the water column to move through an opening connected to a turbine. No water travels through the turbine blades during the operation of this type of WEC device. Although there are shore-based and floating OWC designs, only floating types could be tested at SETS.
- **Point absorbers** are floating or submerged structures with components that capture energy from the vertical motion of waves, which drives electromechanical or hydraulic generators. Point absorbers may be fully or partly submerged, floating or rigidly anchored, and are relatively small compared to the wave length.
- **Horizontal Pendulum** WECs have structural hulls that contain all moving parts, thus no components are exposed to the ocean. Inside, the device will have a pendulum that rotates with pitch, roll and sway of the ocean waves**.**

[2] Available online at: http://www1.eere.energy.gov/windandhydro/hydrokinetic/default.aspx

Mooring Systems

Because a number of different WECs could be tested at the project site, the specific anchors and mooring configurations will vary somewhat. However, because the physical and environmental conditions within the project site are relatively uniform, it is unlikely that the types of anchoring and mooring systems would vary significantly. Anchoring systems could include gravity-based anchors (GBAs), drag anchors, deadweight anchors, suction-installed pile anchors, and/or plate anchors. It is possible that some devices could utilize the same anchors, and possibly mooring lines; for example, if an incoming WEC device could utilize an anchor and/or mooring configuration already in place, then the system could be left in place between tests to limit bottom disturbance.

Little information on WEC mooring designs is available to the public; however, it is expected that all mooring configurations at SETS would require relatively taut lines capable of tensioning large devices. While three- to four-point anchoring layouts could be used, NNMREC is researching the feasibility of single point moorings, a configuration which is desirable for both stakeholders, such as fisherman, as well as device developers.

It is anticipated that WEC devices, mooring buoys, and any subsurface floats would be coated with an antifouling paint to prevent marine life from colonizing on these project components; however, NNMREC-OSU would require that all WEC devices to be tested at SETS use only TBT-free antifouling paints and coatings. Details specific to anchoring and mooring systems will be provided in the technical and environmental documentation developed to support lease review, approval and issuance.

Construction & Installation

No on-site construction activities in the area requested for lease would be associated with the PMEC-SETS. All project components would be constructed at land-based facilities prior to being installed at the project site. Existing pier facilities (described in the Port and Marine Infrastructure section) would serve as mobilization sites. The marine transmission cables, WECs, mooring and anchor systems, navigational buoys, and monitoring equipment, would be staged at mobilization sites for the installation vessels to pick up and transport to the project site.

Installation of the mooring systems would occur prior to WEC deployment. The Oceanus[3], a mid-sized research vessel which accommodates a crew of 12 and a scientific party of 19 for up to 30 days at sea, is one candidate vessel for deploying the mooring systems. Once the anchors and mooring systems are in place, the WECs would be deployed. The WECs would be transported by truck, barge, or marine tow transport to Newport for deployment. Identification of applicable permits required for shipment would be the responsibility of the WEC developer. If transported from a foreign build location, proper permits and licenses would be required to enter the U.S. Prior to deployment, pier-side tests would be performed to check the operation and integration of all equipment to verify the readiness of systems for mooring, connection, power transmission, and shore communications.

WEC deployment plans would be unique to each device; however, it is anticipated that the WECs would be towed or barged to the site, configured, and attached to the mooring system. An example vessel

[3] Specifications for OSU Research Vessels can be found at http://ceoas.oregonstate.edu/ships/.

likely to be used for this task is The SEACOR QUEST, a 160-foot vessel out of Astoria. Once the WEC is attached to its mooring system, it is anticipated that a trunk cable would be attached to the WEC device to connect it to the subsea transmission cable. A detailed plan would be developed by NNMREC in coordination with the device developer to address each WEC installation and connection to the subsea transmission cable.

Each test berth at PMEC-SETS will include a subsea power and communications cable and connector system. The design is expected to be similar to the connectors utilized by the EMEC. Each WEC will require a technology-specific cable design for the portion of cable connecting to their device. The WEC cable design must comply with the cable and connector requirements of PMEC in order to ensure compliance. A subsea connector that will rest on the seabed; a mooring line and marker float would be used to hoist the connector to the deck of an operations vessel, where the PMEC connector would be mated to the WEC connector. Once the connection is made, the mated connectors would be lowered to the seabed.

Operations & Maintenance

NNMREC-OSU will require that the technology developers submit formal plans for review and approval prior to the installation of any WEC. In addition to Installation/Removal Plans and Anchor/Mooring Plans, each developer will be required to provide plans for Operations and Maintenance, Spill Contingency and Response, Emergency Response and Recovery, Safety Management Plan, and Navigational Lighting. All WEC device tests would also be subject to the conditions identified in the Lease Agreement, FERC License Order and Final NEPA documentation for the PMEC-SETS. Details specific to Operations and Maintenance procedures will be provided in the required technical and environmental documentation to support project approval and lease issuance from the BOEM.

Removal & Decommissioning

In addition to the plans noted previously, NNMREC-OSU will require each technology developer to submit Removal and Decommissioning Plan for each WEC device tested at PMEC-SETS. In addition, NNMREC-OSU will develop a Removal and Decommissioning Plan for SETS as part of the final project design, which will be provided as part of the technical documentation to support project authorization.

Anchors could be retrieved by a vessel with adequate assets and load-handling capabilities or decommissioned on site if they would be used for the next WEC test. If being removed completely, the anchors and mooring lines would likely be retrieved by attaching a recovery line to the anchor and then winching it to the surface. This may be accomplished using a remote-operated vehicle (ROV). It may be possible to recover the anchors by using the mooring lines; if this is the case, the ROV would not be needed. Suction-installed pile anchors could be retrieved by pumping water into the anchor chamber, creating positive pressure that forces the embedded anchor out of the sediment. If decommissioned on site, embedment anchors such as plate or pile anchors could also be cut off at the ocean floor using underwater acetylene torches, leaving the buried portion of the anchor in place.

As mentioned previously, the intent would be to limit removal of the anchors to the greatest extent possible to limit bottom disturbance; however, anchor removal and replacement could occur

periodically consistent with the terms of the lease agreement and other project authorizations. If the WECs are to be disposed of after the testing period, NNMREC-OSU would require that all device and all associated materials are disposed of in accordance with federal, state, provincial, and local environmental control regulations and at permitted facilities. Throughout this process, NNMREC-OSU would coordinate with the WEC developers to ensure conformance with any conditions identified in the Lease Agreement, FERC License Order and/or Final NEPA documentation to ensure a smooth and orderly removal.

Although a variety of WECs would be tested at SETS, it is likely that the equipment and procedures employed in removal and decommissioning of each test would be very similar to those employed in the removal and decommissioning of the 2012–2013 WET-NZ test at the PMEC-NETS. A detailed removal and decommissioning plan would be prepared for each WEC device tested at the SETS site. In general, when a WEC test is complete, the device would be de-energized and vessel of opportunity would be used to disconnect the subsea cable. With the cable detached, the WEC device and its mooring system would be removed from the test site.

Power Transmission & Grid Interconnection

The PMEC Conceptual Design Report was completed in March 2013 and can be found in Appendix H; much of the detail for this section of the application can be found in that report. Various alternatives concerning power transmission, cable routings, and grid infrastructure were considered, as well as cost. This study will be used as a core input to the PMEC-SETS design process. The "Newport Site Proposal for PMEC" (provided in Appendix F) also includes information about possible cable landing points for electrical grid interconnection.

Marine Transmission Cables

Marine transmission cables would transmit energy, as well as performance and environmental data, from the SETS test berths on the OCS through the Territorial Sea to an onshore connection point. Four marine transmission cables are planned, one for each test berth. Marine transmission cable alternatives (e.g., voltage, materials, lengths, etc.) were considered in detail PMEC Conceptual Design Report. The PMEC-SETS design will include a comprehensive set of engineering and operational requirements that minimize risks to equipment and personnel. In addition, each deployed project will undergo a thorough review process in order to ensure compliance with PMEC requirements.

As noted previously, conceptual plans for offshore power cables was considered in detail in the PMEC Conceptual Design Report (Appendix H). The report provides preliminary guidance for how to design specific aspects of PMEC-SETS. This topic will be fully developed during SETS design. TE Subcom's Global Sentinel, stationed in Portland, Oregon may be capable of installing the SETS subsea cables. Since the final design of the cables has not yet been determined, precise vessel requirements are unknown. Vessels might be commissioned between other larger projects, a possibility that will be pursued for cost savings potential. Cable crossings are not anticipated at this time. Considerations for cable crossings, including cable protection requirements, will be developed in the desktop study and cable survey, if applicable.

In addition to evaluating marine cable options, NNMREC-OSU is coordinating with resource agencies on the environmental characteristics of the area that cables would transit to help determine the best configuration for SETS. While coral reef interactions are not anticipated for this project, rocky reefs or other geophysical features could be affected by the cable installation process. Potential effects will be identified during the cable routing survey, and should coral reef interactions be identified, mitigation measures will be developed prior the further progression of the cable routing design. NNMREC-OSU is also consulting with the U.S. Army Corps of Engineers and the Environmental Protection Agency in regards to their activities and jurisdiction over, respectively, dredging activities and ocean disposal sites. Additional information about the marine transmission lines and cable routes is being developed as part of the final project design and will be provided in the technical and environmental documentation to support lease review, approval and issuance from the BOEM.

Onshore Cable Landing Options

Six marine cable landing options were identified and studied by the Newport community siting team; the three preferred options identified by the community are listed below:

- **Lost Creek State Park**: 6.5 NM distance from ocean site, public ownership (Oregon State Park), mid-range marine cable run, shortest PUD cable run, fewer rocky reef issues.
- **South Beach State Park:** 5.5 NM distance from ocean site, public ownership (Oregon State Park), multiple landfalls, existing infrastructure and access, rocky reef issues.
- **Yaquina Bay South Jetty:** 6 NM distance from ocean site, public ownership (Oregon State Park), P-2/Public Recreation zoning, existing infrastructure and access, close to ship channel, rocky reefs, highest cost.

Additional on-shore cable options identified in the Newport community site proposal for PMEC (Appendix F) include Don Davis Park/Nye Beach, Lighthouse State Park, and Thiel Creek. Preliminary evaluation indicates that Lost Creek State Park is the only landfall option without rocky reef issues. In addition, it has the shortest on-shore cable run and is the most southerly option, which could be advantageous if the PMEC-SETS site is located in the southern portion of the project area. South Beach State Park was also identified as a preferred option by the Newport site team, as it has multiple landfalls, existing infrastructure and access, and it is the closest to the PUD South Beach Power substation. However, there are potential issues with the marine cable routes to this landfall location because of nearby rocky reefs and dredge spoil areas. Similarly, the proximity of the Yaquina Bay South Jetty site to rocky reefs, dredge spoil areas, and the commercial shipping channel limit the options for marine cable routes and increases the costs of shore-connection. While this option has existing infrastructure and access, it may be subject to additional restrictions because it is zoned as a Public Recreation area.

As part of the final project design process, NNMREC-OSU is conducting further analysis to determine optimal onshore-cable landfall locations and grid-interconnection points for SETS. NNMREC-OSU is also coordinating with resource agencies to ensure all relevant environmental information is considered, including seafloor substrate, rocky reefs, biological resources, cable routes, and other issues. Information about the onshore cable landing point will be provided to the BOEM as soon as the location

is determined, and further details will be included in the technical and environmental documentation developed to support project review.

GRID-INTERCONNECTION

The Central Lincoln Public Utility District (CLPUD) has high capacity (12.5 kV) distribution lines along Highway 101 from Newport to Seal Rock, close to potential cable landing sites for SETS. NNMREC-OSU began coordinating with PUD representatives in 2012, and they have confirmed that grid interconnection for SETS is viable anywhere on the coast adjacent to the proposed project site. Connection of PMEC to the local grid will require standard grid connection equipment typical for industrial users. Power conditioning and other electrical operations will be integrated into the onshore facility prior to being connected to the grid infrastructure In addition, the CLPUD has experience installing and operating SCADA, ION metering, Distribution Automation, Smart Grid technologies and fiber optic communications. This expertise, along with the CLPUD's proven track record of operating a highly reliable system, will facilitate a successful test facility operation at SETS.

NNMREC-OSU is also coordinating with Bonneville Power Authority (BPA) in regard to power transmission and grid-interconnection for SETS. The CLPUD has existing telemetering with BPA's Toledo substation, which would allow metering as required to meet federal interconnection requirements. In addition to power transmission and grid-connection, NNMREC-OSU is also exploring power purchase options with the CLPUD and BPA.

Grid integration and transmission feasibility studies have not yet been developed. Once the cable routing survey and desktop study are completed, the application for grid interconnection will be developed and submitted to BPA, in collaboration with CLPUD. The application submittal will place the SETS project into the BPA project queue and will result in the development of a grid interconnection study by BPA. This study will help to ensure that the proper design requirements are developed during SETS design.

TERRESTRIAL INFRASTRUCTURE

Alternatives for terrestrial infrastructure were developed in detail in the attached PMEC Conceptual Design Report (Appendix H) and the Newport Site Proposal for PMEC (Appendix F). Each of the potential grid connection locations for PMEC-SETS subsea cables (as described above) calls for a directionally drilled casing that would house the cables through the transition from sea to land. The subsea cables would be terminated and transitioned to terrestrial-based cabling technologies. It is anticipated that this would occur in a small onshore structure where electrical switchgear and conditioning equipment, as well as monitoring and communications equipment, will be located. This is expected to require a new structure with a relatively small footprint, since primary data acquisition, controls, monitoring and other equipment will be located at a separate site. The existing fiber optic infrastructure available at the land-based connection location will enable this configuration.

CLPUD has stated that they can handle additional capacity of up to 6.5 MW; NNMREC-OSU will coordinate with both CLPUD and Bonneville Power Administration on upgrades necessary to

accommodate the planned 10MW generating capacity of PMEC-SETS. Details of grid connection will be determined with CLPUD once on-shore connection location is specified.

Since Newport, Oregon was selected as the location for PMEC-SETS, NNMREC plans to leverage the Hatfield Marine Science Center (HMSC) facilities for office space. In addition, HMSC is home to a visitors' center that reaches over 150,000 visitors per year; NNMREC will work with HMSC to provide outreach to the broad community about marine energy.

Onshore Support Facilities & Staging Areas

Maritime vessels will be used for a multitude of activities related to the lifecycle of PMEC-SETS. Specialty vessels are often utilized for specific activities such cable routing surveys, cable installations, and WEC project deployments. The actual vessels that will be utilized for some specialty activities have not yet been identified. Vessel requirements for SETS installation will be developed during final design, including the indication for needed vessel capabilities. Future vessel requirements for utility-scale WEC devices must have significant lifting capabilities, which cannot be currently met by existing vessels. Vessels currently available in the region for operational activities include typical tug boats, simple barges and fishing vessels. Rigid-hulled inflatable boats (RHIBs) are often used for everyday observation and survey activities. The UNOLS vessels staged in the Newport area are available for OSU activities, including the R/V Oceanus and the R/V Pacific Storm. Privately held companies such as NRC Environmental Services regionally operate vessels, which stages vessels in Astoria, Oregon.

A key benefit of the Newport area is that it has the necessary infrastructure, services expertise, and maritime capability to support the needs of the development of offshore wave energy projects. Stakeholders in this supply chain include ports, boat yards, maritime services, fabrication and welding. NNMREC-OSU and Northwest Energy Innovations (NWEI) successfully leveraged this regional supply chain for the successful deployment of the WET-NZ device in summer 2012. An extensive supply chain analysis is forthcoming, which is being procured as part of NNMREC's PMEC pre-design process.

The Ports of Newport and Toledo would likely serve as the primary staging areas for PMEC-SETS. In addition to the resources available in Newport and Toledo, NNMREC-OSU has identified facilities and services in and around Yaquina Bay to support installation, operations and maintenance, and removal/decommissioning activities.

Port of Newport

The Port of Newport is one of only three deep draft ports on the Oregon coast, and its facilities includes the Newport International Terminal, a commercial fishing vessel marina, and a recreational vessel marina (the South Beach Marina). It has traditionally serviced the forest product industry and is served by Land – Sea – Air – Rail. As a commercial shipping port, there will be ample opportunity for inbound and outbound freight needed to support SETS activities, and the nearby municipal airport can handle jet traffic and daily air shipping. The Newport International Terminal is a crucial link between Oregon's central coast highways and the movement of marine commerce. The International Terminal includes two docks, warehousing, and administrative offices, and an on-site customs agent for international freight. The Port of Newport recently expanded the International Terminal facilities with refurbishments

and upgrades, and additional moorage and support facilities were added after the Port of Newport was selected for NOAA's Marina Operations Center-Pacific Homeport in 2009.

National Oceanic and Atmospheric Administration Marine Operations Center

In August 2009, the National Oceanic and Atmospheric Administration (NOAA) signed a 20-yearlease with the Port of Newport for the Marine Operations Center-Pacific (MOC-P). On August 20 and 21, 2011, NOAA celebrated the construction of the MOC-P in the Port of Newport with a 2-day dedication event. The Newport facility includes a 1,300 foot-long pile-supported berthing pier in Yaquina Bay, a small boat dock, and a group of upland facilities, including buildings and site improvements. The facilities can support six NOAA vessels, 60 shore side personnel, and 110 crew members.

Ocean Observatories Initiative

The Ocean Observatories Initiative (OOI) is a National Science Foundation – Division of Ocean Sciences program that focuses the science, technology, education, and outreach of an emerging network of science-driven ocean observing systems. The OOI will conduct ocean science using an integrated ocean observatory with a network of interactive nodes studying interrelated ocean processes on coastal, regional, and global spatial scales. The Endurance Array is a multi-scale array utilizing fixed and mobile assets to observe cross-shelf and along-shelf variability in the coastal upwelling region of the Oregon and Washington coasts. This array will consist of six observation sites—three off the coast of Newport and three near Grays Harbor, Washington—and a network of surface moorings, seafloor platforms, and undersea gliders. However, none of the OOI components off the coast of Newport would be located within the SETS project site. Construction and instrument testing began in 2011, and installation is planned to begin by mid-2013.

Port of Toledo

In addition to the Port of Newport, the nearby Port of Toledo provides important marine services and infrastructure that can support the SETS facility. The Port of Toledo, which is located approximately 5 miles in-land from Newport harbor, features 25-ton and 85-ton mobile boat lifts, a 200-ton floating dry dock, a 15-ton hydro-crane, and man-lifts and forklifts. As an open boatyard, outside marine service vendors are licensed to work through the port facilities and all aspects of vessel maintenance can be performed through either boatyard staff or local service providers. Marine electricians, welders, fitters, hydraulic specialists, sandblasting and painting services are readily available, and these capabilities and experience will serve wave energy developers. Toledo is served by rail that loops through the city and serves several locations, connecting inland along the Yaquina River toward Corvallis. Regular dredging maintains the channel for barging or towing out to sea.

The Port of Toledo's land, buildings, equipment and infrastructure provide an excellent staging area for WEC assembly and maintenance of wave energy devices in a protected environment, and the fully functioning docks and lifts can support WEC deployment and removal activities. NNMREC-OSU has already established a close working relationship with the Port of Toledo, and the boatyard supported the staging, outfitting, launch, and retrieval of the Ocean Sentinel instrumentation buoy and the WET-NZ wave energy device in 2012. In addition to having demonstrated capability to support wave energy development, the Port of Toledo recently completed and adopted a Strategic Business Plan that

highlights its Boatyard Build-Out Plan. The permits for the in-water portion of the project have been filed, and construction is set to commence in November 2013. With the expansion of the boatyard to include a 300-ton mobile lift and a covered high-bay work area, the Port of Toledo could easily support existing and future SETS service and storage needs.

REGIONAL MARINE AND INDUSTRIAL INFRASTRUCTURE PORT OF TOLEDO

In addition to the resources available in Newport and Toledo, NNMREC-OSU has identified sites and services in and around Yaquina Bay to support SETS installation, operations and maintenance, and removal/decommissioning activities.

- *American Bridge Manufacturing* – Located on Bolon Island on the main Umpqua Channel, a heavy manufacturer of structural steel buildings, bridges, and complex structures. ABM has a 32 acre industrial site directly served by rail, with 150 ton lift capacity and direct water access.

- *Fred Wahl Marine* – Fishing and utility shipbuilder located in Reedsport, with marine rail access to the main Umpqua Channel.

- *Reedsport Machine and Fabrication* – Located in the Winchester Bay Marina, Reedsport Machine and Fabrication specializes in boat repair, machining, and specialty fabrication with 80 ton haul out capacity.

- *ORCA Divers* –Industrial diving and marine construction business in Winchester Bay; experience with underwater construction, demolition and salvage; participated in the 2012 WET-NZ deployment at the NNMREC-OSU Non-Grid Test facility in summer 2012.

- *Port of Umpqua Dock* – Commercial dock at the Winchester Bay Marina that supports the local fishing and marine businesses. The dock has a crane capacity of 3,200 pounds, and dockside storage available.

- *Knife River Graving Dock* – Located on the east side of Bolon Island, the Knife River Graving dock facility includes a tide served graving dock with access to the main Umpqua Channel on a 4 acre industrial site.

- *Knife River / LTM Gravel Yard* – Located at the east entrance to Reedsport along Highway 38, the yard is an approximately 10-15 acre industrial site with access to the main Umpqua Channel.

- *International Paper Gardiner Mill Site* – The International Paper Gardiner Mill Site is 330 acres of industrial property with dock access to the Umpqua side channel and turning basin.

- *Oregon International Port of Coos Bay* – Oversees maintenance and development of the Coos Bay deep water channel and channel-served industrial properties. The Port owns and operates many dock and marine properties along the channel, and is a conduit to the other marine industries in the area.

