

**Initiate Conceptual Design
for
Camp Rilea Ocean Renewable Energy Program**

Progress Report

*Prepared by
Oregon Army National Guard*

OWET Agreement
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Change Record

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| 3 | | | | |

Applications

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Approved By:

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Ken Safe, PE, LTC, ORARNG, Principal Investigator

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1. Introduction

The Conceptual Design for the Oregon Military Department (OMD) Camp Rilea Ocean Renewable Energy Program is driven by mission requirements of:

- energy security;
- energy independence;
- disaster resilience;
- evaluation of technologies for sustainable distributed generation applications, for both military and coastal communities; and,
- cooperation with other agencies in the responsible development of wave energy.

This study leverages prior investments by the Department of the Army, the National Guard Bureau, and the Oregon Army National Guard and initiates Conceptual Design.

The cooperation of Camp Rilea Armed Forces Training Center staff, and the Northwest National Marine Renewable Energy Center (NNMREC) is gratefully acknowledged.

1.1 Scope

This Progress Report for the Oregon Wave Energy Trust (OWET) study task “Initiate Conceptual Design” provides an inventory of progress and resources, and an executable plan to move forward.

The Conceptual Design phase must continue in close coordination with regulatory and permitting discussions and employ lessons learned from prior projects. Site characterization and temporary testing are the near-term focus areas.

A “Proposed Action” will be determined during the Preliminary Design phase. The Oregon Military Department (OMD) and support contractors will continue to iterate the content as future tasks are funded. These tasks will complete the conceptual design, preliminary design, permitting, and detailed design progress toward installation.

Throughout this document, the phrases “Marine Energy Converter (MEC)” and “Wave Energy Converter (WEC)” are equal.

The CONOPS Outline document that is referenced is designed to serve as a guideline for the engineering design and environmental planning as well as the overarching document detailing the planned operations for the Camp Rilea Ocean Energy Program.

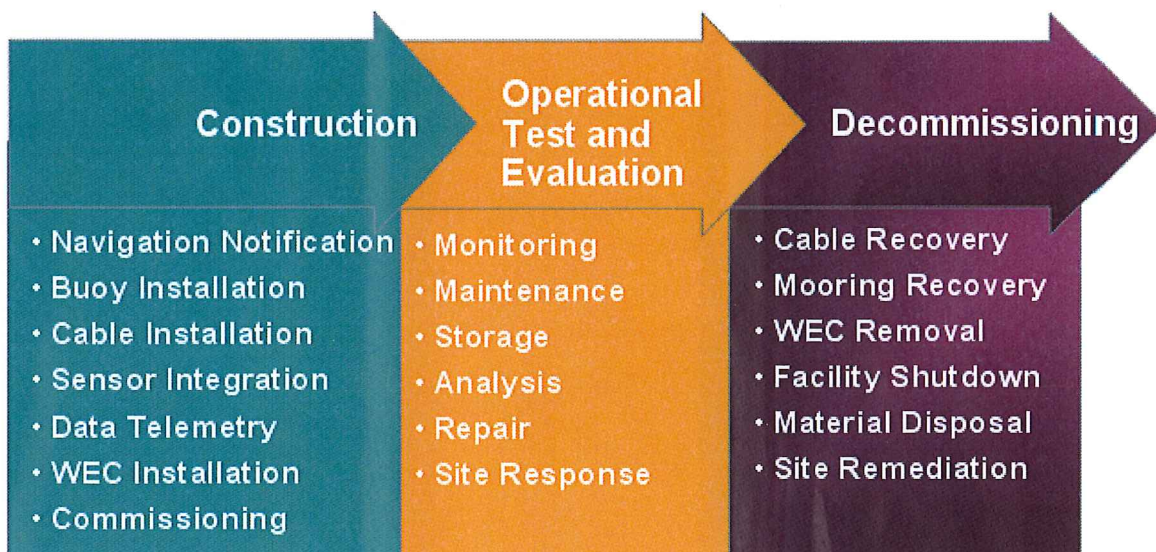


Figure 1 - Life-Cycle Phases of Camp Rilea Ocean Energy Program

1.2 Document Organization

This document provides an inventory of progress and resources and an executable plan.

For ease of reference, the document also includes project requirements and a summary of the concept of operations.