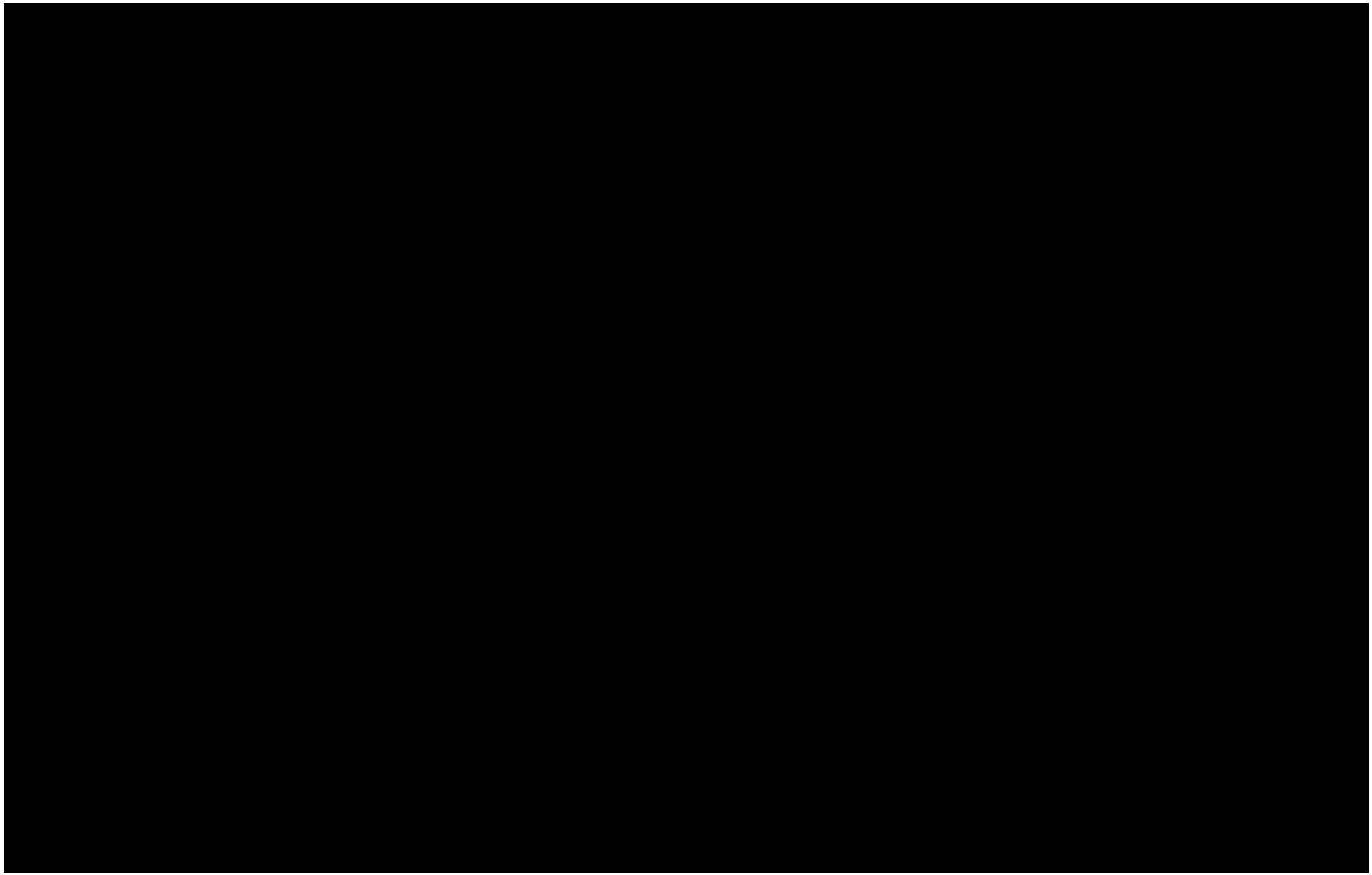
- *Knutson Towboat* – Knutson Towboat Company provides ship assist services, barge towing, dock services, fabrication and repair, and shipbuilding services in the Coos Bay area.
- *Sause Brothers Ocean Towing* – Provides ocean towing, cargo handling, ship assist, and marine construction and repair services; owns and operates fleet of towboats and cargo serving West Coast U.S.
- *Coos Bay Towboat* – Ship assists and pilot services.
- *Southern Oregon Marine* – Constructs, modifies, and maintains tugs, barges, and other marine vessels. SOMAR has large dockside cranes and dry-dock capacity.
- *DB Western* – DB Western is a pressure vessel and processing equipment fabricator with access to the Coos Bay main channel through a port owned dock; has performed vessel repair and marine equipment fabrication at its North Spit location.
- *Giddings Boat Works / Tarheel Aluminum* – Located in Charleston near the Coos Bay entrance, builds, modifies, and repairs commercial fishing vessels and workboats.

GENERAL SCHEDULE OF ACTIVITIES

The PMEC-SETS site selection process was completed in January 2013, and the submittal of this lease request marks the initiation of the BOEM leasing process. NNMREC-OSU plans to initiate the Federal Energy Regulatory Commission (FERC) Licensing Process this summer [redacted]. Pre-design of the SETS project is also underway and will be completed prior to the submission of the License Application to FERC, which is expected to occur in [redacted] The precise sequence of the overall regulatory process will depend on a variety of factors, but NNMREC-OSU anticipates completing the regulatory process in [redacted]

Upon completion of the regulatory process, the project will enter the installation phase, and NNMREC-OSU expects to begin installation activities [redacted]. The subsea cables and test berths (e.g., mooring systems, monitoring equipment, and navigational aids) will likely be installed at the same time, but it is possible that the infrastructure will be installed in stages. Regardless, NNMREC-OSU plans to commence SETS operations in [redacted] with the deployment of the first WEC(s) at the facility. It is expected that each WEC deployed will be tested for one – three years, although this duration will depend on specific technology developer's needs. Based on experiences of other renewable energy test facilities, such as the National Renewable Energy Laboratory and the EMEC, PMEC-SETS is expected to operate for up to 25 years; as such, NNMREC-OSU is seeking a 25 year term for this research lease, with final lease terms to be negotiated with BOEM at a future date and identified through the regulatory process.

[redacted]



OCS Leasing Timeline

As part of the development of the regulatory strategy for the PMEC-SETS, NNMREC-OSU has implemented a collaborative process involving the relevant agencies and stakeholders to collectively explore the project and identify key regulatory and environmental considerations. NNMREC-OSU began engaging with BOEM and the Federal Energy Regulatory Commission (FERC) in fall 2012 to share information about PMEC-SETS and prepare for the regulatory process. In January 2013, NNMREC-OSU formed the PMEC Regulatory Work Group, which is comprised of the primary federal and state agencies involved in the permitting process. In coordination with this group, NNMREC-OSU has identified the various authorizations that will be needed for the PMEC-SETS facility. These authorizations are shown in Tables 2 and 3 below.

Required Authorizations, Approvals & Permits

The primary authorizations required for PMEC-SETS are listed in the table below; as noted, the precise process sequence and authorization instruments will depend on a variety of factors.

TABLE 2: REQUIRED AUTHORIZATIONS, APPROVALS & PERMITS

Agency	*Authorization*
Federal Energy Regulatory Commission	Hydroelectric License
	Small Grid Interconnection Approval
	NEPA Compliance
Bureau of Ocean Energy Management	Renewable Energy Research Lease
	NEPA Compliance
U.S. Army Corps of Engineers	Nationwide Permit 52
U.S. Department of Energy	NEPA Compliance (for funding action)
U.S. Coast Guard	Private Aids to Navigation Permit
	Notice to Mariners
U.S. Fish and Wildlife Service	Migratory Bird Treaty Act Compliance
	Endangered Species Act Section 7 Consultation
National Marine Fisheries Service	Endangered Species Act Section 7 Consultation
	Magnuson-Stevens Act Consultation
	Marine Mammal Protection Act Consultation
Environmental Protection Agency	Section 401 Water Quality Certification (Federal Waters)

Agency	Authorization
Oregon Department of Environmental Quality	Section 401 Water Quality Certification (State Waters)
Oregon Department of Land Conservation & Development	Coastal Zone Management Consistency Determination
Oregon Department of Fish & Wildlife	Compliance with State fish and wildlife management mandates and conservation goals
Oregon Department of State Lands	Easements for Cables in Territorial Sea
Oregon Parks & Recreation Department	Ocean Shore Permit
State Historic Preservation Office (OPRD)	Cultural Resources Review
Lincoln County Planning Commission	Land-Use Compatibility Statement
Bonneville Power Administration	Interconnection Approval

Additional Authorizations

Depending on the final project design, additional authorizations may be needed, which may include (but are not limited to) the following:

TABLE 3: POTENTIAL AUTHORIZATION, APPROVALS AND PERMITS

Agency	Authorization	Project Structure/Activity
U.S. Army Corps of Engineers	National Pollution Discharge Elimination System Permit	construction on onshore facilities (if discharge meets thresholds)
	Wetlands Permit	Placement/construction of onshore facilities in wetlands area
Oregon Department of State Lands	State Removal/Fill Permit	Marine transmission cables within state waters, (if meet thresholds)
	Right-of-Entry Authorization	Site assessment Studies (e.g., geophysical surveys)
Lincoln County	Wetlands Permit	Placement/construction of onshore facilities in wetlands area

Agency	*Authorization*	*Project Structure/Activity*
U.S. Coast Guard	Restricted Navigation Area	WEC berths, cable corridor
Oregon Fish & Wildlife Commission	Fishing Closure	Marine Transmission Cable Corridor (within state waters)
National Marine Fisheries Service	MMPA Permit/Incidental Take Statement	Installation/O&M/Removal Activities; presence of WECs, cables (if meet thresholds)
Environmental Protection Agency	Water Pollution Control Facilities Permit	onshore storm water management system
	Air Quality Permit	Installation/O&M/Removal Activities (if meet threshold)
State Historic Preservation Office (OPRD)	Cultural Resources Management Plan	If cultural/historic resources at project site
Property Owner *(State or Private)*	Interconnection Easement	cable landfall/grid interconnection infrastructure

LEASE REQUEST PROCESS

The PMEC-SETS regulatory process will officially commence with the lease request process. Upon receipt of this lease request, BOEM will conduct an internal review and share the lease request with the Oregon Interagency Task Force. BOEM will then publish a Request for Interest (RFI) in the Federal Register (FR), followed by public comment period (likely 45 days). After reviewing and addressing any comments, BOEM will publish a Determination of No Competitive Interest (DNCI) in the FR. [redacted]

Within 60 days of the DNCI, NNMREC plans to submit a Request for Departure from the SAP Requirements to BOEM. Shortly thereafter, NNMREC-OSU plans submit a Notice of Intent (NOI) and Preliminary Application Document (PAD) to FERC. Coordinating the timing of the Request for Departure with the NOI/PAD could better enable BOEM and FERC to conduct Joint NEPA Scoping. During the Joint NEPA Scoping, NNMREC-OSU will provide draft environmental monitoring plans with the agencies for their review and feedback.

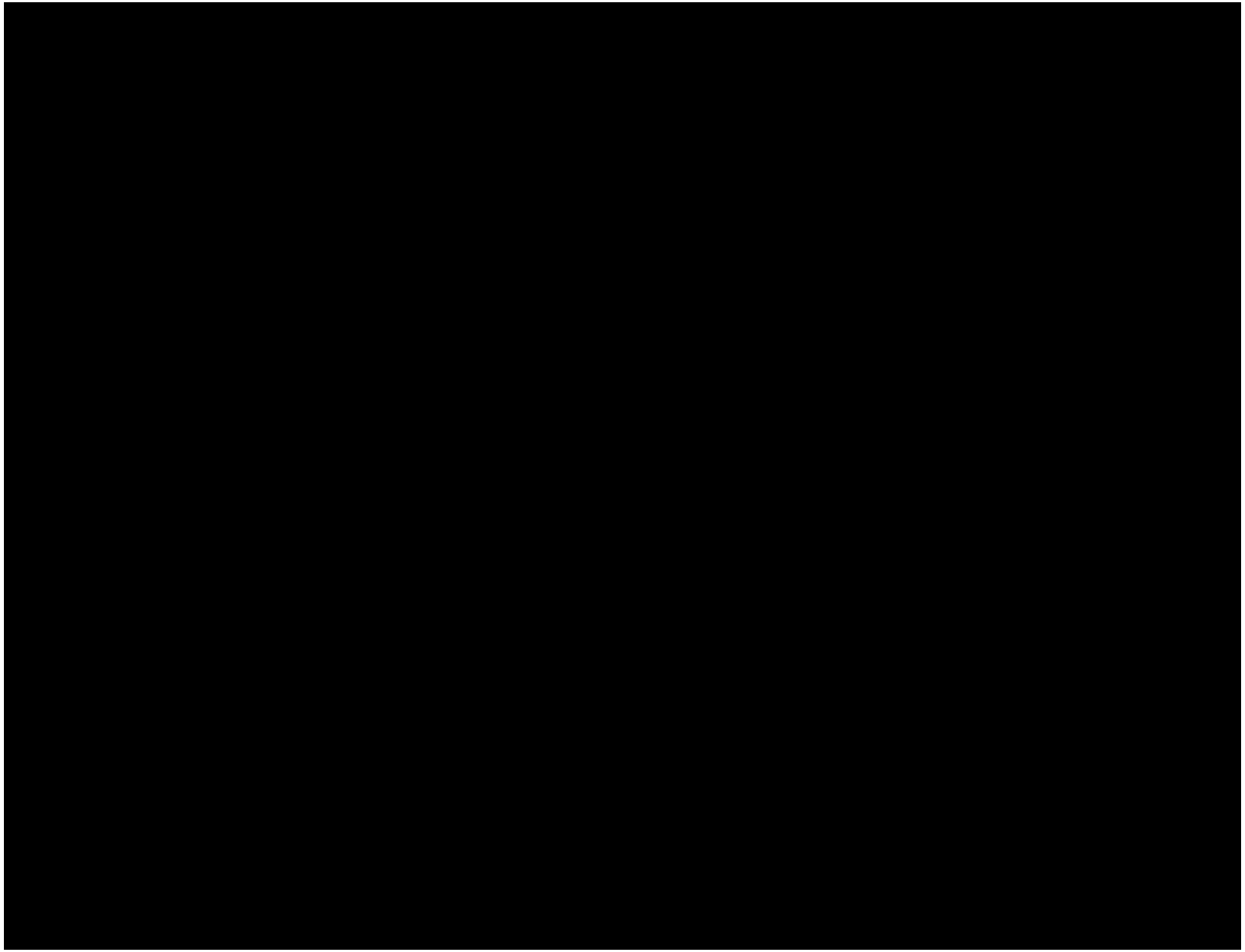
In conjunction with the NEPA Scoping process, NNMREC-OSU will prepare a Draft License Application (DLA), which will in information needed to support review and decision-making for both the Lease and License. After submitting the DLA, a comment period will follow to provide an opportunity for agencies and stakeholder to review and provide feedback on the proposed project. Input from the NEPA Scoping and DLA comments will help to inform the final project design and environmental monitoring plans, as well as the Draft EA/EIS and Biological Assessment (BA). The revised project description and environmental monitoring plans will be submitted as part of the Final License Application (FLA) that NNMREC-OSU will submit to FERC and BOEM.

Shortly after submittal of the license application, NNMREC-OSU will request a Land Use Compatibility Statement (LUCS) from the Lincoln County Planning Department. Once the LUCS is issued, NNMREC-OSU will submit a Joint Permit Application to the Corps of Engineers (the Corps) and the Department of State Lands (DSL) for a Nationwide Permit (NWP) and Removal-Fill Permit, respectively. In addition, NNMREC-OSU will include a Statement of Consistency with the federal permit applications to support the Department of Land Conservation and Development (DLCD) in its CZMA Consistency Determination for the FERC License, BOEM Lease and Corps Permit. Similarly, NNMREC-OSU will include documentation to inform the Department of Environmental Quality's Water Quality Certification (WQC) review for the License, Lease and NWP.

After completing their internal agency reviews, it is anticipated that FERC and BOEM will publish a Draft EA/EIS, which will commence a public comment period. Next, NNMREC-OSU will provide a Biological Assessment to the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) to support consultation with the Corps, FERC and BOEM under their respective statutory authorities (i.e., ESA, MMPA, etc.). At the same time, NNMREC-OSU will submit an application to DSL for the Cable Easement, as well as Ocean Shore Permit application to the Oregon Parks and Recreation Department (OPRD). Finally, NNMREC will submit a Private Aids to Navigation (PATON) Permit application to the US Coast Guard.

Upon completion of the NEPA analysis and internal agency reviews, FERC and BOEM will publish a Final EA/EIS with responses to agency and stakeholder comments. Consultation with NMFS and USFWS will conclude around the same time, at which time NMFS and USFWS will issue their determinations and conditions for the FERC License, BOEM Lease and NWP. Once DLCD, DSL, DEQ, and the OPRD will complete their reviews and issue the respective state permits, DLCD will issue its Determination of Consistency. The WQC and PATON Permit will also be issued around this time.

Once all the environmental compliance determinations have been made and the state permits are in place, the Corps will issue the NWP and BOEM will issue the Lease. Finally, FERC will issue the License Order, along with any conditions required by NMFS and USFWS. [redacted]



WAVE ENERGY RESOURCE DATA

In 2011, the U.S. Department of Energy released a technical report on the wave energy resources, titled Mapping and Assessment of the United States Ocean Wave Energy Resource.[4] This report, created by the Electric Power Research Institute, assesses ocean wave energy potential along the U.S. coasts. Researchers at Virginia Tech and DOE's National Renewable Energy Laboratory supported the report and data validation. According to the report findings, the total annual available wave energy along the Outer Continental Shelf off the coast of Oregon is 116 TW/h per year. In addition, NREL integrated data from the report into the "MHK Atlas, an online atlas that maps U.S. wave energy resources. A recent query of the MHK Atlas for wave energy resources in the area of interest showed Annual Average Significant Wave Heights (SHs) are 2.15 meters at 8 - 9 second energy periods, with an Annual Average Wave Power Density of 31.1 kW/meter. [5]

ENVIRONMENTAL RESOURCES

The marine environment off the coast of Newport, OR has been characterized in a large number of studies, due largely to research and sampling programs performed by OSU's School of Earth, Atmospheric and Oceanic Sciences (CEOAS) and local presence of the Hatfield Marine Science Center (HMSC). The following section provides an overview of the environmental conditions and attributes of the proposed research lease area, including ESA-listed species and designated critical habitats.[6] Site-specific studies, along with additional stakeholder engagement, will be conducted as part of the site characterization activities to establish environmental baseline conditions. Results of these activities will help inform final project design, potential effects analysis, and post-installation monitoring plans for the PMEC-SETS.

> *NOTE: The environmental information provided here is intended to serve as a starting point, as this unsolicited request for a research lease is an initial component of the overall regulatory process. Additional information will be provided to inform future NEPA analysis for specific components of the authorization process (e.g., Lease Issuance, FERC Licensing), as well as through subsequent environmental documentation for other aspects of the regulatory process (e.g., Biological Assessment).*

[4] Available at: http://www1.eere.energy.gov/water/pdfs/mappingandassessment.pdf
[5] Source: http://maps.nrel.gov/mhk_atlas; accessed January 29, 2013.
[6] Much of this information has been adapted from the Final Environmental Assessment prepared in 2012 for the PMEC-NETS, given its close proximity to the area requested for lease. The Final EA is available at http://energy.gov/nepa/downloads/ea-1917-final-environmental-assessment.

Air Quality

Air quality throughout the state is regulated by the Oregon Department of Environmental Quality (ODEQ). Baseline ambient air quality in the vicinity of Newport, Oregon is acknowledged to be good, and Lincoln County, Oregon is in attainment[7] for all air pollutant criteria measured by the U.S. Environmental Protection Agency (EPA; EPA 2012). Population density throughout Lincoln County is low and there are few major industrial facilities within a few miles of the coast. ODEQ does not operate any air quality monitoring stations in Lincoln County, acknowledging the limited potential for local air quality concerns. The Proposed Project would emit only small amounts of air pollutant emissions, as discussed below.

Air pollutant emissions from the Proposed Project would be generated primarily during installation, removal and decommissioning activities, when support vessels would be used to deploy and retrieve anchors and WEC devices. During the operational and maintenance phases, occasional air pollutant emissions would also be generated by support vessels traveling to and from the project site. It is expected that these vessels would burn low-sulfur diesel fuels that would emit some level of sulfur oxides. These vessels would generate most of their emissions at the test site and in transit, which would occur approximately at least 5.0 miles from any onshore sensitive receptor locations. There would be little potential for marine vessel emissions to degrade onshore air quality; therefore, anticipated impacts to air quality are expected to be minimal.

Marine Geology & Bottom Sediments

The Oregon coastal region has been influenced by regional tectonic uplift and glacial sea level fluctuations over the past several million years (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001). During the last glacial maximum, sea level was approximately 400 feet (122 meters) lower than at present. Marine terrace deposits that are less than 1 million years old and consist primarily of sand and silt that were deposited over a sequence of much older Miocene siltstones, mudstones, and sandstones. Yaquina Head and the nearby offshore reefs were formed from a layer of basalt that intruded on the marine sedimentary rocks. Recent marine sands cover the older bedrock on the continental shelf.

Oregon's present-day continental shelf is relatively narrow and extends about 10 to 46 miles off the coast (Electricity Innovation Institute 2004). A rocky submarine bank (Stonewall Bank) begins about 15 miles offshore of Yaquina Bay and extends southwest offshore the Siuslaw River, where the shelf is about 30 miles across (Electricity Innovation Institute 2004; U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001). The bottom sediments shoreward of Stonewall Bank are mostly fine sand to depths of 300 feet (91 meters), with little silt and clay (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001). Sandy sediments extending 3 to 10 miles offshore are typical of much of the Oregon coast, with small variations in the concentration of fine-sized particles in the seafloor sediments due to local currents.

[7] A designated attainment area, as defined by the EPA, is an area that meets the national primary or secondary ambient air quality standard for the pollutant in question. In this case, Lincoln County is in attainment for all EPA criteria pollutants.

Data collected at Ocean Dredged Material Disposal Sites (ODMDS) off Yaquina Bay indicate that local sediments near the PMEC project site are consistent with those found on much of the Oregon shelf, consisting predominantly of medium-grained sand with some shell debris and a minor amount (less than 2%) of silt and smaller material (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2011). There is little silt or clay in nearshore sediments of this region, as a result of winnowing by wave energy. As noted previously, site-specific surveys will be conducted to further characterize environmental baseline conditions and help inform final project design, potential effects analysis, and post-installation monitoring plans.

Oceanography & Meteorology

The high wave energy flux on the Oregon coast is due to prevailing western winds and the large fetch[8] of the North Pacific Ocean (Boehlert et al. 2008). Wave energy on the coast varies considerably by season, such that the wave energy flux is approximately eight times greater during winter than summer offshore of Douglas County, Oregon (Bedard 2005). Episodic winter storms bring large waves from the west and southwest. Currents generated by these waves are uniform throughout the water column, and may have a substantial influence on the transport of fine sediments (silt and clay) at depths of greater than 37 meters (120 feet) (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001).

The circulation of ocean surface waters on Oregon's continental shelf varies seasonally with changing wind stress patterns. During the summer, offshore high pressure systems and associated northerly or northwesterly winds drive upwelling of deep, dense, cold water toward the ocean surface. At present, circulation of surface waters on the continent shelf is dominated by the southward-flowing California Current (U.S. Army Corps of Engineers 2001). In contrast, low offshore pressure systems during winter drive southwesterly storm winds that result in surface circulation dominated by the northward-flowing Davidson Current.

On the inner continental shelf (depths less than about 37 meters [120 feet]), bottom sediments are transported by a combination of wind-driven currents, wind waves, tidal currents, and estuarine-induced currents (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001). Bottom currents on the inner continental shelf are capable of transporting sand-sized sediment. On the middle continental shelf (depths of 37 to 91 meters [120 to 300 feet]), water circulation is mainly influenced by wind-driven currents, whereas on the outer continental shelf (depths of 91 to183 meters [300 to 600 feet]), shoaling waves and regional currents control water circulation seasonally (U.S. Army Corps of Engineers 2001). The net direction of bottom currents on the mid- to outer continental shelf is northward, because the subsurface part of the Davidson Current is believed to flow northward year-round. Bottom currents along the mid- to outer continental shelf are capable of transporting silt and finer-grained sediments (U.S. Army Corps of Engineers 2001).

[8] Fetch is defined as the area over a water body in which the wind blows in an essentially constant direction. Longer fetch lengths are associated with the size of the waves produced.

Acoustic Environment

The area off the coast near Newport already experiences considerable commercial marine vessel traffic from the Port of Newport, which is home to one of Oregon's largest commercial fishing fleets. The project site is close enough to shore to possibly be affected by surf sound. Therefore, existing underwater sound levels in the project area are expected to be moderate to high (Oregon Wave Energy Trust 2009).

In 2010, Haxel et al. (2011) collected baseline acoustic data for the PMEC-NETS. Specifically, the study team deployed two acoustic recording devices on the ocean floor in and near the project site in March 2010. The devices recorded continuously, monitoring underwater sound generated at frequencies of 1 Hz to 2 KHz. The underwater sound pressure levels recorded during the monitoring period ranged from a low of 95 dB RMS re: 1 µPato 136 dB RMS re:1 µPa, with a time-averaged sound pressure level for the monitoring period of 113 dB RM re:1 µPa; a histogram of hourly RMS values shows a normal distribution. The spectrum during periods of above-average underwater sound intensity was dominated by low frequency noise associated with wave action, primarily surf along the shoreline. As noted previously, this information is intended simply to inform existing conditions at the SETS, and NNMREC-OSU anticipates conducting site-specific monitoring for the SETS project as described above in the Site Characterization section of this application.

Water Quality

Water quality on the Oregon coast varies seasonally. During winter, temperatures of nearshore surface waters are about 9 to 10°C and salinities are about 30 to 32 practical salinity units (Boehlert et al. 2008, Landry et al. 1989). Light transmission is higher during winter, and decreases with the transition to summer during upwelling conditions and when phytoplankton bloom (Boehlert et al. 2008). During summer, upwelling brings colder, more saline water onto the inner shelf. Summer surface temperatures are about 12 to 14°C and salinities are about 30 to 32 practical salinity units (Boehlert et al. 2008, Landry et al. 1989). Wind and wave conditions are relatively calm during the spring (March and April) and fall (September and October) transitions between oceanographic regimes (Boehlert et al. 2008).

Principal sources of information for water quality in the project area include water quality data from the Oregon Department of Environmental Quality (ODEQ) Laboratory Analytical Storage and Retrieval Database (LASAR) (Oregon Department of Environmental Quality 2010), and sediment quality data reported during studies performed prior to designation of the dredged disposal area in Yaquina Bay, which is located near the SETS project site (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001).

Water quality data were collected at Site 30244 (located at latitude 44.6851 N, longitude 124.1684 W) on June 11, 2003, by lowering a sonde[9] from the surface to the sea floor and back, collecting water samples at depths of 2, 30, and 60 meters (6, 98 and 197 feet). Results across a water column of about 60 meters (197 feet) showed a steady decline in chlorophyll a and dissolved oxygen with increasing depth. At the time of sampling, there was no apparent thermocline; temperatures declined gradually

[9] A sonde is a water quality monitoring device that measures a number of variables in the water column.

from the surface to about 30 meters (98 feet) in depth, and were fairly uniform below that depth. Nutrient availability increased with depth, presumably reflecting highest uptake rates in the euphotic zone (Oregon Department of Environmental Quality 2010).

Sediment samples for quality assessment have been recovered from outside Yaquina Bay during sampling performed in various years from 1984 to 2000, mostly in summer and fall (U.S. Army Corps of Engineers 2001). The 18 sample locations are in the open waters off Yaquina Bay, an area that, like the PMEC project site, has a uniform fine sand bottom. Metals concentrations detected in all samples were far below the screening levels outlined in the Corps' Sediment Evaluation Framework (SEF) for the Pacific Northwest (SEF 2009). All detected concentrations of organic compounds were either below SEF screening levels or laboratory reporting limits.

Vegetation and Algae

Marine plants off the coast of Newport, Oregon include phytoplankton and sessile algae. Phytoplankton are comprised of simple free-floating uni- and multi-cellular organisms like cyano-bacteria, diatoms, dinoflagellates, silicoflagellates, and coccolithophorids. Sessile algae, commonly termed seaweeds, include many species of large brown and red algae. Sessile algae occur in rocky intertidal and sub-tidal areas of the coast within the photic zone (water depths to which sunlight can penetrate). The largest such algae include several species of brown kelp, that along the Oregon coast consist almost exclusively of bull kelp (*Nereocystis luetkeana*), which grows sub-tidally. This species has special legal status because of its value as a commercial raw material and habitat for protected fish species (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001, 2008).

No hard or rocky substrate is known to occur within the vast majority of the PMEC-SETS study area; however, a small amount of rocky reef exists in a narrow area in approximately 40 meters (131 feet) of water a few miles northeast of the study area (off Yaquina Head). Bull kelp was not observed on this rocky area during videographic surveys in 2010, likely because water depths (i.e., lack of sufficient light) preclude the growth of any bull kelp (Henkel pers. comm. 2010).

Zooplankton, Crab Larvae & Fish Larvae

The zooplankton community inhabiting offshore central Oregon consists of small invertebrate organisms that either spend their entire life cycle in the water column (holozooplankton) or spend only a brief developmental time in the water column before a metamorphosis to an adult life in a nektonic or benthic habitat (merozooplankton). Species composition changes and is influenced by various periodic and episodic factors including prevailing ocean currents, coastal upwelling, and offshore wind direction. The Corps and the U.S. Environmental Protection Agency (EPA 2008, 2009, citing Keister and Peterson 2003) describe the coastal zooplankton community inhabiting central Oregon as being dominated by copepods. In total, 58 copepod species are reported being present in these waters, of which eight occur throughout the year, seven occur only during the summer, and six occur only in the winter. Species composition is seasonally dependent. Overall biomass population and individual species abundance are typically lower in the winter than in the summer months. During the summer months, when the offshore winds blow predominantly from the northwest, surface waters move southward and offshore

due to Ekman drift, allowing the colder, more saline, and nutrient-rich waters from deeper water depths to upwell along the coast. Between January and May, the megalopae larvae of the Dungeness crab (*Cancer magister*) are abundant inshore.

Three species assemblages of fish larvae have been described as inhabiting the coastal waters of Oregon: coastal, transitional, and offshore. The coastal assemblage occurs in the PMEC-SETS area and is typically dominated by smelts (*Osmeridae*), which account for 50% of the population, and English sole (*Parophrys vetulus*), sandlance (*Ammodytes hexapterus*), sanddab (*Citharichthys sordidus*), starry flounder (*Platichthys stellatus*), and Pacific tomcod (*Microgadus proximus*). The highest fish larvae abundance is reported to occur between February and July (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001). Auth et al. (2007) reported northern anchovy (*Engraulis mordax*), slender sole (*Lyopsetta exilis*), rockfish (*Sebastes spp*.), northern lampfish (*Stenobrachius leucopsarus*), and blue lanternfish (*Tarletonebeania crenulairs*) as the dominant taxa along the Newport hydrographic line (43°39'N).

Benthic Invertebrates

Benthic invertebrate communities inhabiting the nearshore marine environment provide important secondary production in marine food webs and are integral to the breakdown and recycling of organic material in the marine ecosystem. They also provide a key food source for important commercial and recreational fish and macroinvertebrate species like Dungeness crab, as well as for other protected or managed fish species. In 2010 and 2011, the Hatfield Marine Science Center (HMSC) conducted surveys in and around the PMEC-NETS to document the presence of a number of demersal fishes and benthic invertebrate species. Although this research was not conducted to identify species at the PMEC-SETS, a review of the observations may provide insight as to species presence and abundance within the area.

Benthic habitats at and near the PMEC-NETS were characterized by Henkel (2011), reporting results of box cores, trawls, and videography performed on 10 occasions between May 2010 and December 2011. Six sampling stations were located within the NETS; three sampling stations were located outside of the Site to the north and three stations were located outside of the Site to the south (between the project site and the north Newport jetty), at water depths of 30 to 50 meters. Sample frequencies and sizes were designed to be large enough to detect potential changes in the future. Principal findings from this monitoring included (Henkel 2011):

- Two distinct sediment types: silty sand at approximately 30 meters, and potentially shallower; and nearly pure sand at 40 meters and deeper.
- Distinct infaunal invertebrate assemblages occur in the two sediment types.
- Distinct infaunal invertebrate assemblages occur north and south of Yaquina Head at the deeper stations.
- Mysid and Crangonid shrimp are highly abundant and likely form the basis of the food web in this nearshore zone, as opposed to the krill-supported food web further offshore.

- Videography observations are more effective than trawls for sampling large invertebrate species such as crabs, sea stars, and sea pens.

FISH

The nearshore and offshore regions of the Yaquina Head area encompass both rocky and soft bottom sub-tidal habitats and the open water pelagic environment. This area, therefore, supports a variety of fish species that typically inhabit all three habitats with frequent movement of fish between them. Typical fish species that inhabit these areas are discussed below. Although very little hard bottom substrate is known to be present in the project site, natural sub-tidal reefs closer inshore at Yaquina Head support pelagic and benthic fish communities that associate with rocky, rather than soft, substrate.

Fish species commonly observed in sandy bottom areas offshore Yaquina Head include English sole (*Parophrys vetulus*), butter sole (*Isopsetta isolepis*), Pacific sanddab (*Citharichthys sordidus*), speckled sanddab (*Citharichthys stigmaeus*), and starry flounder (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2010; Henkel 2011). Sampling by Henkel (2011) found that the fish assemblage varies with season. High densities of flatfish characterized the catch in summer, and speckled sanddab, were usually the dominant species. In October, flatfish densities were significantly lower but prickle breast poachers (*Stellerina xyosterna*) were abundant. In February, a variety of smelt (*Osmerus* spp.) were in high abundances.

Rocky sub-tidal, or hard bottom, habitats typically experience a wide variety of wave and current regimes, substrate, depths, and food sources, producing diverse biological communities (Oregon Department of Fish and Wildlife 2006). The rocky reefs off Yaquina Head provide important habitat for fish species that include sculpins (*Cottidae*), surf perch (*Embiotocidae*), and rocky reef fishes. Shallow reefs up to 20 meters (66 feet) in depth are dominated by black rockfish (*Sebastes melanops*), while deeper reefs are dominated by lingcod (*Ophiodon elongates*), black-and-yellow rockfish (*Sebastes chrysomelas*), and black rockfish (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001; Henkel pers. comm. 2011). Although these areas of rocky sub-tidal habitat are located outside the PMEC-SETS, juvenile lingcod and rockfish will likely use pelagic and soft bottom habitats, and older mature fish typically associated with rocky sub-tidal habitats will often be found swimming in the deeper soft bottom regions. As a consequence, these taxa may be present in the vicinity of the project.

A number of environmental factors affect the fish species present in the pelagic zone, including light penetration, water temperature, proximity to river plumes, and underwater currents (Oregon Department of Fish and Wildlife 2006). Pelagic species commonly found in the area include Pacific herring (*Clupea pallasi*), northern anchovy, and Pacific Ocean perch (*Sebastes alutus).* The area is also utilized by salmon, steelhead, and shad that migrate alongshore; including those stocks that migrate through the Yaquina Bay estuary to spawn upriver (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001).

Essential Fish Habitat

The Pacific Fisheries Management Council (PFMC) manages, under federal Fishery Management Plans (FMP), four groups of fish along the West Coast of the United States: groundfish, salmon, highly migratory species and coastal pelagic species. The groundfish FMP includes more than 80 species of fish and the salmon FMP includes all species of salmon occurring along the west coast of the United States that are commercially fished. The highly migratory species FMP includes the tunas, some shark species and billfish. The coastal pelagic FMP includes five taxa: (northern anchovy (*Engraulis mordax)*, market squid (*Loligo opalescens*), Pacific sardine (*Sardinops sagax*), Pacific (chub) mackerel (*Scomber japonicas*), and jack mackerel (*Trachus summetricus*). As required under the Magnuson-Stevens Act, EFH has been designated for each of these groups except highly migratory species, and all waters within and adjoining the PMEC project area constitute EFH. Specifically, EFH has been designated as follows (Pacific Fisheries Management Council 2010):

- ***Groundfish*** Water depths less than or equal to 11,483 feet (3,500 meters) to the mean higher high water level or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 parts per thousand during the period of average annual low flow; seamounts in depths greater than 11,483 feet (3,500 meters) as mapped in the EFH assessment geographic information service (GIS) data; areas designated as habitat areas of particular concern not already identified by the above criteria.
- ***Salmon*** All waters of the United States between the Canadian border and the Mexican border and out 200 miles (370 kilometers) to the western extent of the Exclusive Economic Zone.
- ***Pelagic*** All waters of the United States from the Canadian border to the Mexican border and out 200 miles (370 kilometers) to the western extent of the Exclusive Economic Zone.

Designated Critical Habitat

Critical habitat has been designated for some of the listed species identified in Table 4. Vertebrate species listed under the ESA may include infraspecific taxa described as Distinct Population Segments (DPS), some of which have been described by the NMFS as Evolutionarily Significant Units (ESU). Designated critical habitat (DCH) for the following species occurs in or near the PMEC project area:

- ***Coho salmon*** On February 11, 2008, NMFS listed the Oregon coast coho salmon ESU as threatened and DCH. Critical habitat for Oregon coast coho salmon includes riverine and estuarine areas within 80 occupied watersheds in 13 associated sub-basins. Critical habitat for coho salmon includes the waters of Yaquina Bay, but does not extend out to the offshore waters of the PMEC project site.
- ***Green sturgeon*** In October 2009, NMFS designated all nearshore waters to a depth of 60 fathoms (360 feet or 110 meters) offshore Oregon as critical habitat for the southern DPS of the green sturgeon (National Marine Fisheries Service 2009). As such, the green sturgeon DCH includes the PMEC project area.

Sea Turtles

Pacific leatherback sea turtles (*Dermochelys coriacea*) are known to occur in offshore waters of the central Oregon coast (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998a, 2007). Green sea turtles in the Pacific Ocean are generally found south of San Diego, California; however, they have been found from Baja, California to Alaska (National Marine Fisheries Service 2011). Loggerhead sea turtles (*Caretta caretta*) also have been seen as far north as Alaska, but most U.S. sightings have been made off the California coast. The olive Ridley sea turtle is also more commonly seen in California waters, although there is at least one case of a hypothermic olive Ridley sea turtle washing ashore off the coast of Newport, Oregon (Hanson 2009).

Designated Critical Habitat

Critical habitat for the leatherback sea turtle was previously designated only in the Atlantic Ocean (44 FR 17710), but on January 26, 2012, NMFS designated critical habitat in the Pacific Ocean off areas of Washington, Oregon, and California (77 FR 4170). The area designated includes the offshore waters between Cape Flattery, Washington, and Cape Blanco, Oregon, out to the 2,000-meter depth contour and a similar area offshore California (National Oceanic and Atmospheric Administration 2010b). As such, the leatherback sea turtle DCH occurs within the PMEC-SETS.

Marine Birds

Bird species commonly observed inhabiting and using the coastal waters of central Oregon near Yaquina Bay include shearwaters, storm petrels (*Hydrobatidae*), gulls (*Laridae*), common murres (*Uria aalge*) and Cassin's auklets (*Ptychoramphus aleuticus*) during the late spring and early summer months. Phalaropes (*Phalaropus spp*.), fulmars (*Fulmarus spp*.), and California gull (*Larus californicus*) predominate during the fall months. During the winter months, phalaropes, California gull, fulmars, other assorted gulls, murres (*Uria spp*.), auklets (*Aethia spp*. and *Ptychorhamphus spp*.), and kittiwakes (*Rissa spp*.) are common. Western (*Aechmophorus occidentalis*), red-necked (*Podiceps grisegena*), horned (*P. auritus*), and eared (*P. nigricollis*) grebes, Caspian tern (*Sterna caspia*), three other species of tern, three species of cormorant, pigeon guillemot (*Cepphus columba*), and red-throated (*Gavia stellata*), Pacific (*G. pacifica*), and common or great northern (*G. immer*) loons also frequent the region (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001).

Brown pelicans (*Pelecanus occidentalis*) are present in the summer and fall as post-breeding transients. Western snowy plovers (*Charadrius alexandrines nivosus*), an Oregon-listed threatened species, are known to forage on shorelines of the coast of Newport (U.S. Fish and Wildlife Service 2007b). Other protected species that may forage in or near the area include short-tailed albatross (*Diomedea albatrus*) and marbled murrelet (*Brachyramphus marmoratus*) (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2001).

Marine Mammals

Marine mammal species potentially present in the PMEC-SETS area include cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals and sea lions). The most common year-round inhabitants are the pinnipeds: Pacific harbor seal (*Phoca vitulina*), and Steller sea lion (*Eumetopias jubatus*). Male California

sea lions (*Zalophus californianus*) and northern elephant seals (*Mirounga angustirostris*) are occasionally observed foraging in southern and central Oregon coastal areas but are not regular inhabitants (Oregon Department of Fish and Wildlife 2010).

Cetaceans potentially present in the project area include transient killer whales (*Orcinus orca*), which appear along the Oregon coast in April, in conjunction with the California gray whales' northward migration. Killer whales of the southern resident group occasionally pass by during migrations from their principal range in Washington and British Columbia, en route to foraging grounds off central California, where they seasonally feed on migrating Chinook salmon (Northwest Fisheries Science Center 2007). Other whales observed offshore of the Oregon coast include blue whale (*Balaenoptera musculus*), finback whale (*Balaenoptera physatus*), sei whale (*Balaenoptera borealis*), Pacific right whale (*Balaena glacialis japonica*), humpback whale (*Megaptera novaeangliae*), and sperm whale (*Physeter catodon*).

California gray whales (*Eschrichtius robustus*) occur along the central Oregon coast throughout the year with a small population of resident whales present between May and October. Migrating gray whales occur between March and June on their northward migration, and between December and March on their southward migration. Ortega-Ortiz and Mate (2008) report that in 2008, gray whales were observed offshore of Yaquina Head transiting the area during both southward and northward migrations. Gray whales migrated southward through the area beginning in mid-January, with the peak of the migration occurring in late January. Northbound migrating gray whales were observed as early as late February, with the peak migration occurring between late March and mid-April. Ortega-Ortiz and Mate (2008) further reported observing gray whale movements predominantly occurring in parts of the ocean where water depths are between 10 and 70 meters (33 and 230 feet).

Federal & State Protected Species

Protected species potentially present in the PMEC-SETS project area during all or part of the year are listed in the table below, which is adapted from the Final Environmental Assessment prepared in 2012 for the U.S. Department of Energy's funding of the PMEC-NETS. As the project authorization process moves forward, NNMREC-OSU will coordinate with appropriate state and federal resources agencies to review and modify (if needed) this list for applicability to the SETS project.

TABLE 4: PROTECTED SPECIES POTENTIALLY PRESENT AT PMEC-SETS

Common Name	Scientific Name	State Status	Federal Status
***E** = Endangered; **T** = Threatened*			
BIRDS			
Marbled murrelet	*Brachyramphus marmoratus*	T	T
Western snowy plover	*Charadrius alexandrinus nivosus*	T	T
Short-tailed albatross	*Phoebastria albatrus*	E	E

Common Name	Scientific Name	State Status	Federal Status
***E** = Endangered; **T** = Threatened*			
Brown Pelican	*Pelecanus occidentalis*	E	
FISH			
Chinook salmon, lower Columbia River ESU	*Oncorhynchus tshawytscha*	E	T
Chinook salmon, upper Willamette River ESU	*Oncorhynchus tshawytscha*		T
Chinook salmon, upper Columbia River spring-run ESU	*Oncorhynchus tshawytscha*		E
Chinook salmon, Snake River spring/summer run ESU	*Oncorhynchus tshawytscha*		T
Chinook salmon, Snake River fall-run ESU	*Oncorhynchus tshawytscha*	T	T
Chinook salmon, Central Valley spring-run ESU	*Oncorhynchus tshawytscha*	T	
Chinook salmon, Sacramento River winter-run ESU	*Oncorhynchus tshawytscha*		E
Chinook Salmon, California coastal ESU	*Oncorhynchus tshawytscha*		T
Coho salmon, Southern Oregon/ Northern California coast ESU	*Oncorhynchus kisutch*		T
Coho salmon, Oregon coast ESU	*Oncorhynchus kisutch*		T
Coho salmon, lower Columbia River ESU	*Oncorhynchus kisutch*		T
Green sturgeon, southern DPS	*Acipenser medirosris*		T
Eulachon	*Thaleichthys pacificus*		T
HERPETILES			
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Green sea turtle	*Chelonia mydas*	E	T
Loggerhead sea turtle, Pacific DPS	*Caretta caretta*	T	T
Olive (Pacific) Ridley sea turtle	*Lepidochelys olivacea*	T	T
MAMMALS			
Steller sea lion, eastern DPS	*Eumetopias jubatus*		T
Killer whale, Southern Resident DPS	*Orcinus orca*		E
Humpback whale	*Megaptera novaeangliae*	E	E
Blue whale	*Balaenoptera musculus*	E	E
Fin whale	*Balaenoptera physalus*	E	E
Northern Pacific Right Whale	*Eubalaena japonica*	E	E
Sei Whale	*Balaenoptera borealis*	E	E

Common Name	Scientific Name	State Status	Federal Status
***E** = Endangered; **T** = Threatened*			
Sperm Whale	*Physeter macrocephalus*	E	E
Gray Whale	*Eschrichtius robustus*	E	

RECREATION

As noted previously, aids to navigation (e.g., marker buoys) would be installed somewhere within the project site and a Local Notice to Mariners would be published to minimize potential vessel collisions or entanglement in mooring lines. Aids to navigation would be in place for the operational lifetime of the Proposed Project and could result in reduced or restricted marine navigational access in a small area within the project site. NNMREC-OSU would hold meetings with the Oregon Marine Board, USCG, the FINE committee, ODFW, and Oregon State Police to identify the appropriate uses of the project site during and between WEC device test periods. This would not be expected to substantially reduce the number of boating days spent in the vicinity of the project area. Boaters intending to use the project area may need to adjust their navigation plans or navigate around the project site infrastructure.

Sport fishing occurs in all regions along the Oregon Coast and offshore areas and is conducted via multiple trip types, including by shore, pier, small craft, and charter boat. The recreational vessel marina (South Beach Marina) includes 450 moorage slips, a fuel dock, and a paved boat ramp (Port of Newport 2010). Roughly 10,000 boating days13 originate at this facility each year (Fisherman Involved in Natural Energy 2008; Nielsen pers. comm.) For recreational fishing catch data, information from the Pacific States Marine Fisheries Commission and reported through the Pacific Recreational Fishing Information Network from the years 2004 to 2009, was reviewed. Predominant species collected by sport fishers in ocean waters outside of Yaquina Bay and to the immediate north and south, are various species of rockfish, salmon, lingcod, tuna, and Dungeness crab. Halibut and salmon fishing are the most popular recreational fishing activities.

The main direct recreation impact of a limited access within the project site would be a reduction in halibut fishing opportunities. However, a reduction in the quality of anglers' fishing experiences resulting from the loss of a small amount of navigational access within productive fishing waters in the project site is a more anticipated impact than a reduction in fishing days. As with boating, disruptions resulting from changes to navigational access are not expected to deter people from fishing in the project vicinity. The main indirect recreation impact would be a reduction in the quality of ocean viewing (including whale watching) experiences primarily by visitors to Yaquina Head Outstanding Natural Area resulting from placement of WEC devices offshore. As discussed in Visual Resources below, the proposed structures could potentially detract from the existing unobstructed ocean views; however, it is expected that the Proposed Project would be nearly imperceptible to viewers.

During scoping for the PMEC-NETS off the coast of Newport, commenters raised the concern that the installation and operation of that project could result in adverse impacts on surfing through altered

wave characteristics. For an EA of a proposed installation of up to six 40 kW offshore PowerBuoys in Hawaii, the Office of Naval Research concluded that the PowerBuoys® would have only localized impacts on currents and wave direction. For example, the impacts on currents would not extend more than the diameter of a few PowerBuoys® (Department of the Navy 2003). A sediment transport study published by the Oregon Wave Energy Trust (2009b) that included wave modeling for the Reedsport wave energy project determined that wave height variations up to 15% are possible within approximately 0.6 mile (1 kilometer) of a WEC device, but wave variations decrease to 3% over distance up to 2.5 miles (4 kilometers).

As described previously, the PMEC-SETS would be located approximately 5 miles from the coast of Oregon. Based on the studies and modeling referenced above, wave attenuation associated WEC devices at this distance is not expected to discernibly affect the quality of waves used by surfers. However, site-specific effects analysis, along with additional stakeholder engagement, will be conducted for the PMEC-SETS as part of the regulatory process to characterize and, if needed, mitigate impacts to recreation.

Commercial Fishing

Many important commercial fish species along the Oregon coast are known to spend a portion of their life history around and within the Yaquina Bay Estuary. Some commercially important species landed at Newport reside predominantly as adults in the ocean waters beyond Yaquina Bay, but spend their juvenile phase or a portion of their adult life stage within the estuary itself (e.g., Dungeness crab). Others spend their entire life history in the deeper offshore areas of the Oregon coast (e.g., albacore tuna), and are not normally found within the project area.