- Progress and Resources
- Project Requirements
- The Concept of Operations Outline
- The Plan of Action and Milestones (POAM) to move forward

2. Progress and Resources

This OWET Study leverages prior investments by the Oregon Army National Guard.

- Feasibility Study, funded by the Oregon Army National Guard.
- Marine Infrastructure Analysis, funded by the Oregon Army National Guard.
- Initiation of Conceptual Design, funded by OWET
 - Initial Outreach
 - Requirements Definition
 - Draft Concept of Operations
 - Cable Route Study
 - Sound and Sea Technology Document, *Cable Route Desktop Study*, August 29, 2013
 - Progress Report
- Wave Resource Assessment (Garcia-Medina, Özkan-Haller, Ruggiero)
 - Wave Resource Assessment in Oregon and southwest Washington, USA
Gabriel García-Medina, H. Tuba Özkan-Haller, Peter Ruggiero,
published in *Renewable Energy*, November 6, 2013
College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, USA
School of Civil and Construction Engineering, Oregon State University, USA
- Cooperation of Oregon Military Department and Camp Rilea
- Cooperation of Northwest National Marine Renewable Energy Center

3. Project Requirements

In order to develop an executable plan in the complex stakeholder environment and regulatory-permitting regimes, the Conceptual Design must consider technology, policy, and advocacy.

1. Technology: The facility design will be requirements-driven, technology-neutral, and vendor-agnostic.
 - Provide recommendations that accommodate a range of WEC technologies.
2. Policy: Adhere to the requirements of the Oregon Territorial Sea Plan and other state and federal regulators.
 - Provide recommendations that consider navigation safety factors in the approach to the Mouth of the Columbia River (MCR).
3. Advocacy: Minimize conflict with existing users.
 - Provide recommendations that recognize that OMD is a community-centric organization. As such, it is vital that public outreach and minimizing conflict with existing users are key factors for all aspects of this project from conceptual design to phased development.

In support of the Oregon Wave Energy Trust (OWET) grant to "Initiate Conceptual Design," and based on completion of milestone "Initiate Outreach," this task identified the key objectives of:

1. Site characterization, including evaluation of wave resource
2. Temporary testing and demonstration of marine energy converters
3. Phased testing, demonstration, and evaluation

4. Concept of Operations Outline Summary

The concept of operations (CONOPS) summary for the Camp Rilea Ocean Energy Facility will explore permitting alternatives during temporary testing and consider government owned (OMD) and government operated (OMD) with contractor support during phased development. Another alternative will be for developer permitted and owned with OMD cooperation.

One potential operational model would be for OMD to authorize the Oregon State University (OSU) Northwest National Marine Renewable Energy Center (NNMREC) to conduct marine operations at Camp Rilea using procedures developed for the Pacific Marine Energy Center (PMEC) offshore Newport, OR. This is similar to arrangements at the Hawaii National Marine Renewable Energy Center support to the US Marine Corps Base Kaneohe Bay.

In support of the Oregon Wave Energy Trust (OWET) grant to "Initiate Conceptual Design," and based on completion of milestone "Initiate Outreach," the initial project summary consists of the following proposed activities:

- Site characterization that will leverage the expertise at OMD and OSU
- Temporary testing and demonstration of marine energy converters that will use procedures developed by NNMREC
- Phased testing, demonstration, and evaluation that will use procedures will be developed in collaboration with NNMREC and PMEC

4.1 Site Characterization

Identify existing environmental inventory documents. Identify wave measurement studies that have employed existing wave measurement capabilities for characterization of the wave resource in, or on the boundary of, the Marine Danger Zone (MDZ).

Collaborate with OSU and NNMREC for geo-physical and geo-technical surveys.

OMD holds environmental baseline data and information for Camp Rilea.

OMD intends to use existing wave measurement studies for characterization of the wave resource in, or on the boundary of, the Marine Danger Zone (MDZ). These studies have employed existing wave measurement capabilities.