Eight ports along the Oregon coast support commercial fishing vessels, and Newport is among the most important of these. The commercial fishing vessel marina supported 393 commercial fishing vessels in 2000. The primary fisheries exploited by boats out of the Port of Newport, Oregon, in terms of ex-vessel landing values, were groundfish, crab, shrimp, highly migratory species, and salmon (National Oceanic and Atmospheric Administration 2007). In the Newport area, crabbing and salmon fishing are the most popular commercial fishing activities.

The species, including both fish and invertebrate species, that comprised at least 1% of either the total catch value or total weight landed in Newport in 2010 were collected both in the nearshore and offshore environment, as well as within Yaquina Bay itself. In reviewing the catch totals for Newport against those reported for the landing regions immediately to the north and south, Depoe Bay and Florence, respectively, the landings reported for Newport were at least an order of magnitude greater than either of the two adjacent ports (Oregon Department of Fish and Wildlife 2010).

Commercially important species in the Newport area inhabit a variety of positions in the water column and are caught with a variety of techniques. Key species are typically caught using traps (e.g., Dungeness crab), long-lines (e.g., sablefish and albacore), or trawling at different locations within the water column (e.g., mid-water trawls for Pacific whiting and bottom trawls for sole species). While some species are landed only seasonally (e.g., Dungeness crab and albacore tuna), others are landed

fairly consistently throughout the year. For example, the short spine thorny head catch ranged from about 2 – 44 tons per month over the course of the year, but typically fell within the 20 – 30 ton range.

Newport and South Beach flank the Port of Newport, the focus of the area's commercial fishing and recreation and tourism industries. In 2000, a total of 393 vessels delivered commercial fish landings to Newport. In that year, Newport and South Beach residents owned 90 and 19 active commercial fishing vessels, respectively. The main fisheries exploited by these boats, in terms of ex-vessel landing values, were groundfish, crab, shrimp, highly migratory species, and salmon; these species accounted for more than $24 million in Newport landings in 2000. Newport prides itself on having a "working waterfront," and recognizes that the seafood industry is at the core of its history and culture (National Oceanic and Atmospheric Administration 2007).

The activities associated with the installation and removal of the Proposed Project could limit the use of the immediate vicinity for commercial and recreational fishing and navigation. Similarly, the operation of the Proposed Project may result in a small loss of navigational access in the project site if navigational restrictions are necessary to minimize potential vessel collision with project structures. This localized impact would be short in duration and would be anticipated to result in negligible impacts on socioeconomics and environmental justice. Further, the commercial fishing users in the project area are represented by FINE, which participated on the Newport Community Siting Team and thoroughly vetted the community's proposal and project site. In fact, the PMEC-SETS location was initially recommended by FINE based on their broad knowledge of the regional ocean. The FINE representatives who approved this site have said, "We're willing to give up good fishing assets because we're staunchly for natural energy research" (see letter from FINE to Governor of Oregon in Appendix YY).

Marine Transportation & Navigation

Marine navigation is defined as the movement of ships and other watercraft in oceans, inlets, and bays. This section describes existing conditions and applicable regulations related to marine navigation extending between Newport Bay and the project site, as well as potential impacts on marine transportation safety associated with PMEC-SETS. For the purposes of this discussion, the study area for marine navigation is defined as the project site (i.e., the 2-square-nautical-mile area of the OCS), as well as the area between the project site and the onshore landfall location for the marine cables.

The main shipping lane into the Yaquina Bay deep-water port runs across the northern boundary of the area identified by the Newport Community Siting Team, which is also partially located within a tugboat lane. However, the siting team, which included Port commissioners to represent maritime commerce, consulted with an expert in marine operations who stated that neither of these issues poses a problem as the lanes are not strictly used once vessels are out on the open ocean. There are no known state or local navigational laws or regulations specific to the project area.

Pursuant to the Ports and Waterways Safety Act (33 U.S.C. et seq.), the U.S. Coast Guard (USCG) is responsible for providing the lead NEPA agencies for the Proposed Project (*i.e.*, BOEM and FERC) with an evaluation of the potential impacts on the safety of navigation and the traditional uses of the waterway and other USCG missions. During that evaluation, the USCG will takes into account all possible uses of

the waterway to reconcile the need for safe access routes with the needs of other waterway uses. The USCG also establishes systems and designations to protect and provide additional safe navigational access, including special anchorage areas (33 U.S.C. 2030[g]); vessel traffic service areas (33 CFR 161), safety or security zones (33 CFR 165), traffic separation schemes (33 CFR 167), or shipping safety fairways (33 CFR 166) within or near the study area. As part of the final design and authorization process for PMEC, NNMREC-OSU will coordinate with the USCG to determine which of these designations apply to the project area.

As the federal agency responsible for marine safety, the USCG is also responsible for maintaining federal aids to navigation (e.g., LORAN[10] stations, lighthouses, buoys, and structures), permitting private aids to navigation, and keeping the boating community abreast of changes in the navigational system. The 13th District of the USCG, Waterways Management Branch, assumes these responsibilities for Oregon. NNMREC-OSU will coordinate with the USCG to ensure that PMEC structures are marked and maintained appropriately, as documented in an approved Private Aids to Navigation (PATON) permit. The PATON application requires an assessment of the appropriate onsite aid, including the shape, dimensions, information and regulatory marks, and lighting characteristics of the marker.

Natural Hazards, Hazardous Materials, Offshore Dump Sites, Unexploded Ordinances

The actively used Yaquina Ocean Dredged Materials Disposal Site (ODMDS) includes two areas approximately 1.75 miles (2.82 kilometers) offshore from the Yaquina Bay Entrance Channel. Each site occupies an area of 597 acres (2.4 square kilometers) of sea floor and has the capacity to receive dredged materials for some 20 years. These areas are used to dispose of materials dredged in order to maintain safe deep-draft navigation through federal channels and permitted actions. Since the ODMDS sites began receiving dredged material in 1928, approximately 21,465,000 cubic yards of dredged material has been deposited there. The Yaquina ODMDS is located northeast of the project site and anticipated cable routes, so the proposed project is not expected to have any impacts to the disposal sites or activities. However, NNMREC-OSU has and will continue to coordinate with the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency with regards to PMEC structures and activities to ensure they do not interfere with the disposal sites.

Military Uses

The waters offshore Newport, Oregon are designated as U.S. Navy Operation Areas, which are areas used by the Navy Fleet Forces for training and weapons systems testing. NNMREC-OSU is not aware of any Operation Subdivision Areas, military Danger Zones, or other military Restricted Areas located in or near the project site. NNMREC-OSU will coordinate with the appropriate government agencies as the site characterization and permitting phases proceed to ensure there are no conflicts with or impacts to military uses from the project.

[10] LORAN is the acronym for Long Range Navigation, a terrestrial radio navigation system using low-frequency radio transmitters that uses multiple transmitters to determine the location and speed of the receiver.

Cultural & Historic Resources

NNMREC-OSU is unaware of any cultural resource survey of the PMEC area at this time. As part of the regulatory process, however, notice of the proposed project will be provided to the State Historic Preservation Office (SHPO), interested Native American tribes, and other interested parties to confirm that no cultural resources are located near or would be affected by the project. If any historical, cultural, and/or archeological resources are encountered during any phase of the project (e.g., site assessment, installation, operations, removal/decommissioning), then activities would immediately cease and the SHPO would be contacted.

Visual Resources

The visual perception of the PMEC-SETS and its potential impacts on sensitive visual resources in the vicinity will determine effects to aesthetic resources. Aesthetic impacts can result from a number of activities, including the permanent or temporary obstruction of scenic views, the addition of an undesirable element to the visual landscape, or the removal or degradation of an aesthetically pleasing visual element. The PMEC-SETS would introduce new, human-made elements to the visual landscape which have the potential to create visual contrasts that could affect the integrity, unity, or perceived quality of the visual landscape. Because visual impacts are subjective and linked to human experience, potential adverse impacts will depend on the context and sensitivity of viewers affected, as well as the duration of the impacts.

It is anticipated, however, that most project structures activities would be outside of the visual range of beach areas adjacent to the project site. For an average adult standing on the shore near sea level, the distance to the horizon on flat terrain is approximately 3.0 miles (Nautical Know How 2009). The PMEC-SETS is approximately 5 nautical miles from shore; as such, project structures and activities would be near or beyond the limit of visual perception. However, it is possible that on clear days with calm or flat seas, the tops of the WEC devices (particularly larger models) would be silhouetted against the sky.

Installation and removal activities would involve approximately the same number of vessels and a similar intensity of activity, so effects on the visual landscape are anticipated to be similar during these phases. Operations and maintenance would involve fewer vessels and a lower level of activity, so effects are anticipated to be smaller during this phase. Overall, negligible impacts on aesthetic resources are anticipated; however, site-specific effects analysis, along with additional stakeholder engagement, will be conducted to characterize and, if needed, mitigate impacts to visual resources.

Socioeconomics and Environmental Justice

Lincoln County, Oregon includes the communities of Newport (an incorporated city), South Beach (an unincorporated area partially located within the Newport city limits), and the surrounding lands and waters. Their combined population in 2000 was estimated at 10,641. Approximately 90% of the population was white, while the next largest group identified with two or more races. In 1999, Per-capita income was approximately $20,400, while median household income was approximately $32,000. In comparison, the national per-capita and median household incomes in 1999 were $21,587 and $41,994, respectively. Roughly 14% of the population had income below the poverty level. The area's

main employment sectors are government; education, health, and social services; and entertainment, recreation, accommodation, and food. The area's main industries are tourism, fishing, and wood products (National Oceanic and Atmospheric Administration 2007).

Activities associated with the installation and removal of the project structures could results in short-term, temporary limitations in commercial and recreational fishing and navigation within the PMEC-SETS and immediate vicinity. Similarly, the project operations may result in a small loss of navigational access within the project site if navigational restrictions are necessary to minimize potential vessel collision with project structures. These temporary, localized impacts would be short in duration and are anticipated to result in negligible impacts on socioeconomics and environmental justice.

The design, installation and operations of the PMEC-SETS could create a few new local jobs and would result in a minor beneficial employment impact. Additional local economic activity would result from the ongoing personnel and local services associated with project operations and maintenance. Based on the small number of minorities and the moderate income levels in the study area, minimal impacts on environmental justice populations are anticipated.

CONFORMANCE TO STATE & LOCAL ENERGY PLANNING

STATE

On December 14, 2012, Governor Kitzhaber released the 10-Year Energy Action Plan for Oregon, which is a central component of the Governor's overall strategy to position Oregon to be more competitive in the global economy. The 10-Year Energy Action Plan emphasizes the importance of the state's Renewable Portfolio Standard that directs Oregon utilities to meet a percentage of their customers' energy needs through renewable resources, which include wave energy. Goal 2 of the Plan, Enhance Clean Energy Structure, highlights wave energy as an important component of the energy resource mix that Oregon will capitalize on to meet the state's power supply needs. Specifically, it states that:

> *Responsibly sited wave energy has significant potential not only to provide additional resources to power Oregon, but to create a business cluster and models that can be exported to other states and countries around the world. The state is committed to developing a regulatory structure that is useful and provides clear guidelines for developing wave energy facilities off of the Oregon coast.*

In addition to highlighting the wave energy industry in Oregon, the Governor's plan underscores the importance of the NNMREC-OSU wave energy testing facility and its role in accelerating the development of wave power in Oregon.

The PMEC-SETS project site was identified through a comprehensive a site selection process that involved environmental review and extensive consultation with stakeholders and other interested parties. While the wave energy devices and mooring systems associated with the SETS project would be located on the OCS, the subsea transmission lines would be located within the Territorial Sea of the State of Oregon and are therefore subject to review for consistency with Statewide Planning Goal 19 (Ocean Resources) and Oregon's Territorial Sea Plan (TSP) Part IV. Because the project site was selected in close coordination with stakeholders and the purpose is to better understand the ecological, economic and social impacts and benefits of wave energy, the proposed project is consistent with the Territorial Sea Plan and Goal 19.

LOCAL

The CLPUD serves the Newport area and will manage the transmission of energy from PMEC-SETS to the electric grid. NNMREC-OSU began coordinating with the CLPUD prior to the final site selection in 2012, and PUD representatives have confirmed that grid interconnection for the SETS wave energy test facility is viable. The CLPUD has existing telemetering with BPA's Toledo substation which will allow metering as required to meet federal interconnection requirements. NNMREC-OSU is also coordinating with Bonneville Power Authority (BPA) in regards to power transmission and grid-interconnection for SETS.

QUALIFICATIONS DOCUMENTATION

LEGAL

NNMREC is a research center at OSU, and it is OSU that is the official legal entity owning and operating the PMEC-SETS facilities. OSU is a public university in the state of Oregon, and is an agency of the state. Documentation of OSU's legal status in the form of a letter from the Oregon Governor's office can be found in Appendix A. There have been no legal or regulatory actions taken against NNMREC-OSU since it's formation in 2009.

TECHNICAL

ORGANIZATION PROFILE & STRUCTURE

Oregon State University was founded in 1868 as Oregon State's Land Grant university. OSU is one of only two universities in the U.S. to have Sea Grant, Space Grant and Sun Grant designations. Oregon State is also the only university in Oregon to hold both the Carnegie Foundation's top designation for research institutions and its prestigious Community Engagement classification.

As Oregon's leading public research university, with $281 million in external funding in the 2012 fiscal year, Oregon State's impact reaches across the state and beyond. With 12 colleges, 15 Agricultural Experiment Stations, 35 county Extension offices, the Hatfield Marine Sciences Center in Newport and OSU-Cascades in Bend, Oregon State has a presence in every one of Oregon's 36 counties, with a statewide economic footprint of $2.06 billion.

Oregon State has a diverse student body of over 26,000 students from across Oregon, all 50 states and more than 100 countries. They can choose from more than 200 undergraduate and more than 80 graduate degree programs, including over 30 degrees online offered through Oregon State Ecampus. Oregon State increasingly attracts high-achieving students, with nationally recognized programs in areas such as conservation biology, agricultural sciences, nuclear engineering, forestry, fisheries and wildlife management, community health, pharmacy and zoology.

NNMREC, a partnership between OSU and the University of Washington (UW), was established through the U.S. DOE Water Power Program and local funding to support wave and tidal energy development for the United States. The collective NNMREC activities facilitate commercialization of wave and tidal energy devices, inform regulatory and policy decisions, and close key gaps in marine renewable energy understanding with an emphasis on student learning.

Since its establishment in 2008, NNMREC has made great strides to assist and guide the development of the wave energy industry in the U.S. through technology testing and validation, environmental study and analysis, and understanding the human dimensions of the emerging ocean energy industry. One of NNMREC's primary roles is to serve as an integrated, standardized test center for US and international wave energy developers, and it has quickly become a "one stop shop" for the wave industry, providing comprehensive testing facilities for all technologies from early TRL (e.g. wave tank) to advanced TRL (e.g. open ocean testing).

LABORATORY AND FIELD FACILITIES

NNMREC-OSU is home to world-class research facilities, including the O.H. Hinsdale Wave Lab, the Wallace Energy Systems and Renewables Facility in Corvallis, OR and the Hatfield Marine Science Center in Newport, OR. With the ability to leverage existing world class research facilities both on land and in the ocean, PMEC is the final component that is needed to position the US West Coat as truly competitive in the international market for the ocean energy industry.

- **Wallace Energy Systems & Renewables Facility** The WESRF provides research, testing and services related to machines and drives, power electronics, hybrid electric vehicles, power systems and renewables. WESRF is the home of the ?, an instrument that creates the relative motion between a spar and heaving buoy to simulate wave action. Eleven wave energy device prototypes have been tested on the Linear Test Bed.
- **O. H. Hinsdale Wave Research Laboratory** The O.H. Hinsdale Wave Research Laboratory (WRL) is one of the largest and most sophisticated laboratories for education, research and testing in coastal and ocean engineering and related areas. Projects include: tsunami research, wave energy, wave-structure interaction, near shore hydrodynamics and environmental fluid mechanics. A leading center for research and education in coastal engineering and nearshore science, the WRL facilities include a Large Wave Flume (104 m long), Tsunami Wave Basin with multi-directional wave maker, and Control Room for on-site researchers. The Large Wave Flume is the largest of its kind in North America. Tsunami Wave Basin is equipped with a large-stroke, directional wave maker with active wave absorption. These facilities have been used to test 1:15 and 1:33 scale wave energy converters, respectively.
- **Hatfield Marine Science Center** HMSC plays an integral role in marine and estuarine research and instruction, as a unique laboratory facility serving resident scientists and graduate students, and as a base for oceanographic research.

PRIOR/CURRENT PROJECTS

In addition to its land-based facilities, one of NNMREC-OSU's most distinguishing attributes is its proximity to the ocean itself. The ocean waters just north of Newport Harbor have as served as a primary testing ground for the wave energy industry in the US. In addition to testing various energy generation technologies, significant investment has been made in understanding ecosystem interactions and socioeconomic effects of this new industry. After four years of laboratory study and analysis, NNMREC-OSU became home to the nation's first ocean test berth in 2012, capable of testing a variety of ocean energy technologies while monitoring interactions with the local ecosystem.

This open ocean test facility, PMEC-NETS, is located approximately 2.0 miles (3.2 kilometers) off the coast of Newport, encompassing an area of approximately one square nautical mile that ranges in depth from 45 – 55m. Significant wave heights (SWH) average 1 - 2.5m during summer months at 6 - 9 second energy periods. During winter months these increase to SWH averaging 2 - 5m at 8 - 12 second energy periods, with maximum significant wave heights of 7 - 14m. In 2012, NNMREC-OSU completed

construction of its novel Ocean Sentinel, an instrumentation buoy that enables off-grid scaled testing of wave energy converters (WECs).

The Ocean Sentinel is a surface buoy based on the 6-meter NOMAD (Navy Oceanographic Meteorological Automatic Device) design that facilitates open-ocean, stand-alone testing of WECs with average power outputs of up to 100 kW, providing power analysis and data acquisition, environmental monitoring, as well as an active converter interface to control power dissipation to on-board electrical loads. In 2012, the Wave Energy Technology-New Zealand (WET-NZ) device was the first WEC device deployed and tested at the open-ocean test site with the Ocean Sentinel. In addition to device testing, NNMREC-OSU has conducted a significant level of baseline and potential effects monitoring at the non-grid test site, focusing on benthic habitat, marine mammals, electromagnetic frequency (EMF), and acoustics.

The NETS site is available for WEC testing on a year round basis if the WEC stands alone with self-contained data acquisition instrumentation. WECs can be connected to the Ocean Sentinel for testing during the months of May through October. The NETS site is fully permitted for Ocean Sentinel deployment; WECs to be tested require a US Army Corps permit. In addition to being used for WEC testing, the NETS site will be used for research investigations related to WEC deployments at PMEC-SETS. For example, plans are underway to test a variety of anchoring options at NETS that will inform design decisions at SETS.

PROJECT PERSONNEL

Include key personnel directly involved w/management of the proposed project and site. Include names, titles, description of relevant experience, credentials/training.

Belinda Batten is the NNMREC Director, and a Professor of Mechanical, Industrial, and Manufacturing Engineering (MIME) at OSU. She has over ten years of program management and leadership experience, having been the School Head of MIME, and a the Program Manager for Dynamics and Control for the Air Force Office of Scientific Research. She holds a PhD in Mathematical Sciences from Clemson University and serves on the Oregon Wave Energy Trust Board. She is responsible for the overall direction of the PMEC-SETS project, and is the primary lead for fundraising.

Sean Moran, PE, MS, MBA is the NNMREC Ocean Test Facilities Manager and in this capacity was responsible for bringing PMEC-NETS online in summer 2012. He has broad experiences as a consultant for large civil engineering projects, as well as experience with city planning? He is responsible for the Engineering Design aspects of the PMEC-SETS project.

Sarah Henkel, PhD is NNMREC-OSU's Director of Environmental Research and is an Assistant Professor of Zoology at the Hatfield Marine Science Center. She is a Benthic Ecologist and was responsible for benthic characterization at the PMEC-NETS. She is responsible for coordinating the scientists and engineers performing baseline studies for site characterization at PMEC-SETS, and is a primary liaison for the Stakeholder Committee concerned with permitting and adaptive monitoring and mitigation for PMEC-SETS.

Dan Hellin, MS is NNMREC's Environmental Compliance Manager, responsible for overall adherence to agreements established within permitting and licensing processes. He has over 20 years of experience in coastal and ocean management and has been involved in multi-disciplinary research projects focused on a wide range of issues including marine spatial planning; port and harbor management; waterfront planning; offshore renewable energy; watershed management; the application of GIS technologies; assessments of marine facilities; studies of recreational boating and fishing; regulatory and policy analysis and development; and economic analysis. He is responsible for coordinating compliance with adaptive management plans for testing at PMEC-NETS. This entails communicating requirements to WEC developers, working with the environmental scientists and ocean test facilities manager to ensure that all monitoring plans are carried out per agreements. He is responsible on reporting on monitoring outcomes to all pertinent stakeholders. These responsibilities will carry over to the PMEC-SETS once that facility is operational.

Greg McMurray, PhD has over thirty years' experience working in the arena of ecological risk assessment in marine and coastal environments. This experience has fostered a unique skill set with which to address the environmental and regulatory challenges of renewable ocean energy development. Chief among these skills are project management, scientific integration and synthesis, and the thoughtful and deliberate use of science to inform policy decisions, especially as applied to the evolving ecosystem-based management and marine spatial planning paradigms. He assists NNMREC with advice around environmental protocols relating the regulatory framework, and will work in NNMREC in this role until permits and licenses for PMEC-SETS are obtained.

TECHNICAL CONSULTANTS

Include key consultants directly involved w/management of the proposed project and site. Include names, titles, description of relevant experience, credentials/training.

Pacific Energy Ventures (PEV) specializes in project management of early stage technologies, regulatory and policy analysis, and developing public-private partnerships in the emerging renewable energy sector. PEV's expertise lies in project coordination, regulatory strategy, strategic marketing, and securing public and private funds for renewable energy development.

Oregon Wave Energy Trust (OWET) leads economic development activities for wave energy technology in Oregon, and is a key partner to NNMREC and WEC developers. They provide funding for research and testing, and are leaders in supporting and developing the supply chain for marine energy in Oregon State University.

European Marine Energy Center (EMEC) in Orkney Scotland led a team to provide the preliminary concept design for PMEC-SETS. As the global "gold standard" in wave and tidal testing, their knowledge and insights about best practices for a grid connected test center have been a key piece of the design process thus far for SETS. EMEC continues to assist NNMREC with advice and consulting services.

Aquatera, also in Orkney Scotland, is an environmental and products consultant that has been engaged in marine renewable energy. They provide information that aids in management of potential impacts of projects such as PMEC-SETS on the environment, and the environment on the project. They provide

integrated support for the full lifecycle of renewables projects from initial concepts through to decommissioning.

Central Lincoln Public Utility District will provide engineering and construction services for the land-based infrastructure design related to grid connection for PMEC-SETS.

Requests for proposals will be released for contractors to propose to assist NNMREC in the various aspects of PMEC-SETS design and construction, including: environmental document preparation for regulatory and permitting; cable routing; engineering design of land-based infrastructure (e.g., switch gears, data acquisition equipment, grid connection elements—working with CLPUD); engineering design services for subsea cable power and communications connector system; cable design; sea-based infrastructure, including directional drilling; SETS construction.

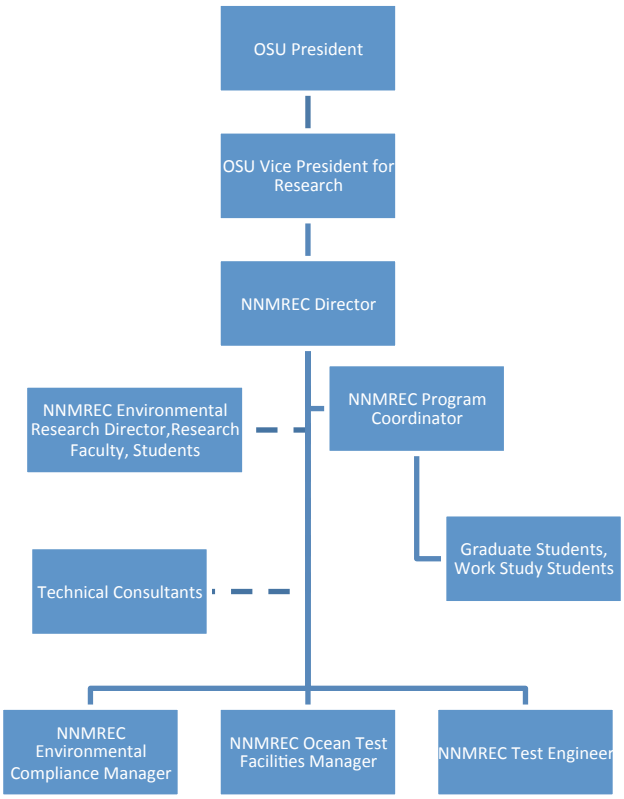


FIGURE 7: NNMREC ORGANIZATIONAL CHART WITHIN OREGON STATE UNIVERSITY

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ACQUISITION FEE

There is no acquisition fee for a research lease, as indicated by 30 CFR, Part 285, Section 238, paragraph (g).

CERTIFICATION

[redacted]

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PERSONAL COMMUNICATIONS

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APPENDICES

[redacted]

Appendix A: Documentation of Legal Qualifications

Appendix B: Documentation of Technical Qualifications

[redacted]

Appendix C: Documentation of Financial Qualifications

[redacted]

Appendix D: Letters of Support

Appendix E: Feasibility Study for a Grid Connected Pacific Marine Energy Center

This final report, which was completed in December 2011, is provided as documentation of the Technical Evaluation of Candidate Sites conducted as part of the PMEC site selection process.

Appendix F: Newport Community Site Proposal for PMEC

The proposal developed by the Newport Community Siting Team for the Pacific Marine Energy Center, which was submitted to NNMREC-OSU in December 2012, is included here to provide additional information about the PMEC site selection process and site characteristics.

Appendix G: Examples of WEC Device Technologies

This document was provided as Appendix C to the Final Environmental Assessment prepared by the U.S. Department of Energy in 2012 for its funding of the NNMREC Non-Grid Test Center, and it is included here to provide additional information about the types of WEC devices that would be tested at PMEC.

[redacted]

APPENDIX A: DOCUMENTATION OF LEGAL QUALIFICATIONS

JOHN A. KITZHABER, MD
GOVERNOR

February 5, 2013

Ellen Aronson, Pacific Region Director
Bureau of Ocean Energy Management
770 Paseo Camarillo, 2nd Floor
Camarillo, CA 93010

Dear Ms. Aronson:

I am writing on behalf of the Governor to confirm that OSU is an agency of the State of Oregon pursuant to Oregon Revised Statutes 351.011. Further, the Governor's Office authorizes Oregon State University, through the Oregon State Board of Higher Education, to negotiate the terms and conditions and enter into a renewable energy lease with the Bureau of Ocean Energy Management for the purpose of constructing and operating a Pacific Marine Renewable Energy Center on the Outer Continental Shelf (OCS).

Oregon State University (OSU) is home to the Northwest National Marine Renewable Energy Center (NNMREC). Within OSU's research and economic development mission, NNMREC is intended to serve as an integrated, standardized test center for entities interested in developing wave energy devices. To that end, NNMREC proposes to construct and operate a Pacific Marine Renewable Energy Center on the OCS.

Please contact me with any questions regarding this authorization.

Sincerely,

Gabriela Goldfarb
Policy Advisor - Natural Resources
Office of Governor John Kitzhaber

254 STATE CAPITOL, SALEM OR 97301-4047 (503) 378-3111 FAX (503) 378-6827
WWW.OREGON.GOV

APPENDIX B: DOCUMENTATION OF TECHNICAL QUALIFICATIONS

APPENDIX C: DOCUMENTATION OF FINANCIAL QUALIFICATIONS

APPENDIX D: LETTERS OF SUPPORT

Serving Portions of Coos, Douglas, Lane, and Lincoln Counties on Oregon's Central Coast

CENTRAL LINCOLN
YOUR PUBLICLY-OWNED ELECTRIC UTILITY

2129 North Coast Highway • P.O. Box 1126 • Newport, Oregon 97365-0090 • 541-265-3211 • fax: 541-265-5208

August 8, 2013

Dr. Belinda Batten
Northwest National Marine Renewable Energy Center
Oregon State University
350 Batcheller Hall
Corvallis, OR 97331

RE: Business Services for the Pacific Marine Energy Center South Energy Test Site

Dear Dr. Batten,

This letter is provided as documentation of the Central Lincoln People's Utility District's current and ongoing relationship with the Northwest National Marine Renewable Energy Center (NNMREC) at Oregon State University (OSU). Central Lincoln is Oregon's fourth-largest electric utility, serving some 55,000 Oregonians, and fully one-third of Oregon's coastline. We are a consumer-owned electric utility owned by the customers and communities we serve. CLPUD supports, and will continue to support, the wave energy industry in Oregon.

CLPUD is anticipating direct involvement in the design and construction of the Pacific Marine Energy Center (PMEC) South Energy Test Site (SETS). Central Lincoln's Chief Engineer, and our Power Analyst have met with NNMREC staff and consultants on multiple occasions to discuss the feasibility, eligibility and technical requirements necessary for connection of this facility to our local grid infrastructure. We will continue to help develop the requirements as the design of the SETS proceeds. In addition, CLPUD participated in the community siting committee that proposed the best alternative site for the SETS, serving as a critical input for the BOEM lease request application. We look forward to continuing to assist NNMREC with this exciting project.

Please contact me if you need any additional information.

Sincerely,

Debra Smith
General Manager

DS:cc

August 8, 2013

Dr. Belinda Batten
Northwest National Marine Renewable Energy Center
Oregon State University
350 Batcheller Hall | Corvallis, OR 97331

Subject: Business Services for the Pacific Marine Energy Center South Energy Test Site

Dear Dr. Batten,

This letter is provided as documentation of Aquatera's current and ongoing business relationship with the Northwest National Marine Renewable Energy Center (NNMREC) at Oregon State University (OSU). Aquatera supports, and will continue to support, the wave energy industry in Oregon.

Aquatera is currently working with NNMREC on various aspects of the development of the Pacific Marine Energy Center (PMEC) South Energy Test Site (SETS). Our firm is currently under contract for the development of a supply chain analysis study for NNMREC, through our partner, the Oregon Wave Energy Trust (OWET). Aquatera was also a critical partner in the development of the Conceptual Design Report for PMEC Facility, led by EMEC, which was completed in March, 2013. In addition, Aquatera in currently under contract with NNMREC for general consulting services, which enables direct consultation with NNMREC on a daily basis. We look forward to continuing to assist NNMREC on this exciting project.

Please call Gareth Davies at +44(0) 1856 850088 or email gareth.davies@aquatera.co.uk if you need any additional information.

Sincerely,

Gareth Davies
Managing Director
Aquatera Ltd.

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

August 9, 2013

Dr. Belinda Batten
Northwest National Marine Renewable Energy Center
Oregon State University
350 Batcheller Hall | Corvallis, OR 97331

Subject: Business Services for the Pacific Marine Energy Center South Energy Test Site

Dear Dr. Batten,
This letter is provided as documentation of the National Renewable Energy Laboratory's (NREL) current and ongoing business partnership with the Northwest National Marine Renewable Energy Center (NNMREC) at Oregon State University (OSU). NREL supports, and will continue to support, the wave energy industry in Oregon.

NREL has worked with NNMREC-OSU since its inception and continues to provide support for the development of the Pacific Marine Energy Center (PMEC) and the South Energy Test Site (SETS) under a cooperative Research and Development Agreement (CRADA). NREL is also currently collaborating with NNMREC as a partner for a recent U.S. Department of Energy (DOE) Funding Opportunity Announcement (FOA) for continued development of fully energetic offshore wave energy testing facilities. We look forward to continuing to assist NNMREC on this exciting project.

Please call Al LiVecchi at (303) 384-7138 or email Al.LiVecchi@nrel.gov if you need any additional information.

Sincerely,

Robert W Thresher

Robert W. Thresher
Marine Hydrokinetic Program Manager & Research Fellow
National Renewable Energy Laboratory
Robert.Thresher@nrel.gov
303-384-6922

EMEC 10
TEN YEARS OF MARINE ENERGY EXPERIENCE

8 August 2013

Dr. Belinda Batten
Northwest National Marine Renewable Energy Center
Oregon State University
350 Batcheller Hall | Corvallis, OR 97331

Dear Dr.Batten

Business Services for the Pacific Marine Energy Center South Energy Test Site

This letter is provided as documentation of EMEC's current and ongoing business relationship with the Northwest National Marine Renewable Energy Center (NNMREC) at Oregon State University (OSU). EMEC supports, and will continue to support, the wave energy industry in Oregon.

EMEC is currently working with NNMREC on various aspects of the development of the Pacific Marine Energy Center (PMEC) South Energy Test Site (SETS). EMEC led the design of the recently completed Conceptual Design Report for PMEC Facility (March 2013). In addition, EMEC intends to enter into a general consulting services contract with NNMREC, which will enable direct consultation with NNMREC on a daily basis. This business relationship will help to disseminate the knowledge necessary for the operation of ocean testing facilities. We look forward to continuing to assist NNMREC on this exciting project.

Please call Neil Kermode at +44(0) 1856 852 068 if you need additional information.

Yours sincerely

Neil Kermode
Managing Director

pacific ENERGY VENTURES

Steven R. Kopf, Senior Partner
(484) 459-8200
skopf@peventuresllc.com

Justin Klure, Managing Partner
(503) 475-2999
jklure@peventuresllc.com

August 8, 2013

Dr. Belinda Batten
Northwest National Marine Renewable Energy Center
Oregon State University
350 Batcheller Hall | Corvallis, OR 97331

Subject: Business Services for the Pacific Marine Energy Center South Energy Test Site

Dear Dr. Batten,

This letter is provided as documentation of Pacific Energy Ventures' (PEV) current and ongoing business relationship with the Northwest National Marine Renewable Energy Center (NNMREC) at Oregon State University (NNMREC-OSU). PEV is a consulting and business development firm specializing in project management, regulatory and permitting, governmental affairs, and policy in the renewable energy sector. With extensive experience in all aspects of ocean renewable energy development, our firm has the advantage of a multi-dimensional perspective on the ocean energy industry.

PEV has worked with NNMREC-OSU since its inception in 2008, most recently providing project management and regulatory compliance services for the Pacific Marine Energy Center (PMEC) North Energy Test Site (NETS). Starting in 2012, PEV entered into a general consulting services contract with NNMREC-OSU to provide ongoing project management and regulatory consulting for the PMEC South Energy Test Site (SETS).

We look forward to continuing to partner with NNMREC on this exciting project.

Please call (503) 475-2999 or email jklure@peventuresllc.com if you need any additional information.

Sincerely,

Justin Klure
Managing Partner

OregonWaveEnergy TRUST

240 North Broadway, Suite 115, Portland, Oregon 97227
www.oregonwave.org

August 8, 2013

Dr. Belinda Batten
Northwest National Marine Renewable Energy Center
Oregon State University
350 Batcheller Hall | Corvallis, OR 97331

RE: Business Services for the Pacific Marine Energy Center South Energy Test Site

Dear Dr. Batten,

This letter is provided as documentation of the Oregon Wave Energy Trust's (OWET) current and ongoing business relationship with the Northwest National Marine Renewable Energy Center (NNMREC) at Oregon State University (OSU). OWET supports, and will continue to support, the wave energy industry in Oregon. OWET has worked with NNMREC-OSU since NNMREC's initiation in 2007. OWET is currently working with NNMREC as a sub-awardee for the development of a supply chain analysis study and a market analysis study related to the development of the Pacific Marine Energy Center. OWET is also currently collaborating with NNMREC as a partner for a recent US Department of Energy (DOE) Funding Opportunity Announcement (FOA) for continued development of fully energetic offshore wave energy testing facilities. We look forward to continuing to assist NNMREC on this exciting project.

Please call Jason Busch at (503) 729-2253 or email jbusch@oregonwave.org if you need any additional information.

Warm regards,

Jason Busch
Executive Director

APPENDIX E: FEASIBILITY STUDY FOR A GRID CONNECTED PACIFIC MARINE ENERGY CENTER

Northwest National Marine Renewable Energy Center Oregon State University

Feasibility Study for a Grid Connected Pacific Marine Energy Center

This report was developed by Pacific Energy Ventures, with technical support from Parametrix, on behalf of Oregon State University.

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Table of Contents

APPENDICES

I. Background

The Northwest National Marine Renewable Energy Center (NNMREC), one of three federally sponsored ocean energy centers, is a partnership between Oregon State University (OSU) and the University of Washington (UW). As national leaders in ocean energy research and development, NNMREC-OSU focuses on wave energy and NNMREC-UW focuses on tidal energy. The National Renewable Energy Lab (NREL) is also a key partner in the center. For the purposes of this report, references to NNMREC assume to be that of NNMREC-OSU.

Since its establishment in 2008, NNMREC has made great strides to assist and guide the development of the wave energy industry in the US through technology testing and validation, environmental study and analysis, and understanding the human dimensions of the emerging ocean energy industry. One of NNMREC's primary roles is to serve as an integrated, standardized test center for US and international wave energy developers. NNMREC is also home to world-class research facilities available to NNMREC and its partners, including the O.H. Hinsdale Wave Research Laboratory, the Wallace Energy Systems and Renewables Facility, and Hatfield Marine Science Center.

In addition to its land-based facilities, one of NNMREC's distinguishing attributes is its proximity to the ocean itself. The ocean waters just north of Newport Harbor have served as a primary testing ground for the wave energy industry in the US. In addition to testing various energy generation technologies, significant investment has been made in understanding ecosystem interactions and socioeconomic effects of this new industry. After four years of laboratory study and analysis, NNMREC will be home to the nation's first ocean test berth (non-grid connected) in 2012, capable of testing a variety of ocean energy technologies while monitoring interactions with the local ecosystem. At this Newport ocean site, NNMREC aims to have a full suite of testing capabilities to support the advancement of small-scale and full-scale devices supported by both land based and in ocean testing facilities.

While the NNMREC ocean test berth is a critical step forward, developers and policy-makers alike have determined that a full-scale, grid connected ocean test facility is needed to achieve industry commercialization and fully reap the benefits of this clean, renewable energy resource. Fulfilling this need is the primary purpose of the ***Pacific Marine Energy Center (PMEC).***

> ***PMEC Vision:*** *Leverage NNMREC expertise and industry partnerships to develop a full scale, grid-connected ocean energy demonstration center that can accommodate multiple devices of various technology types and scales.*

NNMREC has developed a four-phase approach to achieve the PMEC vision:

- Phase 1: Non-grid connected, ocean testing off the coast of Newport, OR for proof of concept through prototype devices (To commence in 2012).
- Phase 2: Grid Emulation System testing for prototype devices and system verification (Involves site selection, design and installation of subsea transmission cable and shore-based infrastructure).

- Phase 3: Grid connection of the cable to support final demonstration and testing (involves permitting for grid connect and shore-based infrastructure).
- Phase 4: Additional grid connected ocean test berths to support final demonstration and testing (Involves design and installation of a second subsea transmission cable and shore-based infrastructure).

As noted, the non-grid connected ocean test site discussed above in Phase 1 will be located just north of Newport, OR, approximately 2-3 miles offshore, and NNMREC plans to begin wave energy device testing at this location in the summer of 2012. It is possible that Phases 2-4 could be performed at the ocean test site off the coast of Newport; however, additional site characteristics will be required for the services provided in Phases 2-4. For example, to meet required water depths for some devices, the test site would need to be deeper than the current Newport site. Therefore, three other locations are being evaluated along with the Newport site as part of this feasibility study. The purpose of this study is to:

- **Identify the site characteristics required for the successful development of PMEC; and**
- **Conduct a technical evaluation of candidate sites that meet these criteria.**

II. Pacific Marine Energy Center

A grid connected ocean energy demonstration center is a critical component of advancing the marine energy industry in the US. The interest and value in this type of test center has been documented in numerous reports reflecting industry and stakeholder interests. In particular, The Ocean Renewable Energy Coalition's recently published MHK Roadmap[1] for ocean energy acknowledges that the development of a demonstration center is a necessary step in commercializing this sector. Furthermore, the report acknowledges the ***most pronounced underlying success factor for this industry is the ability to focus resources – commercial, financial, scientific and political – on deploying MHK devices and studying their interactions with the natural environment, increasing technical efficiencies and learning from direct experience.*** PMEC can meet this objective by serving as the cornerstone for the industry to not only maximize current investment, but also to direct future investment in such a way that accelerates the development of new ocean energy generating technologies.

To that end, the PMEC is designed to demonstrate the viability of marine energy off the northwest coast of the US by providing a fully functional ocean test facility for prototype and commercial scale devices (TRL 5-9). PMEC will offer up to four test berths connected to the regional grid, and will be capable of testing individual devices up to one megawatt in size. By offering numerous device testing options in conjunction with transmission and grid interconnection infrastructure, the PMEC will facilitate wave

[1] http://www.oceanrenewable.com/wp-content/uploads/2011/05/MHK-Roadmap-Final-November-2011.pdf

energy technologies' progress from early-stage ocean testing through final demonstration for commercialization use. Specifically, the PMEC will meet the following key industry development needs:

- Site for testing subscale devices with grid simulation capability;
- Ocean test berth for single device testing;
- Multiple-berth testing (e.g., small arrays of 2 to 10 devices) for commercial scale devices and prototypes; and
- Opportunity for potential expansion to commercial activity.

The PMEC is intended to be a full service test facility. Although the specific PMEC offerings are still under development, it is expected they will include, but are not limited to the following:

- Standardized testing at reduced cost;
- Standardized power analysis at accredited facility;
- Grid interconnection data from accredited facility;
  - Grid synchronization data
  - Standardized fault testing
- Power dissipation;
- Demonstration of power on the grid (e.g., technical and contractual);
- Procedures and protocols for all stages of development.

In addition, the PMEC will provide assistance through each stage of testing:

- Pre-Test Stage
  - Guidelines for Streamlined Permitting Process
  - Deployment and Testing Plans
  - Research and Monitoring Plans (including IP plans)
- Test Stage
  - Testing Protocols and Procedures
  - Device Monitoring (power and performance)
  - Environmental Monitoring
- Post-Test Stage
  - Data Analysis
  - Demobilization
  - Decommissioning

Figure 1. Ocean Power Technologies PB150 being deployed in Scotland. A similar device is planned for deployment in Oregon in 2012.

III. The Oregon Advantage

The State of Oregon and the Northwest Region of the US are uniquely positioned to lead the development of ocean energy. Oregon and the Northwest have invested more resources and expertise than any other region in the US. In addition to successful demonstration projects, Oregon will likely be

home to the Nation's first commercial license for ocean generated electricity. Oregon has clearly demonstrated its ability to attract investment and develop successful projects.

In short, the Oregon advantage consists of:

- Resource Required to Test TRL 9 Utility Scale Devices (and summer climates suitable for TRL 5-7)
- Information Transferable to US West Coast Commercialization
- Oregon Wave Energy Trust and State of Oregon
- Proximity to Supply Chain
- Site Accessibility
- Comprehensive R&D Facilities
- Stakeholder Consortium

Resource Required to Test TRL 9 Utility Scale Devices (and summer climates suitable for TRL 5-7)

Oregon's wave resource is one of the best in the US, giving developers the opportunity to test a range of scaled devices, including, TRL 5-7 and most importantly TRL 9 testing capability. Although certain small scale devices may be preferable to test the only the summer months, the Oregon resource has the ability to demonstrate to utilities and other investors the commercial viability and survivability of related commercial technologies.

Information Transferable to US West Coast Commercialization

The information collected and analyzed at the PMEC in Oregon can be applied to future commercial developments along the west coast. Because the Oregon coastline is similar to the California and Washington coasts, both physically and biologically, information regarding site development, interactions with the environment, and other attributes of project development can be used to inform future ocean energy projects on the US west coast.

Oregon Wave Energy Trust and the State of Oregon

Oregon is home to the nation's only state-sponsored public/private partnership established with the sole mission to advance the wave energy industry. Since its inception in 2007, the Oregon Wave Energy Trust[2] (OWET) together with the State has invested over $10 million to advance wave energy development, funding numerous environmental, social and technical studies needed to support the industry. Furthermore, Oregon is home to multiple Technology Readiness Level (TRL) 5/6 and 7/8 and ocean energy companies, and OWET has provided direct cost match to various US Department of Energy (USDOE) sponsored programs.

Proximity to Supply Chain

Oregon is home to world class manufacturing and supporting industries for the ocean energy sector. Facilities both in Portland and along the coast are situated to construct, deploy and maintain wave energy devices and supporting services.

Site Accessibility

All potential sites are within a three hour drive of the Portland International Airport, and within 125 miles of OSU's campus in Corvallis. In addition, all sites are located within 50 nm of a deep water port that will allow for easy access to manufacturing capabilities, deployment services, and vessels.

[2] www.oregonwave.org

Comprehensive R&D Facilities

NNMREC has become a "one stop shop" for the wave industry, providing comprehensive testing facilities for all technologies from early TRL (e.g., wave tank) to advanced TRL (e.g., ocean test berth). With the ability to leverage existing world class research facilities both in Corvallis and at the Hatfield Marine Science Center in Newport, PMEC is the final component that is needed to position the US West Coast as truly competitive in the international marketplace of ocean energy industry.

Stakeholder Consortium

NNMREC is developing an consortium of stakeholders that support the vision of a grid connected test facility in Oregon. The role of this consortium is to provide technical input to both guide and contribute to the PMEC's development. The stakeholders include a variety of industry participants, including technology developers, government agencies and community leaders.

IV. Industry Benefits

A grid connected ocean test facility has been discussed and analyzed at various levels of industry and government. In addition to offering a centralized location for testing and evaluating ocean energy technologies, the PMEC will provide benefits to a variety of industry partners and stakeholders:

Technology Developers

- Provides economical means of deploying and testing prototypes in the ocean environment.
- Leverages infrastructure and experience gained through ongoing and planned investments by DOE, OWET, BOEM, and others.
- Provides performance data for third-party validation.

NNMREC

- Offers centralized location to conduct technological and environmental testing.
- Increases likelihood of significant financial support for testing activities by the public sector, given the unified industry and academic beneficiaries of the project.

State and Federal Government

- Focuses funding for infrastructure across several proposed wave energy projects to benefit the industry as a whole.
- Accelerates information gathering, technology design and testing, as well as environmental impact analysis.
- Provides standardized testing metrics for technology performance evaluation.

West Coast Region

- Limits potential conflicts among competing uses for multiple ocean energy test sites.
- Serves as a "magnet" for federal/regional/private funding for ocean energy research and development.
- Increases efficiency and effectiveness of public funding by concentrating it on one, full-service facility.
- Provides a training ground for future jobs in the ocean energy industry.