The primary wave resource study is:

“Wave resource assessment in Oregon and southwest Washington, USA”

- Gabriel García-Medina^{a, b}; H. Tuba Özkan-Haller^{a, b}; Peter Ruggiero^a
 - ^a College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, USA
 - ^b School of Civil and Construction Engineering, Oregon State University, USA
- Renewable Energy
(see <http://www.sciencedirect.com/science/article/pii/S0960148113005922>)

OMD does not plan to install wave measurement devices in the near-term. Installation of temporary wave measurement devices by MEC developers will be considered, subject to proper permitting:

1. One wave measurement device at the Northwest corner of the MDZ (with proper standoff to avoid the existing telecommunications cable); and/or,
2. One wave measurement device at the Southwest corner of the MDZ and/or,
3. Bottom-mounted devices.

Coordination is required to identify existing measurements, or optimize the placement of temporary wave measurement devices. Stakeholders include: the Coastal Data Information Program (CDIP), Clatsop County for input from stakeholders and existing users; the Columbia Bar Pilots; the United States Coast Guard (USCG); the Port of Portland (PDX); the US Army Corps of Engineers (USACE); the US Army Engineer Research and Development Center (ERDC); Scripps Institution of Oceanography (SIU); Oregon State University (OSU); and all mandated regulatory and permitting agencies.

4.2 Temporary Testing and Demonstration of Wave Energy Converters

Evaluate the possibility of short-term tests and demonstrations of MECs in, or on the boundary of, the Marine Danger Zone (MDZ) or on the Outer Continental Shelf (OCS) with surface lay cables, vice use of a cable burial plow. Trenching across the public beach may be required.

1. The Oregon Territorial Sea Plan (TSP) encourages testing and demonstration of MECs.
2. Local stakeholders and existing users have encouraged that early development be with single devices, and then a small array, to evaluate what works and monitor effects.
3. Close coordination with existing users is a key planning factor.
4. Camp Rilea can complement the capabilities of the Northwest National Marine Renewable Energy Center (NNMREC) for shallow and mid-depth testing.
5. MEC evaluation is required to design the infrastructure for cable installation.
6. A range of permitting alternatives will be explored, including application by developers.
7. Outreach to potential MEC developers was accomplished at the Oregon Wave Energy Trust (OWET) Developers Summit at Camp Rilea on September 25, 2013 and at the OWET Ocean Renewable Energy Conference in Astoria on September 26 and 27, 2013.
8. The Concept of Operations (CONOPS) will consider either a developer applicant with OMD cooperation, or a government applicant (OMD) and government operated (OMD) test and evaluation facility with contractor support. One model that will be explored is for the Northwest National Marine Renewable Energy (NNMREC) Pacific Marine Energy Center (PMEC) to support on-water operations.

4.3 Phased Testing, Demonstration, and Evaluation

The Camp Rilea Ocean Energy Program will consist of projects that evaluate technologies and operations for the application of marine energy for Camp Rilea, the US Army, military facilities around the globe, and coastal communities that need sustainable distributed generation. Evaluation requires deployments of sufficient length to measure performance, reliability, maintenance and upgrade procedures and is anticipated to be ten to fifteen years.

1. **Initial Phase:** The conceptual design will be based on an initial phase to provide energy security and energy independence Camp Rilea (potentially 2MW average annual output). Consider measures to harden infrastructure and enhance disaster resilience where practical. Net metering will be evaluated.
2. **Expansion to Existing Grid Limit:** The conceptual design will consider the possibility of net metering and expansion within the existing capabilities of the North Coast distribution grid (potentially 2MW to 10MW or 20 MW average annual output). Consider measures to harden infrastructure and enhance disaster resilience where practical.
3. **Expansion to North Coast Distribution Grid Limits:** The conceptual design will consider expansion that may include focused improvements to the North Coast distribution grid (potentially 20 MW to 30 MW average annual output). Consider measures to harden infrastructure and enhance disaster resilience where practical.
4. **North Coast Grid Improvements:** The conceptual design will consider later expansion that includes improves to reinforce the North Coast distribution grid and transmission grid (potentially 20MW to 40 MW average annual output). Consider measures to harden infrastructure and enhance disaster resilience where practical.
5. **North Coast Community Scale Project Expansion:** The conceptual design will consider eventual expansion to "community scale," limited to the energy consumption at the Bonneville Power Administration (BPA) Clatsop Substation (currently 50 MW average annual output). Consider measures to harden infrastructure and enhance disaster resilience where practical.

During phased testing and demonstrations, the use of surface lay cables and hoses is anticipated. Trenching or burying across the public beach is planned for continued use of the public beach for traffic and recreation.