V. Technical Evaluation of Candidate Sites

In order to perform a comprehensive evaluation of potential sites for the PMEC, it is important to consider the industry perspective. As such, collection of industry input was the first step in the technical site evaluation. This information was combined with regulatory needs and stakeholder interests to develop both initial screening criteria and detailed site evaluation criteria. The screening criteria were used to select four candidate sites for further evaluation. Finally, the detailed site evaluation criteria were utilized to evaluate the four candidate sites identified.

V.1 Input from Industry

Utilizing resources from NNMREC and OWET, feedback on requirements for an optimal grid connected ocean test site was gathered from industry. This industry input was used as the basis for the preliminary and detailed site evaluation criteria discussed below in Section V.3. In addition, the Cumulative Effects Tool developed by OWET was used to help guide the site evaluation process. For the purposes of this feasibility study, results of the Cumulative Effects Tool analysis are provided in spatial maps included as appendices to this report, including an industry report prepared by Parametrix. The table below summarizes input from industry, representing the most commercially advanced technologies.

Table 1: Industry Input on Site Requirements

Physical	
Min/Max/Optimal water depth for Point Absorbers	○ Single Device: 60m min., 80 - 100m opt., 150m max ○ 10 MW array: bathymetry driven and distance from shore, 100m if close enough to shore
Mooring footprint	○ Single Device: largest radius of 400m, 800m diameter ○ 10 MW array: same as single device until more information collected
Bottom Conditions	○ Preferred Types: sandy/mud bottom ○ Feasible Types: rock bottom (if use drilling to install anchors) ○ Non-feasible Types: reef
Construction	
Assembly/deployment scenarios:	○ Location for pre-commissioning tests of 4 - 8 weeks in sheltered area, min. 30-35m water depth (e.g., Swan Island near Portland or Vigor shipyard in Portland; considering dredging an area that would be deep enough) ○ Either barged to site or towed to site ○ At site, use ballasting to upright the system, then mooring, umbilical etc.
Required facilities:	Place to perform monitoring activities: Space for at least 3 engineers and their laptops, 120ft x 150ft staging area, covered work space of about 90ft x 120ft, AC power 120V, 200A; 240V, 200A; 480V, 200A, 150lbs air, potable water, waste water collection, fork lift, external lighting and shop lighting,

	500sq feet of office space, heating/AC, 120V, 50A; 240V 50A, internet and LAN access, phone lines, restrooms, etc.
Required equipment:	Power monitoring equipment, utility connection with fiber optic communication line
Mode of transport	From fabricator to assembly and deployment area: towed or barged from shipyards in Portland
Construction Window	○ Single Device: 12 months ○ 10 MW array: 6 - 8 months per device.
Interconnection/Power Sale	
Voltage – Min/Max/Optimal:	○ Developers are still investigating (11 - 40kV).
Mooring	○ Number of anchors: 1, 2, 3 or 6 ○ Cable length/type: synthetic line, 4 - 6in. diameter, likely chain, 400m. ○ Installation technique: anchor handling tug, or special purpose barge drop anchors ○ Removal technique: Same as installation. ○ Approach to providing financial surety for removal: bonding
Maximum Cable Length (Subsea/Terrestrial)	○ Single Device: 3 - 5miles subsea, to substation location ○ 10 MW array: similar to single device.
Power Conditioning – onboard or centralized	○ Single Device: Energy storage on WEC, Power Quality leveling improvement on WEC ○ 10 MW array, some energy storage and power quality may be centralized due to power smoothing of multiple device
Load Bank – for non-grid connected device	○ Capacity of load bank on board: example of 400 kW average, 2 MW peak
Operations and Maintenance	
Maximum transit distances for dockside and at-sea maintenance	○ Single Device: 1 hr transit each way (2 - 4 nm dockside, 8 - 12 nm at sea), to allow 6 hrs on site (full day) ○ Multi-Device Array (10 MW): Same as above
Required facilities and equipment: vessel requirements, and similar to above	○ Regular O&M ○ Major overhaul ○ Emergency response

V.2 Initial Site Screening

In order to conduct a detailed site evaluation, an initial set of screening criteria were used to develop a short-list of sites for consideration. In developing the screening criteria both the objectives of the PMEC and industry needs were used. PMEC is designed to test a variety of technologies in the near term (2-5 years) and to have a facility capable of testing both near shore and deep water technologies in the long term (5 - 10 years). Therefore, the near-term focus of the PMEC site will be to accommodate those technologies closest to commercialization (higher TRL levels in need of grid connection) and those currently funded by USDOE. The following screening criterion were developed based on industry needs expressed through project development and site assessment activities in Oregon over the last five years, i.e., technologies closest to commercialization.

Primary Site Requirements:

- Within 50 nautical miles of deep water port
- Within 15 nautical miles of service port
- Water Depth 60 - 100 meters
- Within 5 miles to 115kv transmission line from shore landing
- Soft Bottom
- Leverages existing industry activity

Secondary Site Requirements:

- Water Depth 15 - 40 meters

Based on these initial screening criteria, the following locations off the Oregon coast were identified as appropriate for further evaluation:

- Warrenton, OR
- Newport, OR
- Reedsport, OR
- Coos Bay, OR

Figure 2. WET-NZ device being deployed in New Zealand. A similar device is planned for deployment in Oregon in 2012.

V.3 Evaluation Criteria

To further evaluate the sites identified during the initial screening, detailed evaluation criteria were developed based on input from industry and from information gathered from site assessment and project development activities in Oregon over the last few years. For each site, information was collected and reviewed for each of the following criteria. (Table 2 on page 20 provides a summary of the information gathered for each site.)

Proximity to Facilities for Deployment

This criterion provides an assessment of the proximity of the project site to facilities that are suitable for final assembly and deployment of wave energy devices. For each proposed project site, the nearest port with deep water access and the required infrastructure was determined and the distance from the port

to the project site was calculated using Google Earth. Note that Coos Bay has the largest industrial complex with manufacturing facilities and wharf side assembly areas that are suitable. Astoria and Yaquina Bay have less infrastructure, but are likely suitable for demonstration programs in single device deployments. Commercial deployments from these ports, however, would require new investments in infrastructure. As such, it is important to evaluate transit distances to facilities that currently have the required infrastructure. Accordingly, distances to Vigor Marine (Portland), American Bridge (Reedsport), and Saus Brothers (Coos Bay) were determined.

Note that Ocean Power Technologies plans to deploy its first wave energy device from Vigor Marine in Portland. However, its moorings are being fabricated by American Bridge in Reedsport. Vigor is approximately 287 miles from the Reedsport project site, while American Bridge is about 16 miles. This illustrates that for demonstration programs, the capabilities of the manufacturer are likely more important than the transportation distance. This is likely to change as deployments get larger and companies seek to minimize transportation costs.

Proximity to Port for Service Vessels Capable of Conducting Onboard Maintenance

This criterion provides an assessment of the proximity of the project site to facilities that are suitable for ongoing operations and maintenance that will be performed at the project site. It is assumed that these operations will be conducted by vessels approximately 40 feet in length. As such, ports with less infrastructure are suitable for this purpose. Interviews with wave technology developers have indicated that a minimum transit time from port to project site is essential. A general rule of thumb is that the transit distance should be less than two hours. The four candidate sites that have been selected generally meet these criteria. The Newport site is the closest (8 miles) and the Coos Bay site is the longest (14 miles). The Coos Bay case assumes that the operations base is located at the Saus Brothers facility, which is approximately 10 miles upriver from the jetties; however, distance to the Coos Bay site could be significantly shorter if the operations base was located closer to the jetties.

Another important factor in proximity to port is the site's susceptibility to closures due to treacherous conditions at the harbor entrance during bad weather. While recent, detailed data from the US Coast Guard are not presently available, Coos Bay and Newport are generally considered to be the best all weather ports. Access to Astoria and Winchester Bay can be significantly more difficult in the winter months because of severe weather. This is an important consideration, as early-stage projects will likely require frequent trips for maintenance, inspection, and repairs.

Proximity to Facilities for Dockside Repair

Unlike operation and maintenance, this criterion assumes that the ocean energy device must be returned to a port with infrastructure suitable for the intended repair. Failure analysis will likely indicate that devices will need dockside repair and/or maintenance approximately once per five years. This analysis assumes that it is financially infeasible to tow devices back to Portland for service. As such, ports with moderate levels of infrastructure are considered. Disconnecting and towing an ocean energy device will likely only be attempted during periods of calm weather, so port accessibility is a somewhat lesser criterion than dockside repair during severe weather.

Logistical Convenience for Staff, Developers, Researchers

This criterion attempts to provide an assessment of the convenience of the site for staff, researchers, and developers. Recognizing that the selected site will be visited frequently, it is important to consider flying and driving times. Driving distances were calculated using Google maps and flying times were calculated based on direct or one-stop flights. As expected, the Warrenton and Newport sites are the most convenient to the Portland International Airport.

Energy Resources

The Oregon coast has been studied and identified as having some of the best ocean energy resources in the lower US. The energy resource is assumed to be relatively equivalent for all sites analyzed in this study. Below is an excerpt from the work conducted by Pukha Lenee-Bluhm, Robert Paasch, and H. Tuba Ozkan-Haller on Oregon's wave energy resource (included as Appendix 1 to this report):

> *The wave energy resource has been assessed and characterized at ten locations in the US Pacific Northwest using archived spectral records from wave measurement buoys. Seasonal bias due to the distribution of missing records was compensated for by weighting the existing records such that the appropriate number of hours for each month was considered. The wave energy resource at each location was characterized using six quantities derived from each hourly spectrum: omnidirectional wave power, significant wave height, energy period, spectral width, direction of maximum directionally resolved wave power and directionality coefficient.*
>
> *. . . Strong seasonal trends were observed with greater wave power, significant wave height, energy period and directionality coefficient, and narrower spectral width, when comparing winter months to summer months. The mean wave power during the winter months was found to be up to 7 times that of the summer mean. The direction of maximum directionally resolved wave power tends to head more towards the south in the summer months, with a typically 10° - 20° less in the summer than in the winter. The sea states observed at stations closer to shore (depth <50 m) exhibited much greater directional uniformity, with a larger directionality coefficient and the direction of maximum directionally resolved wave power occurring within a smaller range.*
>
> *The wave resource was presented in detail for two representative locations, with mean water depths of 135 and 40 m. Monthly means and statistical ranges were presented for the six characteristic quantities, showing the broad range of sea states that should be anticipated at any time of the year. In addition to knowing how the characteristics of the wave resource are distributed over time, it is critical to consider distributions over energy. Empirical cumulative distributions were presented, in terms of both occurrence and contribution to total energy, for six quantities characterizing the resource.* ***While a mean annual wave power of 31 kW/m was observed at the shallower location, mean hourly wave power varied over a vast range. Wave power of 10 kW/m or less occurs 40% of the time, contributing only 8% of the expected annual energy while wave power of 200 kW/m or more occurs 1% of the time and accounts for 10% of the annual energy.***

Proximity to Interconnection

Cable length is perhaps the single largest cost factor in the development of a wave energy demonstration center. This criterion evaluates both the subsea and terrestrial distances from the proposed project sites to electrical substations (69 kV, 115 kV, 230 kV). Subsea cable lengths were calculated using the bathymetry shown in the NOAA map for each site (in Appendix 20 and assumes a perpendicular route to the beach. The terrestrial routes are based on existing rights-of-way between the beach and the substation, and the distances were determined using Google Earth. Additionally, this criterion presents the seafloor conditions for the cable route and a littoral geology, both of which could have significant influences on installation costs and permitting. Information for subsea bottom conditions was obtained from Oregon Marine map, and Google Earth was used to estimate the littoral geology (defined as the type of soil conditions at the interface between ocean and land).

It is assumed that each site would require directional drilling as the cable crosses the beach. Soil conditions are unknown for each site as detailed cable routing has not yet been established. However, it is assumed that conditions are similar at each site and that the cable crossing could be made in areas of sand and low lying land in order to minimize cost. Therefore, the primary cost differential of the transmission infrastructure is distance, with the subsea distance being the dominating factor. The general bathymetry of the Oregon coast is characterized by shallower water along the North Coast and deeper water along the South Coast. As such, the Warrenton and Newport sites have the longest subsea transit distances of 8.9 nm and 7.8 nm, respectively, to 75-meter water depth. Reedsport and Coos Bay have much shorter subsea transmission distances – 2.9 nm and 2.0 nm respectively, to 75-meters. Terrestrial distances are minimal for all four sites, with Newport being the shortest (0.8 nm) and Reedsport being the longest (3.4 nm). In summary, Warrenton will likely have the highest transmission cost, with Newport, Reedsport, and Coos Bay having similar total costs of interconnection.

Figure 3. Northwest power grid.

Potential Environmental Effects

As the environmental resources are homogenous in sandy bottom regions of the Oregon coast, no particular site is likely to have a relative benefit over another. However, the four candidate project sites are be evaluated with the goal of minimizing potential environmental effects. Based on the environmental analyses conducted by Ocean Power Technologies for their Reedsport OPT Wave Park and the West Coast Wave Energy Framework conducted by Pacific Energy Ventures, there is a strong understanding of potential stressors and receptors. Detail analyses of a selected site for a given technology type (e.g., point absorber) will be required, however, to further determine the suitability.

Potential Effects to Human Uses

This criterion evaluates each of the proposed sites based on potential for conflicts with human uses. Impacts to commercial fishing vary with the depth of the project site: shallower sites typically have more impact on the Dungeness crab fishery while sites with depths exceeding 60 m generally have little to no impact to this fishery. This assumption will be validated with the maps for each site provided by Parametrix (see Appendix 2). Aesthetics are also an important factor in site selection; devices located closer to shore (e.g., Oyster) would likely have higher potential for aesthetic effect. Similarly, sites near headlands may experience more view shed effects.

Access to Utilities for Energy Off-Take

This criterion presents some basic information on utilities that are likely to purchase power from the grid connected demonstration project. The value for this power may be a function of utilities' demand for renewable energy or mandate to buy renewable power. Interconnecting to a utility that has neither a government mandate nor self-imposed requirement (e.g., Central Lincoln Public Utility District) may require that the power be wheeled to a customer that does. This criterion is especially important as projects transition from single device testing to small array demonstration.

In addition to the above criteria discussed, site selection will be subject to other considerations such as:

- Economic Development
- Marine Traffic
- Marine Debris
- Salvage plans
- Permits/Authorizations (e.g., Oregon Territorial Sea vs. OCS)
- Baseline studies
- Long-term environmental monitoring
- Adaptive Management Plans

V.4 Candidate Site Options

Based on the initial screening criteria discussed in Section V.2, the following locations off the coast of Oregon were identified as appropriate for continued evaluation:

- Warrenton, OR
- Newport, OR
- Reedsport, OR
- Coos Bay, OR

The following section offers a detailed technical description of each of the above site location options and a summary of distinguishing features. Further detailed analysis of each site as well as stakeholder outreach will be required to determine the final, optimal location for PMEC.

SITE OPTION 1: WARRENTON, OREGON

LOCATION

This site is located on the northern coast of Oregon, west of the Camp Rilea Military base, approximately 10 miles south of the Port of Astoria.

Deployment Port:	Astoria, 10 NM
Maintenance Port:	Astoria, 10 NM
Dist. to Portland via Barge:	114 NM
Dist. to Coos Bay via Barge:	179 NM
Driving Dist. from Corvallis:	172 mi.
Driving Dist. from PDX:	97 mi.

INTERCONNECTION

Subsea Transmission Dist.:	2.7 NM to 25 m depth
	5.6 NM to 50 m depth
	8.9 NM to 75 m depth
Substrate for Cable Run:	Sand/Mud
Onshore Dist.	1.0 mi. to 115 kV
to Substation:	7.8 mi. to 230 kV
Geology at Cable Crossing:	Sand
Interconnection Utility:	PacifiCorp

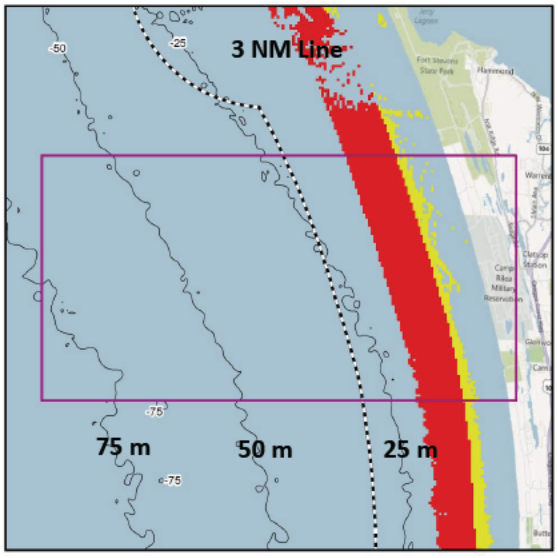


Figure 4. Warrenton Site Location Map. The lower map illustrates "locations suitable for ***coastal devices"***. More detailed analysis can be found in Appendix 2.

POTENTIAL IMPACT ON EXISTING USES

Commercial Fishing:	Mod at 25 m depth
	High at 50 m depth
	High at 75 m depth
Aesthetics from Land:	High at 25 m depth
	Low at 50 m depth
	Low at 75 m depth
Surfing:	Low

SUMMARY OF DISTINGUISHING FEATURES

- Close proximity to the Port of Astoria, but weather windows may be limited for port access.
- Shortest driving distance to PDX and longest driving distance from Corvallis.
- Potential to partner with OR Military Department and leverage Department of Defense infrastructure investment.
- Potentially less impact on commercial fishing pending a higher resolution analysis.
- Longest transmission distance will increase infrastructure costs.
- Gradually increasing water depth provides large potential for future commercial expansion.

SITE OPTION 2: NEWPORT, OREGON

LOCATION

This site is located off the central coast of Oregon to the southwest of the Newport test berth. It is southwest of Yaquina Head and approximately 8 miles north of the Port of Newport.

Deployment Port:	Newport, 8 NM
Maintenance Port:	Newport, 8 NM
Dist. to Portland via Barge:	221 NM
Dist. to Coos Bay via Barge:	94 NM
Driving Dist. from Corvallis:	52 mi.
Driving Dist. from PDX:	144 mi.

INTERCONNECTION

Subsea Transmission Dist.:	1.3 NM to 25 m depth
	2.8 NM to 50 m depth
	7.8 NM to 75 m depth
Substrate for Cable Run:	Sand/Mud
Onshore Dist.	0.8 mi. to 115 kV
to Substation:	10.1 mi. to 230 kV
Geology at Cable Crossing:	Sand/Mud
Interconnection Utility:	Central Lincoln PUD

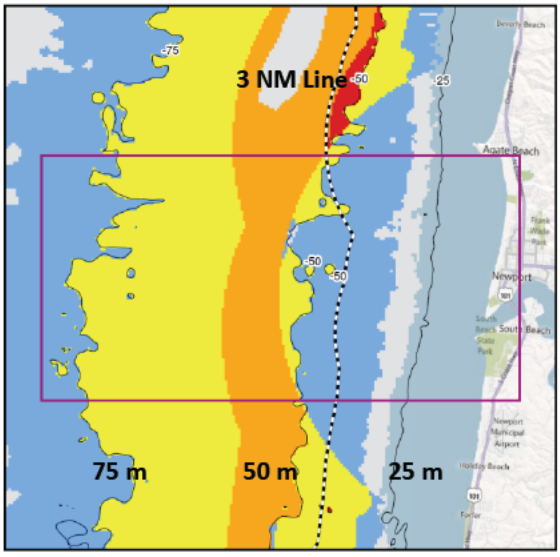


Figure 5. Newport Site Location Map**.** The lower map illustrates "locations suitable for ***off-shore devices***". More detailed analysis can be found in Appendix 2.

POTENTIAL IMPACT ON EXISTING USES

Commercial Fishing:	Mod at 25 m depth
	High at 50 m depth
	High at 75 m depth
Aesthetics from Land:	High at 25 m depth
	Mod at 50 m depth
	Low at 75 m depth
Surfing:	Low

SUMMARY OF DISTINGUISHING FEATURES

- Close proximity to the Port of Newport.
- Only interconnection is with Central Lincoln PUD, a public utility with no RPS requirement.
- Very close to OSU facilities, including Hatfield Marine Science Center and Oregon Sea Grant.
- Closest site to OSU campus in Corvallis.
- Strong existing relationship with Fishermen Involved in Natural Energy (FINE).
- Gradually increasing water depth provides large potential for future commercial expansion.

SITE OPTION 3: REEDSPORT, OREGON

LOCATION

This site is located on the southern coast of Oregon, due west of the Ocean Power Technologies (OPT) Reedsport Project site and approximately 40 miles north of Coos Bay.

Deployment Port:	Coos Bay, 39 NM
Maintenance Port:	Winchester Bay, 11NM
Dist. to Portland via Barge:	287 NM
Dist. to Coos Bay via Barge:	39 NM
Driving Dist. from Corvallis:	114 mi.
Driving Dist. from PDX:	211 mi.

INTERCONNECTION

Subsea Transmission Dist.:	1.0 NM to 25 m depth
	2.0 NM to 50 m depth
	2.9 NM to 75 m depth
Substrate for Cable Run:	Sand
Onshore Dist.	3.4 mi. to 115 kV
to Substation:	4.9 mi. to 230 kV
Geology at Cable Crossing:	Sand
Interconnection Utility:	CLPUD, PNGC, BPA

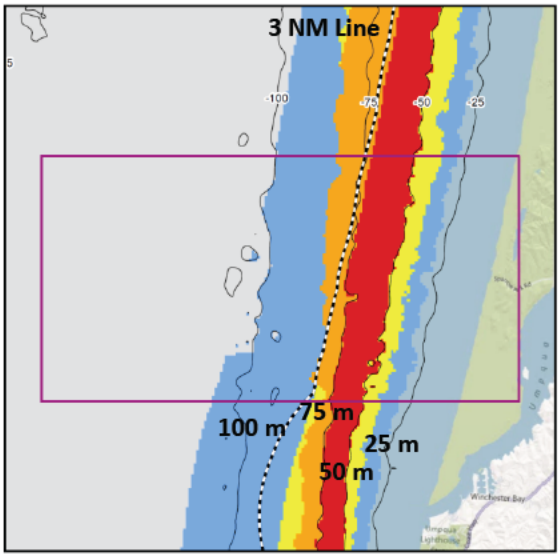


Figure 6. Reedsport Site Location Map. The lower map illustrates "locations suitable for ***off-shore devices***". More detailed analysis can be found in Appendix 2.

POTENTIAL IMPACT ON EXISTING USES

Commercial Fishing:	Mod at 25 m depth
	High at 50 m depth
	High at 75 m depth
Aesthetics from Land:	High at 25 m depth
	Mod at 50 m depth
	Low at 75 m depth
Surfing:	Low

SUMMARY OF DISTINGUISHING FEATURES

- Moderate proximity to the Port of Coos Bay, a very good all weather port.
- Very close to Winchester Bay, suitable for ship based maintenance.
- Good access to transmission and potential load base.
- Potential to partner with OPT and leverage extensive environmental analyses and studies.
- Deep water depths near shore minimize cost of infrastructure.
- Rapidly increasing water depth may limit ability to expand site for commercial development.

SITE OPTION 4: COOS BAY, OREGON

LOCATION

This site is located off of the southern coast of Oregon, west of the town of Lakeside and approximately 14 miles north of Coos Bay

Deployment Port:	Coos Bay, 14 NM
Maintenance Port:	Coos Bay, 14 NM
Dist. to Portland via Barge:	303 NM
Dist. to Coos Bay via Barge:	14 NM
Driving Dist. from Corvallis:	136 mi.
Driving Dist. from PDX:	234 mi.