During the planning of all phased development projects, evaluation of cable route alternatives will be conducted to identify optimum routes from the electric grid, through Camp Rilea, with directionally drilled bores for cables or hoses beyond the surf zone, and buried cables or hoses to potential study sites. All cables and hoses must adhere to international standards for standoff from the existing telecommunications cable at the north boundary of the MDZ.

The routes for cables and hoses will focus on potential near-term and mid-term projects, as well as consider potential expansion scenarios.

4.4 Long Term System Infrastructure (Outline)

The Camp Rilea Ocean Energy System Infrastructure may be comprised of six (6) major segments, consisting of:

- (1) Sea-Based Infrastructure Segment, including the Marine Energy Converter (MEC) or Wave Energy Converter (WEC) devices and device-specific moorings
- (2) Submarine (Power) Cabled Infrastructure (SCI) Segment
- (3) Power Interconnect Infrastructure (PII) Segment
- (4) Data Acquisition and Telemetry Infrastructure (DATI) Segment
- (5) Logistics and Facility Support Segment
- (6) Physical Security and Safety (PSS) Segment

5. 2014 Plan of Action and Milestones

The objective of the 2014 Plan of Action and Milestone (POA&M) for the Camp Rilea Ocean Energy Program is to maintain continuity and forward momentum through program management and systems engineering support to OMD.

The focus will be on coordination with NNMREC and pursuit of temporary testing opportunities.

The WEC developers that expressed interest and the OWET Developers Summit held at Camp Rilea and the Conference held in Astoria will be provided an opportunity to evaluate the Draft Request for Information – Expression of Interest (RFI-EI). Coordination with Clatsop County for public outreach is planned prior to broader issue of the RFI-EI.

In addition, the OMD Staff plans to collaborate with OWET on a planned environmental inventory of the Camp Rilea Renewable Energy Facility Suitable Study Area (REFSSA).

| <i>Task Name</i> | <i>Start</i> | <i>Finish</i> |
|--|--------------|---------------|
| Program Management | 1/1/2014 | 12/31/2014 |
| Systems Engineering and Coordination with NNMREC | 1/1/2014 | 12/31/2014 |
| Project Kickoff and Outreach | 2/4/2014 | 2/20/2014 |
| Use Draft RFI-EI to Evaluate Temporary Testing Opportunities in 2014 | 2/19/2014 | 4/2/2014 |
| Issue Request for Information-Expression of Interest | 6/3/2014 | 7/29/2014 |
| Potential Temporary Testing | 7/8/2014 | 10/2/2014 |
| Monitoring and Adaptive Management | 7/9/2014 | 10/7/2014 |
| Potential Extended Testing | 8/4/2014 | 12/31/2014 |
| Reporting and Public Dissemination | 12/2/2014 | 12/31/2014 |

APPENDIX A GLOSSARY OF TERMS

| | |
|----------------------------|---|
| Boundary Marker Buoy | Buoy marking the boundary of the site. |
| Commissioning | Process by which the Camp Rilea Ocean Energy infrastructure and WEC arrays are “made ready” for power generation. This is the point at which the five-year operational phase begins. |
| Control Center | OMD facility where Camp Rilea Ocean Energy environmental and system condition data will be monitored. |
| Device Marker Buoy | Buoy to mark any part of the WEC or device sub-sea mooring. |
| In-Water Facility | The Camp Rilea Ocean Energy marine based infrastructure in its entirety. |
| MEC | Marine Energy Converter, a device that can convert wave, tidal, ocean current, offshore wind into electrical energy or a storage vector such as fresh water. Includes hybrid wave-wind devices. |
| Ocean Instrumentation Buoy | Buoy containing sensors and data acquisition and/or communications equipment, may or may not also be a boundary or device marker buoy. |
| Qualification | Process by which a candidate WEC is compared against minimally acceptable criteria for consideration for deployment at the Camp Rilea Ocean Energy site. |
| On-Shore Facility | The Camp Rilea Ocean Energy land based infrastructure in its entirety. |
| On-site Monitoring Station | Unmanned secure facility where power cables terminate, data telemetry is received from In-Water Facility, and data is stored. |
| WEC | Wave Energy Converter, a hydrokinetic “device” manufactured by an outside party to convert waves into usable energy |