INTERCONNECTION

Subsea Transmission Dist.:	0.9 NM to 25 m depth
	1.4 NM to 50 m depth
	2.0 NM to 75 m depth
Substrate for Cable Run:	Sand
Onshore Dist.	2.0 mi. to 115 kV
to Substation:	12.0 mi. to 230 kV
Geology at Cable Crossing:	Sand
Interconnection Utility:	CLPUD, PacifiCorp, BPA

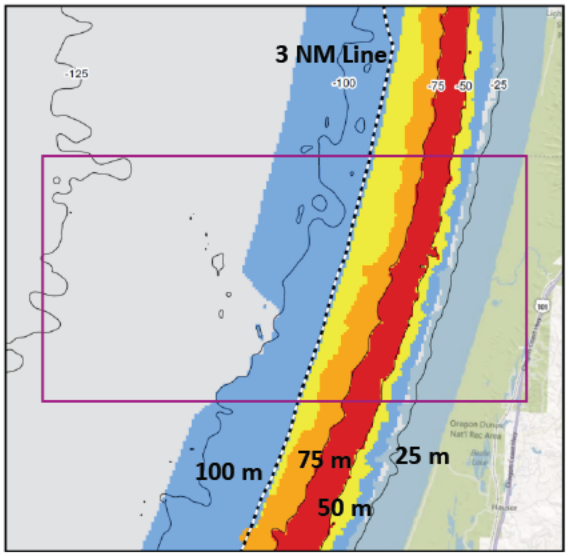


Figure 7. Coos Bay Site Location Map. The lower map illustrates "locations suitable for ***off-shore devices***". More detailed analysis can be found in Appendix 2.

POTENTIAL IMPACT ON EXISTING USES

Commercial Fishing:	Mod at 25 m depth
	High at 50 m depth
	High at 75 m depth
Aesthetics from Land:	High at 25 m depth
	Mod at 50 m depth
	Low at 75 m depth
Surfing:	Low 7

SUMMARY OF DISTINGUISHING FEATURES

- Very close proximity to the Port of Coos Bay, a very good all weather port.
- Best site for deployment and maintenance.
- Very good access to transmission and potential load base, including investor owned utilities with RPS requirements.
- Longest driving distance from PDX.
- Shortest transmission route will minimize cost of infrastructure.
- Rapidly increasing water depth may limit ability to expand site for commercial development.

Table 2: Site Evaluation Summary Table

Evaluation Criteria	Candidate Site Location			
	Warrenton	Newport	Reedsport	Coos Bay
Proximity to Deployment Facilities	10 miles	8 miles	39 miles*	14 miles
Distance to Port for Vessel Based Maintenance	10 miles	8 miles	11 miles	14 miles
Proximity to Port for Dock Repair	10 miles	8 miles	39 miles*	14 miles
Convenience to Staff, Developers and Researchers	Good	Best	Good	Good
Wave Resource	Excellent	Excellent	Excellent	Excellent
Subsea Transmission Distance	5.6 miles to 50 m*	2.8 miles To 50m	2.0 miles To 50m	1.4 miles To 50m
Potential Environmental Effects	Known Manageable	Known Manageable	Known Manageable	Known Manageable
Potential Effects to Existing Users	Low	Low to Moderate	Dungeness Fishery*	Dungeness Fishery*
Access to Utilities for Energy Take-Off	PacifiCorp	CLPUD	CLPUD PNGC BPA	BPA PacifiCorp CLPUD

* Denotes attribute that may not meet the criteria discussed in Section V. Further investigation is required to assess accurate site characteristics.

VI. Cost Drivers and Estimates

NNMREC has estimated the cost of developing the PMEC to be approximately $25 million. This estimate is based on outreach with industry representatives and international marine energy centers similar in size and scope. At this cost, it is anticipated the PMEC could accommodate up to four full scale ocean energy devices at a time. A more detailed analysis of the total costs of the PMEC is underway, in conjunction with a robust fundraising strategy.

Although a more detailed cost proposal is still under development, NNMREC has determined that the majority of the cost drivers for this project include:

- Sea Based Infrastructure (e.g., subsea cables, power pod, etc.)
- Land Based Infrastructure (e.g., interconnection, load bank, shore based facilities, etc.)
- Operations and Maintenance
- Testing and Commissioning

Based on current analysis, it has been determined that the subsea cable lengths will the primary cost differential between the sites, whereas the other cost drivers should remain relatively constant.

NNMREC anticipates a combination of private and public funds to fully develop PMEC, and has a proven track record in developing industry partnerships. These leveraged funds will come from a variety of sources, but likely to include the following:

- State of Oregon
- Federal Agencies
- Private Foundations
- Industry Associations
- Developers/Utilities

VII. Conclusion and Next Steps

Based on the detailed site analysis outlined in this report, all four locations meet the technical feasibility requirements for a grid connected test facility. However, there are other factors to consider before a final site selection is made. NNMREC will pursue the following actions over the next few months to determine which site would best support the grid-connected elements of PMEC.

- *Cost Evaluation*: NNMREC will pursue detailed cost estimates and evaluate how each site may increase or decrease the cost of deployment and operation.
- *Leveraging Value*: NNMREC will evaluate each site in how best they leverage existing and future activities and investments.
- *Stakeholder Input*: NNMREC will take the analysis to local stakeholders and other interested parties to gather additional input prior to moving forward on one or more PMEC site options.

Results from this information gathering will inform the final site-selection decision, with an anticipated completion date of early 2012.

APPENDIX F: NEWPORT COMMUNITY SITING PROPOSAL

PROPOSAL: NEWPORT SITE FOR THE PACIFIC MARINE ENERGY CENTER

EXECUTIVE SUMMARY

The Newport Community Site Selection Team has selected a Newport ocean site and proposes that it serve as the site for the Pacific Marine Energy Center (PMEC) with Newport and Toledo supplying land-based assets. Our team has identified options for elements needed to support the development of the PMEC test site as detailed in our proposal.

Our unique blend of a strong marine science research base, one of the largest fishing fleets on the west coast, a strong education presence, and a top tourist destination on the Oregon Coast makes us an ideal choice for PMEC's location. With emphasis on ocean-based economic development, our region has superb attributes for PMEC that will improve with time. The infrastructure that supports these ongoing activities will also support the users of PMEC.

All primary stakeholders, including the Fishermen Involved in Natural Energy (FINE), the Central Lincoln People's Utility District (PUD), Lincoln County, the Cities of Newport and Toledo, and the Ports of Newport and Toledo, have been directly involved in the preparation and approval of this proposal.

We propose a 4.5 square nautical mile ocean site approximately 6 nautical miles offshore from Yaquina Bay. This area has a sandy bottom with depth of 32 to 41 fathoms. The FINE representatives who have approved this area have said, "We're willing to give up good fishing assets because we're staunchly for natural energy research."

Six marine cable landing locations were studied and all represent easy connectivity into the PUD power grid. Three are recommended for further consideration.

We have located sites in and around Yaquina Bay for PMEC storage and staging areas, administrative office space, and a visitor center. The Cities and Ports are willing to assist in providing space and facilities to support PMEC. A sample list based on current availability is included.

A unique, cooperative, and strong education and research presence and other human resources abound in our community. Community partnerships will be possible on many levels. Our strong tourism industry also offers excellent public education opportunities.

Our team focused on cost sharing options unique to what our area has to offer for the successful development of PMEC. We identified viable cable landing sites involving public lands and rights-of-way that could be leveraged as a match, alleviating the need for NNMREC to acquire easement rights for cable infrastructure, or to construct access roads and related improvements. City, County, and /or State Parks have the potential to cost share through the provision of favorable lease terms.

The organizations in Lincoln County have a strong presence in the State of Oregon. Witness our coming together to win our bid for becoming the homeport for the National Oceanic and Atmospheric Administration's Pacific research fleet. This same presence and sense of community will be there to support the development and continuing activities of PMEC.

We request that NNMREC representatives visit Newport's proposed sites for PMEC.

INTRODUCTION: Newport, Oregon, is the leading coastal city in the Pacific Northwest and Northern California in marine and coastal science, education, and ocean industries. It represents the ideal site for the location of the Pacific Marine Energy Center (PMEC). In this proposal, we describe the ocean and land-based sites for PMEC facilities as well as the attributes of Newport and Toledo that make our site for PMEC compelling.

THE OCEAN SITE: A rigorous process was used to define an optimal ocean site for PMEC that meets approval of all stakeholders. Initially recommended by FINE based on their broad knowledge of the regional ocean, the proposed ocean location has been agreed to by all stakeholders. The site is located about 6 nautical miles off shore and is roughly 3 nautical miles in north-south dimension and about 1.5 nautical miles in the east-west dimension. This relatively flat, sandy-bottom area varies in depth from 32 to 41 fathoms. The main shipping lane into the Yaquina Bay deepwater port runs across the northern boundary of the site. This site is partially located within a Yaquina Bay tugboat lane. An expert in marine operations has stated that neither of these issues poses a problem as lanes are not strictly used once one is out on the open ocean. The boundaries are: North latitude 44 degrees, 36 minutes, and 0 seconds. South latitude 44 degrees, 33 minutes, and 0 seconds. West longitude 124 degrees, 14 minutes, and 30 seconds. East longitude 124 degrees, 11 minutes, and 30 seconds. (See map.)

Marine habitats at this site have been characterized in a number of studies, and the proximity of the Hatfield Marine Science Center (HMSC) and its sampling programs mean that the physical and ecological systems are well known, providing critical, long-term baseline environmental information. The gray whale migratory route passes generally shoreward of this area but can extend out to about 35 fathoms in depth. The users of the area are represented by FINE. They have thoroughly vetted this proposal and are represented on the Team. Port commissioners also sit on the Team to represent maritime commerce.

ON-SHORE CABLE LANDFALL OPTIONS: Six cable landfall options were initially proposed. Off-shore rock reefs, dredging activities in Yaquina Bay, landfall private property owners versus publicly owned sites, in-water and on-shore cable runs, available infrastructure, ease of access, visibility, and other issues were considered. (See addenda.)

Three Preferred Sites, the estimated Marine Cable Run, and Key Choice Factors are (in alphabetical order):

Lost Creek State Park 6.5 NM Owner: Oregon State Park (public). Mid range marine cable run, shortest PUD cable run, fewer rock reef issues. Further to the ocean site, but is the only landfall without marine cable rock reef issues.

South Beach State Park 5.5 NM Owner: Oregon State Park (public). Closest to ocean site, multiple landfalls, existing infrastructure and access, rock reef. This location would be closer but could have marine cable rock reef issues. It is closest to the PUD South Beach power substation.

Yaquina Bay South Jetty 6 NM County/State Park ownership. Zoning is P-2/"Public Recreation" and is subject to the South Beach State Park Master Plan. HMSC user, existing infrastructure and access, PMEC cables must be routed up ship channel. This is highest cost and has issues with rock reefs, but has existing equipment connections with HMSC and NNMREC.

POWER GRID CONNECTION: Central Lincoln PUD has existing high capacity 12.5kV distribution lines along Highway 101 and close to potential cable landing sites from Newport to Seal Rock. PUD representatives state that grid interconnection for the wave energy test facility is viable for these locations with minimal interconnection facilities required. The PUD has existing telemetering with BPA's Toledo substation which will allow metering as required to meet federal interconnection requirements. In

addition, the PUD has experience installing and operating SCADA, ION metering, Distribution Automation, Smart Grid technologies, and fiber optic communications that will facilitate a successful test facility operation.

OFFICE, VISITOR, AND STORAGE SPACE

Port of Newport: The Port of Newport has land on either side of Yaquina Bay for siting offices and a visitor center. The Port is investigating the development of an Ocean Technology Center building to be located adjacent to the NOAA site. This site will also house tenants in related ocean research and operations for up to 30,000 total square feet. Potential tenants include academic and business institutions involved in the National Science Foundation's Ocean Observatories Initiative, marine technology firms, and federal and state agencies. This will provide an excellent collaborative environment where tenants can get to know one another and form connections. The Port of Newport Business Plan will be available March 2013. Near its International Terminal is waterfront acreage (owner: W. Hall) suitable for storage.

Hatfield Marine Science Center: Possibilities also exist for the co-location of the PMEC Visitor Center with the HMSC Visitor Center. This facility, which focuses on interpreting marine science to the public and conducts research on how people learn in informal environments, already has several displays that emphasize marine renewable energy. The HMSC Visitor Center recently opened a wave tank display with computerized, user-operated wave tanks and the opportunity to test "mini-wave energy converters". While this development would require negotiations and agreements between PMEC and OSU, the synergies of co-location are evident.

An additional option for the administrative offices and staging area for PMEC could exist on the HMSC campus. While there is no existing space available for such activities, OSU has considered preliminary concepts for an "Ocean Observing Initiative Support Building" between OSU Ship Support and the HMSC Visitor Center. This project would provide a facility supporting the broad ocean observing initiative at OSU and the University of Washington. OSU is a national leader in this area, and has significant research funds through the National Science Foundation already secured to conduct the research. If built, this 21,600 sq. ft. facility would serve as an adjunct to OSU Ship Support Facility at the north end of the HMSC Campus. It will allow staging for cruises, buoy repair and maintenance, and instrument development for OSU and several supporting institutions. It is possible that this facility, if built, could also house PMEC's administrative needs, subject to negotiations with OSU.

The City of Newport has invested millions into the streets, paths, lighting and related utilities in South Beach so that in the event a suitable "build to suit" option can be identified on Port property or the HMSC campus those costs will not have to be borne by NNMREC (as is typically the case with new development).

Other Existing Office: West Coast Bank building, 222 NE Hwy 20, Toledo. Owner: West Coast Bank. Zoned commercial. This former bank would provide first-class office space for PMEC and has dense wiring for data.
Western Title Building ground floor, 255 SW Coast Hwy, Newport. Owner: Western Title (Slape Investment). Zoned commercial. This space is a former dispatch center and is densely wired for communications. Of 24,000 square feet, about half is or will become available.
Cardinal Building, 914 SW Coast Hwy, Newport. Owner: Richmond family. Zoned commercial. Office building has 3 floors of mostly empty offices near the bridge and has ocean view.

The Port and City of Toledo have land available to construct build-to-suit office and storage facilities to meet identified PMEC space needs.

MARINE INFRASTRUCTURE

The Port of Toledo operates a boatyard in Toledo, which is classified as an open boatyard. The Port operates a 25-ton and 85-ton mobile boat lifts, a 200-ton floating dry dock, a 15-ton hydro-crane, and has man-lifts and forklifts available. As an open boatyard, outside marine service vendors are licensed to work through the boatyard. It has marine electricians, welders, fitters, hydraulic specialists, sandblasting and painting services available. All aspects of vessel maintenance can be performed at the boatyard either through boatyard staff, or local service providers. These capabilities and experience will serve wave energy developers. This includes land and buildings for assembly of wave energy devices, maintenance work in a protected environment, fully functioning docks for equipment deployment and haul out. The Port worked closely with OSU staff of NNMREC, having staged, help outfit, and launch the Ocean Sentinel. They also worked with Pacific Energy Ventures to launch their prototype wave energy device, the WETNZ.

The Port of Toledo has just completed and adopted a Strategic Business Plan that highlights its Boatyard Build-Out Plan. The permits for the in-water portion of the project are being filed this month, with construction planned to start in November 2013. With the proposed expansion of the boatyard to include a 300-ton mobile lift and a covered high-bay work area, the boatyard could easily support existing and future PMEC service and storage needs.

Toledo is served by rail that loops through the city and serves several places, connecting inland along the Yaquina River toward Corvallis. Dredging maintains the channel for barging or towing out to sea.

The Port of Newport also has assets being completed at their International Terminal site. As a shipping dock, there will be ample opportunity for inbound and outbound freight for wave energy developers. Yaquina Bay has one of the easiest and safest channels for navigation on the west coast. It is served by Land – Sea – Air – Rail. There is an on-site customs agent for the international firms. The community is interested in investigating a Foreign Trade Zone.

Newport has a municipal airport that can handle jet traffic and has a sophisticated navigation system for its users. Fed Ex has a hub for daily air shipping.

The PUD: The final piece of infrastructure we want to draw attention to is the reliable grid and the fiber optic backbone. Outage history shows that the PUD operates a highly reliable system; history can be provided upon request. Lincoln County was a pioneer in buried fiber optic loops that undergo continual expansion. There is a high degree of available (dark) fiber.

HUMAN RESOURCES

The workforce of Lincoln County has a high percentage of people employed both directly and indirectly in a marine-related enterprise. The skills and knowledge of some of our local people were built over a lifetime. There are specialists in boat maintenance and fabrication, marine technology, and a highly advanced fishing industry. Vessel owners are branching into scientific purposes through partnerships at HMSC and have increased their crew knowledge and capabilities. The addition of large NOAA vessels will only increase the human resource pool over time. Due to the HMSC campus, the human resource in marine science is of the highest caliber and is doing cutting-edge research that would fit well with the goals of PMEC. Schools, the community college campus, and amenities such as the arts are superb for a place of its size.

COMMUNITY PARTNERSHIPS

There is a valuable partnership in place with a technologically advanced fishing industry. This has contributed to the success of current scientific endeavors and has a strong tourism component. Newport is known for its working waterfront and Toledo for its wooden boat show.

Newport is a unique community where partnerships and collaboration are particularly strong in research and education. The South Beach Peninsula is a highly focused center for marine research and education, and many elements are directly pertinent to the success of PMEC. With a combined budget of over $70 million per year and employment of more than 500, this activity has been embraced as an economic development cluster by the City of Newport, the Economic Development Alliance of Lincoln County, and the Yaquina Bay Economic Foundation.

Newport has capability in all levels of education around marine sciences. The Lincoln County School District has an objective for its students to become the most ocean literate in the nation. Its collaborations with HMSC and the Oregon Coast Aquarium (OCA) create great opportunities for local youth and for training teachers to learn about and incorporate marine science and PMEC renewable energy in their curricula. The Oregon Museum of Science and Industry has purchased property and is developing a field camp that will accommodate some 200 youth for field camps in marine and coastal science. This presents an opportunity for significant outreach to educate young students about PMEC and marine renewable energy because most of these students come from larger Oregon metropolitan areas. Along with some 600,000 public visitors per year to the OCA and HMSC Visitor Center combined, this represents a tremendous outreach capability difficult to duplicate in other locations.

Higher education is similarly well developed. The Oregon Coast Community College has developed a new main campus in South Beach, which houses the unique Aquarium Science Program, a two-year degree program that creates trained specialists for the aquarium and aquaculture industry. This program was developed in partnership with the OCA and HMSC, with funding from the National Science Foundation. Preliminary discussions have been held about a similar program in technical education for renewable energy at OCCC focused on marine renewables, potentially in collaboration with Columbia Gorge Community College (wind energy) and the Oregon Institute of Technology (geothermal). Siting of PMEC in Newport could serve to jumpstart this collaborative program, fostering efforts that would produce trained employees for marine renewable energy development. HMSC brings many activities from OSU to the coast, and these have the potential to increase understanding of marine renewables should PMEC locate in Newport. If PMEC needs undergraduate or graduate students for internships, HMSC has the facilities and infrastructure to provide both students and the student support. It also provides the linkage to the larger OSU that can provide needed specialists directly to developers associated with PMEC.

The research enterprise on the South Beach Peninsula complements the educational program and will also serve as a valuable resource for PMEC. HMSC includes diverse research programs in many facets of marine science, including marine biology and ecology, oceanography, fisheries, aquaculture, marine geology and biogeochemistry, acoustics, marine mammals, ocean health, and marine resource economics. From the academic programs at OSU to the diverse research portfolio of the eight state and federal agency activities at HMSC (ODFW, three in NOAA, US EPA, US Fish & Wildlife Service, USDA-ARS, and USGS), a good deal of research on the environmental effects of marine renewable energy is conducted out of Newport. Several of the agencies serve regulatory functions and are asked to comment on permits related to ocean activities, including marine renewables. The research community has been augmented by NOAA's Marine Operations Center of the Pacific, and those elements of infrastructure support that are beneficial to our fishing industry and for research vessels and the marine research enterprise will similarly benefit PMEC. PMEC staff as well as developers deploying wave energy

devices will have access to experienced scientists who can advise on questions related to marine renewable energy – from environmental effects to permitting questions.

Finally, the vast volumes of data collected about the ocean and marine habitats off Newport can serve as valuable baseline data against which environmental effects can be evaluated. All of these benefits will be difficult or impossible to duplicate elsewhere on the Oregon Coast.

Recreational users of the ocean are another potential for community partnerships, as well as the conservation groups that value the beach and ocean resources.

COST SHARING IDEAS FOR PMEC

LOCAL GOVERNMENT: Ports of Newport, Toledo (i.e., sources available to them); Lincoln County lottery sources; Bonding/ Financing /Debt servicing; City of Newport, lower costs of siting; City of Newport, urban renewal; City of Newport, room tax; City and County in-kind opportunities; Corvallis and Benton County.

NONPROFIT SECTOR: OSU Foundation; Foundations interested in renewables; Grand Ronde Tribal Charitable Fund; Siletz Tribal Charitable Fund; Three Rivers Tribal Charitable Fund; School District; Oregon Coast Aquarium; OMSI; Conservation groups; Gates Foundation; Bullit Foundation; Ford Family Foundation; Environmental Defense Fund; Oregon Community Foundation.

PRIVATE SECTOR: Banks; Cascades West Financial Services; ShoreBank Cascadia or other community development banks; renewable energy companies; Georgia Pacific grant program; PMEC users.

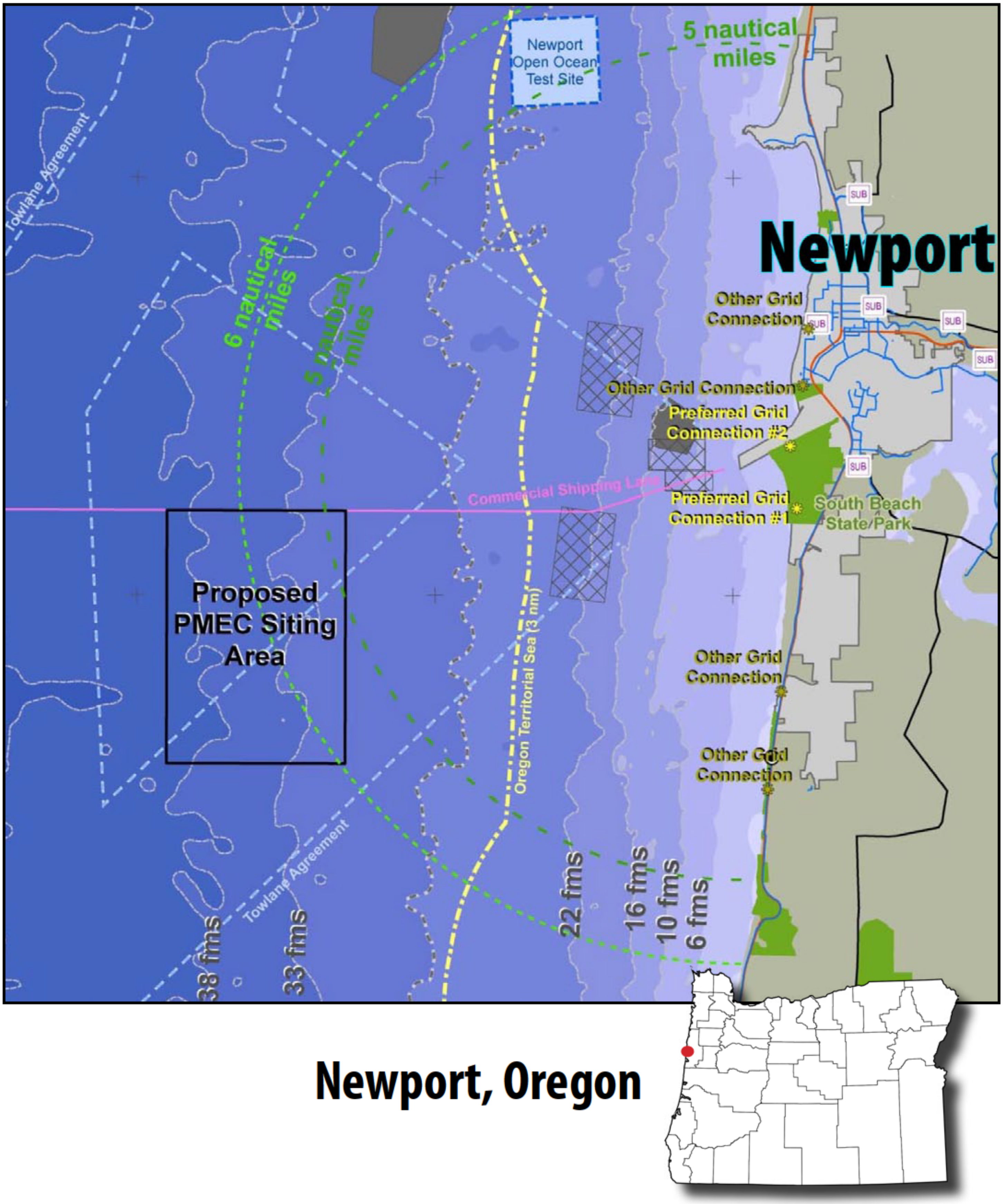
STATE OF OREGON: We have identified at least five state agencies that may have an interest.

NEWPORT COMMUNITY SITE SELECTION TEAM

David Allen	Public at Large	Paul Amundson	Chair, Public at Large
Tracy Bailey	Tribes /Econ. Devel.	Caroline Bauman	Economic Development
George Boehlert	Economic Devel.	Walter Chuck	Port of Newport
Jack Craven	Charter Fishing	Ralph Grutzmacher	Local Government
Doug Hunt	Local Government	John Lavrakas	Marine Infrastructure
Bruce Lovelin	Central Lincoln PUD	Paul Stannard	Commercial Fishing
Derrick Tokos	Local Government	Fred Sickler	Ocean Recreation

Technical Advisors:
Bud Shoemake, Port of Toledo Manager.
John Schaad, Customer Services, Bonneville Power Administration.

Proposed PMEC Siting Area



Newport, Oregon

Build To Suit:
Port Property or HMSC Campus

Characteristics:

- Existing marine research and education area
- Partnering opportunity with HMSC visitor center
- Infrastructure available (water, sewer, streets, etc.)
- Size: 6,000 sq. ft. (office, visitor center, warehouse)
- Cost: $1.65 million
- Financing: Port, State, others

Hildenbrand, Kaety

Subject: FW: PMEC

From: info@portoftoledo.org [mailto:info@portoftoledo.org]
Sent: Thursday, December 06, 2012 2:41 PM
To: 'John Lavrakas'
Cc: 'Ralph'; Hildenbrand, Kaety
Subject: PMEC

The Port of Toledo Commission and Staff fully supports the effort to locate PMEC off of Newport.

As you may be aware, the Port of Toledo operates a boatyard in Toledo. We have worked closely with OSU staff of NNMREC, having staged, help outfit, and launch the Ocean Sentinel. We also worked with Pacific Energy Ventures to launch their prototype wave energy device, the WETNZ.

Through our boatyard facility we helped to assemble the devices. We have provided support and heavy equipment such as travel lift, crane, and forklifts which were necessary for launching and retrieving the devices, as well as access to the Yaquina Bay's world class marine service industry.

The Port of Toledo has just completed its' Strategic Business Plan which includes a focus on its' Boatyard Build-Out Plan. This plan was adopted by the Port Commission at our November 2012 meeting. The permits for the in-water portion of the project are being filed this month, with construction planned to start in November 2013. With the proposed expansion of the yard to include 300-tons mobile lift and covered, high bay, work area, the Boatyard could easily support the existing and future PMEC's service and storage needs.

Bud Shoemake
Port Manager

Port of Toledo
P.O. Box 428
496 NE Hwy 20, Unit 1
Toledo Oregon 97391
541.336.5207
www.portoftoledo.org
info@portoftoledo.org

Board of Commissioners

Courthouse, Room 110
225 W. Olive Street
Newport, Oregon 97365
(541) 265-4100
FAX (541) 265-4176

November 26, 2012

Governor John Kitzhaber, MD
900 Court St., NE
Salem, OR 97310

Dear Governor Kitzhaber:

On November 20, 2012 the Fishermen Interested in Renewable Energy (FINE) Committee unanimously voted to recommend to the Lincoln County Board of Commissioners that a 6 to 7 mile square mile area of ocean, west of Newport, become the site of the Pacific Marine Energy Center (PMEC). PMEC would be a grid-connected offshore energy research facility. The Oregon Wave Energy Trust (OWET) has identified development of PMEC as their highest priority. Laying the groundwork for PMEC has now also become a high priority for the Lincoln County fishing community and other key community stakeholders.

The area of ocean off Lincoln County selected by FINE poses fewer conflicts with recreational/commercial fishing activities and other existing uses of the ocean than other sites off the Central Coast. Dr. Belinda Batten, Director of Oregon State University's (OSU) Northwest National Marine Renewable Energy Center (NNMREC), attended the FINE meeting. Dr. Batten, working collaboratively with fishing industry representatives, provided valuable input that enabled FINE to delineate a site for PMEC that meets the key logistical features OSU needs to optimize their research program.

The membership of FINE has always been supportive of ocean energy ***technology and environmental impacts*** research. Since 2006, FINE has worked closely with OSU Sea Grant Extension and the faculty of NNMREC. For example, FINE worked with OSU to identify the existing one-square mile NNMREC wave energy research site off Yaquina Head. In addition, on an ongoing basis, FINE provides technical and practical advice to OSU and wave energy technology companies utilizing NNMREC on the logistics of marine operations at NNMREC. NNMREC and the wave energy companies will tell you that leveraging the collective experience of local fishermen, who understand the realities of working in a harsh marine environment, is a key ingredient of success.

Not surprisingly, with the growing cluster of world-class oceanographic research activities taking place in Newport, the members of FINE and other leaders in Lincoln County believe that ***research*** on ocean energy is a natural fit for our community.

However, the members of FINE also strongly oppose the identification of ocean areas adjacent to and near the Central Coast (***especially*** within Oregon's Territorial Sea) for future utility-scale/commercial ocean energy projects.

The members of FINE are deeply concerned about the potential future loss of ocean space. The State of Oregon's marine reserve designation process and the siting of NNMREC consumed approximately 19% of Lincoln County's Territorial Sea. No other sub-region of the Oregon Coast was asked to absorb that level of reduced fishing effort.

Over the last few years the members of FINE developed a good understanding of the status of the wave energy industry. In a larger sense, they ***don't*** believe it is necessary, at this time, especially ***in Oregon's Territorial Sea***, to establish very many sites for commercial-scale wave energy operations. Wave energy is a nascent industry. They are nowhere close to producing electricity at price points that are competitive with other renewable energy technologies (in particular, the terrestrial wind industry). The exception to that rule may be in niche markets, in particular, remote island communities where energy costs are prohibitive.

More than anything, the members of FINE believe a focus on research makes sense for both industries. Together, those industries can develop the most efficient and effective technologies for energy production. We all have a stake in the development of efficient wave energy technologies. That will help us concentrate and pinpoint the appropriate locations of commercial scale sites based on proven technologies. It follows, then, with highly efficient/effective ocean energy devices, ocean energy projects can have minimal impacts on the marine environment and the other sustainable/beneficial uses of the ocean.

In closing, please know the members of FINE believe that the vote they took on November 20, 2012 ***(to identify an optimal site for PMEC)*** may rank among the most important/pragmatic steps ever taken to keep Oregon in forefront of the development of these emerging technologies.

Sincerely,

LINCOLN COUNTY BOARD OF COMMISSIONERS

BILL HALL, Chair

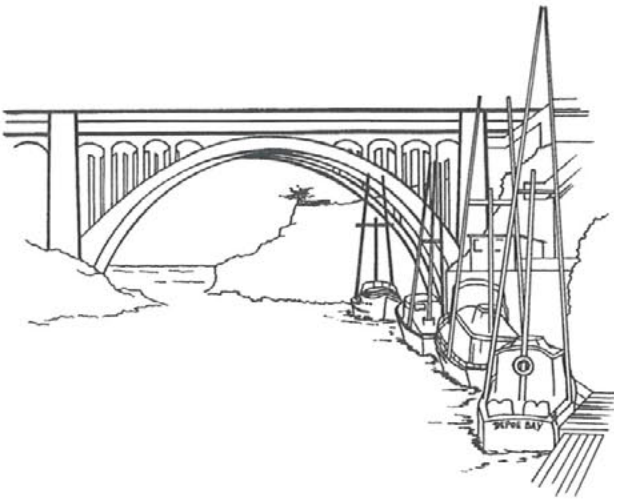
TERRY N. THOMPSON, Commissioner

DOUG HUNT, Commissioner

CC:
Bob Jacobson, Chair FINE
FINE Members
Belinda Batten, NMREC and PMEC
PMEC Siting Committee
The Coastal Caucus
Ocean Policy Advisory Council
The Oregon Congressional Delegation
Julie Kiel, Oregon Wave Energy Trust President
Stephen Chu, Secretary, U.S. Department of Energy
Ken Salazar, Secretary, U.S. Department of Interior
Jane Lubchenco, Administrator, NOAA

CITY of DEPOE BAY

Post Office Box 8 + Depoe Bay, Oregon 97341
Phone (541) 765-2361 + Fax (541) 765-2129
TDD# 1-800-735-2900



December 3, 2012

Scott McMullen, Chairman
Ocean Policy Advisory Council
635 Capitol Street N.E., Suite 150.
Salem, Oregon 97301-2540

Dear Chairman McMullen:

The City of Depoe Bay, Oregon and the Depoe Bay Near Shore Action Team (NSAT) continue to support the position of the Fishermen Involved in Natural Energy (FINE) group regarding wave energy in the Oregon Territorial Sea. We completely agree with the position they took at their Nov 20th meeting, namely that the proposed PMEC wave energy site off the Lincoln County coast be designated for research only and that wave energy development sites not be located in the Oregon Territorial Sea within the boundaries of Lincoln County. The people of Depoe Bay and Lincoln County have already had significant portions of the Oregon Territorial Sea off the coast of Lincoln County carved out for Marine Reserves. Additionally, we whole heartedly agree with the position on wave energy stated by the Lincoln County Commissioners in their November 26, 2012 letter to Governor Kitzhaber.

At this very early stage in the wave energy development, we do not believe it is in the best interest of the state of Oregon and communities and businesses which depend on the bounty of the waters of Oregon's territorial sea to commit to large parcels within the Oregon Territorial Sea to future commercial ocean energy projects. Further, we are of the position that not only should the PMEC and NNMREC sites be designated for research but they should be counted as part of the total number of sites selected by the State of Oregon.

Sincerely yours,

Carol Connors

Carol Connors, Mayor
City of DepoeBay

cc: Lincoln County Commissioners

FOR BOC REVIEW

Date Rec'd 12-5-12
Comm. Hall BH
Comm. Thompson
Comm. Hunt
Requires
BOC Approval: ☐

Copy to:

_____
_____
_____
_____
_____
_____

CITY OF NEWPORT
169 SW COAST HWY
NEWPORT, OREGON 97365

COAST GUARD CITY, USA

phone: 541.574.0629
fax: 541.574.0644
http://newportoregon.gov

mombetsu, japan, sister city

December 17, 2012

Scott McMullen, Chair
Ocean Policy Advisory Council
635 Capitol St. NE, Suite 150
Salem 97301-2540

Dear Chair McMullen,

We understand that you will soon be considering amendments to the Territorial Sea Plan to identify suitable locations and siting criteria for offshore wave energy development. The City Council recognizes that this is the culmination of many years of hard work by the Department of Land Conservation and Development, key stakeholders, and citizens and we would like to express our deep appreciation for all of their efforts.

As you may be aware, Oregon State University's Northwest National Marine Renewable Energy Center (NNMREC) has identified Newport and Reedsport as finalists for the proposed Pacific Marine Energy Center (PMEC) grid-connected wave energy test facility. The City is working with its community partners in Newport and Toledo on developing a proposal to NNMREC and it is our sincerest hope that we will be successful in this endeavor.

On November 26, 2012 the Lincoln County Board of Commissioners wrote a letter to the governor, on behalf of the Fisherman Involved in Natural Energy (FINE) Committee, which expressed a similar view with respect to the value of the PMEC development to our community. The letter further notes that the fishing community has always stepped forward to assist Oregon State University in its efforts to research and develop wave energy technology and that the growing cluster of marine research activities in Newport makes this type of project a natural fit for our community.

This isn't without its risks though, and as the Board of Commissioner's points out there is growing concern within the fishing community about the potential future loss of ocean space should commercial-scale wave energy development projects seek to occupy our coastal waters in addition to sites reserved for research purposes.

Commercial fishing and fish processing contribute substantially to our local economy and in many ways define the character of our community. With that in mind, the City of Newport fully supports Lincoln County and FINE in their effort to limit future deployments off the County's coastline to non-commercial wave energy operations. This approach promotes wave energy research while at the same time protecting the critical needs of our fishing industry.

Thank you for your time and consideration.

Sincerely,

Mark McConnell

Mark McConnell, Mayor
On Behalf of the Newport City Council

Yaquina Bay Ocean Observing Initiative
Establishing Newport Oregon as a hub for ocean observing in the Pacific Northwest

Supplier Listing

This document provides a listing of suppliers on the Oregon Coast and in other parts of Oregon that provide critical services needed to support ocean observation, research, and deployment. If your company is not in this list, and you would like to add it, please let us know on the comment form. While every effort has been made to ensure the information is complete and up to date, you should contact the supplier directly to obtain the most current information. If you wish to update a listing or provide us any other comments on this site, please notify us on our Comment Page.

Companies who are qualified to do work with the government are identified with the words "Government Contractor Ready". If you are not currently a government contractor, but are interested in becoming one, visit the BuyLocalLincolnCounty website to learn more.

Categories:

Commercial Diving
Marine Construction & Repair
Marine Engineers
Marine Services
Marine Suppliers
Metal Fabricators
Plastic Fabricators
Research & Development
Riggers and Rigging Supply
Stevedores
Towing & Barge Companies
Underwater Housings

Commercial Diving

Advanced American Construction

AAC provides full service diving services on a 24-hour, seven days a week, emergency and non-emergency response basis.
Website: www.callaac.com
8444 NW St. Helens Road
Portland, Oregon 97231
Telephone: 503-445-9000

REFERENCES:

1. Wave Energy Infrastructure Assessment in Oregon. This report was prepared for the Oregon Wave Energy Trust by the Advanced Research Corporation of Newport. John Lavrakas and Jed Smith, Dec. 1, 2009.
2. Port of Newport Business Plan, in process and finalized March 2013.
3. Port of Toledo Strategic Investment & Capital Investment, adopted Nov. 20, 2012.
4. Newport Travel Impacts, 1991-2011. Dean Runyan Associates. June 2012.
5. Non-consumptive Ocean Recreation in Oregon: Human Uses, Economic Impacts, & Spatial Data. Surfrider Foundation et al., March 3, 2011.
6. Supplier Listing, Yaquina Bay Ocean Observing Initiative. June 2012.

ADDENDA:

Other On-Shore Cable Landfall Options (northernmost site first):

Don Davis Park/Nye Beach, 7.5 NM distance from site, City ownership, existing access and infrastructure, extensive reefs.

Lighthouse State Park, 7 NM distance from site, City ownership, marine cables must cross dredging channel.

Thiel Creek, 6 NM distance from site, lowest PUD costs, private property and access issues, infrastructure costs, special zoning exception needed, rock reefs.

Notes on Recreational Use (references 4 & 5):

In a statewide survey generated by Surfrider Foundation et al., "Non-consumptive Ocean Recreation in Oregon," Lincoln County was ranked by far the most visited county. In 2010 Oregon residents took an estimated 27 million trips to the coast, 88% for recreation. A random sample of 4,000 residents found that over 80% had visited the Oregon Coast at least once in the past 12 months. The most popular activities were shore-based. Wildlife viewing activities such as tide pooling and whale watching were popular with nearly a third of respondents indicating participation. Ocean based activities such as surfing, kayaking and boating captured between 2-8% of the survey sample. These activities are trending upward.

Yaquina Bay is ranked by www.bestfishinginamerica.com as one of Oregon's most popular all around recreational bays, safe for new boaters with plenty of crabbing supplies and boats to rent. ODFW has a link to Yaquina Bay for good clamming and crabbing areas.

APPENDIX G: EXAMPLES OF WEC DEVICE TECHNOLOGIES

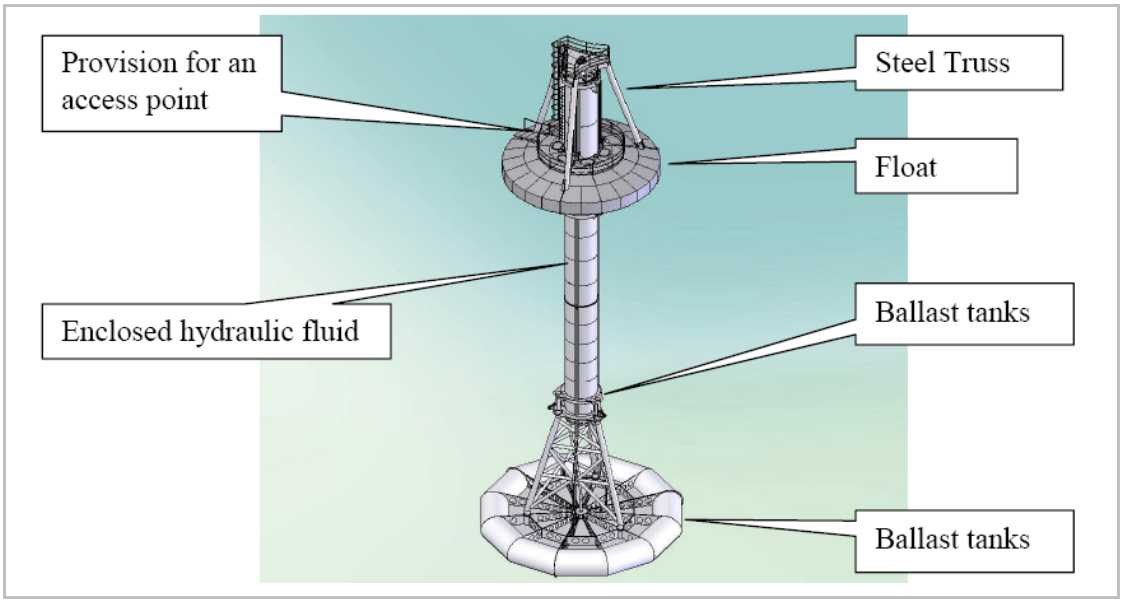
Introduction

Over the lifetime of the Northwest National Marine Renewable Energy Center's Wave Energy Test Project, (Proposed Project) a number of wave energy conversion devices are expected be tested. The specific WEC device prototypes and models that would be tested as part of the Proposed Project are not presently known, with the exception of the WET-NZ device, which has a planned deployment at the project site in August of 2012 and will undergo testing in 2012 and 2013. As described in Section 2.7 of the Environmental Assessment (EA) for the Proposed Project, general WEC device designs that are reasonably expected as part of this Proposed Project include pitching/surging/heaving/sway devices, point absorber devices, and oscillating water column devices capable of operating in water depths of approximately 55 meters (180 feet). Examples of these designs are provide in this Appendix and include the most probable types of devices that could be tested with the Proposed Project. These examples provide a basis for the analysis of effects of the Proposed Project that is included in the EA. Other WEC devices proposed for future tests would require authorization by the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act prior to their deployment and would undergo environmental reviews under this process.

Ocean Power Technologies PowerBuoy®

The PowerBuoy® design, developed by Ocean Power Technologies (OPT), is one of the most widely deployed WEC device designs in the world. Presently, a 10-buoy test array of the PB150 PowerBuoy® is proposed for deployment in Reedsport, Oregon (Figure 1). The PB150 is a utility-scale 150 kilowatt (kW) buoy that—in the initial design—contains hydraulic fluid, which is cycled as the buoy moves up and down with the waves. The moving fluid or mechanical parts are used to spin a generator, which produces electricity. The buoy is approximately 35 meters (115 feet) tall (of which approximately 9 meters [30 feet] project above the water's surface) and 11 meters (36 feet) in diameter. It is held in place by a three-point mooring system (Reedsport OPT Wave Park 2010).

Figure 1. Ocean Power Technologies PB150 PowerBuoy®



Source: Reedsport OPT Wave Park 2010.

Embley Energy SPERBOY™

The SPERBOY™ (Figure 2), developed and patented by Embley Energy, is a floating oscillating water column device consisting of a buoyant structure with a submerged, enclosed column. Housed above the oscillating water column on top of the buoy is the plant: turbines, generators, and associated system facilities. Air displaced by the oscillating water column is passed through turbine generators above the water's surface. The device can be deployed in deep water to maximize energy production. The entire body floats and maintains optimum hydrodynamic interactions for the prevailing wave spectrum, maximizing energy capture. The total height of the device is approximately 50 meters (164 feet), with 35 meters (115 feet) of the device below water. The diameter of the SPERBOY™ is approximately 30 meters (98 feet[1]) (U.S. Department of Energy 2008).

[1] Dimensions represent maximum envisaged size of a full-scale commercial unit

Figure 2. Embley Energy SPERBOY™

Source: U.S. Department of Energy 2008.

Ocean Energy Ltd. OEBuoy

The OEBuoy device is a floating system with the mouth of the oscillating water column facing away from the wave direction that uses wave energy to compress air in a chamber and pump it through an air turbine system (Figure 3). The design isolates the power conversion system above and away from the seawater and also provides high-speed air flow to the turbine. The OEBuoy has undergone several years of development and testing. In 2006 and 2007, Ocean Energy Ltd. conducted a winter sea trial on the 25,401-kilogram (28-ton), 1:4-scale OEBuoy prototype at the Irish Marine Institute test site in the waters off of Galway, Ireland (U.S. Department of Energy 2008). OEBuoy is the only device of its kind to have undergone 2 years of rigorous testing and is now ready for market.

Figure 3. OEBuoy (1:4 Scale)

Source: U.S. Department of Energy 2008.

Floating Power Plant A/S FPP Poseidon

The Poseidon is based on a hydraulic power take-off system. It is designed for an offshore location in areas with considerable variation in wave activity levels and has a high efficiency and energy production. The Poseidon uses a float that absorbs the energy from incoming waves, and uses a piston pump to transform energy from the wave into water pressure. That water is then sent through a turbine to generate electricity. Poseidon was developed by the Danish company, Floating

Power Plant A/S (FPP). The Poseidon 37, a 327,000-kilogram (360-ton) and 37-meters (121-foot)-wide hybrid renewable energy demonstration plant (Figure 4), was launched in 2008 off the coast of Lolland in Denmark (Floating Power Plant 2011). Although the Poseidon 37 can be configured with wind turbines, any Poseidon device tested as part of the Proposed Project would include wave energy components only.

Figure 4. Poseidon 37 (Shown with Wind Turbine Configuration)

Source: Floating Power Plant 2011.

FPP has also developed and tested Poseidon models of the following sizes (Floating Power Plant A/S 2011):

- 2.4 meter (7.9-foot) wave front, system test
- 15 meter (49-foot) wave front, floater test
- 4 meter (13-foot) wave front, system test

References

Floating Power Plan A/S. 2011. Home of Poseidon. Available: <http://www.poseidonorgan.com/> Accessed May 9, 2011.

Reedsport OPT Wave Park. 2010. FERC Project No. 12713. Available: <http://www.oceanpowertechnologies.com/reedsport.htm>. Accessed: March 25, 2010.

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