

NW National Marine Renewable Energy Center (NNMREC) Close to the Customer Survey

Summary Report and Recommended Strategies

September 1, 2009

Purpose: Outline strategies for Center activities and the test berth that respond to the Close to the Customer Survey.

Background

In 2008, Oregon State University began the planning process to develop the Nation's first Ocean Test Berth (OTB) off the coast of Newport, Oregon. The OTB is recognized as critical infrastructure required to test and validate Wave Energy Conversion (WEC) devices.

In an effort to assess the needs of the industry, Oregon State University surveyed wave energy developers to explore the following:

- Developers' general interest in testing facilities
- Future testing and support service needs of wave energy developers
- Technical requirements for testing
- Concerns and needs regarding environmental impacts

A survey was developed and e-mailed to 51 wave energy developers throughout the world. Data collection was conducted through e-mail or phone and was completed in October 2008. Of the wave energy developers contacted to participate in the survey, 24 responded; providing a response rate of 47%. Outlined below is the state of development of the respondents.

Stage of Development	Number of Respondents	% of Total Respondents
Doing numerical modeling	1	5%
Building a prototype	5	23%
Have a prototype that needs tank testing	7	32%
Have a prototype that needs ocean testing	1	5%
Have tested a prototype and developing the next	8	36%

Summary of Results

INTEREST IN TESTING FACILITIES:

- All but one of the respondents to the C2C report confirmed that they intend to ocean test their technology.
- Approximately 75% of respondents will test their devices within 1 - 2 years of the survey (2010 - 2011). The remaining 25% would test within 6 months (2009).
- Of those surveyed, 75% already have a test facility in mind. In a follow-up question, 92% believe the site they have selected will meet their needs.
- Of those surveyed, less than half indicated they were inclined to test in Oregon. However, two (2) respondents said they will definitely test their device in Oregon.
- Key reasons given for why respondents would NOT test in Oregon:
 - Location relative to production

- Already have access to sites
- Other available testing sites such as EMEC
- Most respondents indicated that if testing was subsidized, bringing their device to Oregon for testing would be more likely.

FUTURE TESTING AND SUPPORT SERVICES:

The interest and need for both testing services and support services varied both by stage of development and by respondent. There are no discernable themes in the responses.

Stage of Development	Testing Support Services	System Support Services
Doing numerical modeling	Interested in many of the services	Interested in all services
Building a prototype	Not interested in any services	Some interested in some services
Have a prototype that needs tank or ocean testing	Interested in more than half the services	Some interested in some services
Have tested a prototype and developing the next	Half interested in services	Not interested

TECHNICAL REQUIREMENTS:

Technical requirements vary significantly depending on the developer, technology and stage of development. Those that have tested one facility, indicate they will need higher capacities as they test the next phase. The variety in responses are outlined below:

- **Peak instantaneous power requirements** range from 0 to 10,000 kW, with a mean of 1,000 kW.
- The average **power per wave period** ranges from 0 to 700 kW, with a mean of 207 kW .
- The **peak voltage** ranges from 6 to 33,000 volts with a mean voltage of 6,000 volts.
- **Peak current** ranges from .05 to 800 amps with a mean of 187 amps.
- 50% of the respondents will be producing AC power, while the other 50% will be producing DC power.
- Eight of nine respondents will be producing three phase power.
- Approximately 50% of respondents would expect to be grounded through the test berth and will want a ground conductor.
- Wide range of responses to sampling rates needed to meet needs.
- Wide range in size of watch circle, mooring devices used.

ENVIRONMENTAL IMPACTS:

Respondents were asked how important it was to have the ability to gather other information from their device. Respondents were given a list of options and a scale of 1 to 7, with 7 being extremely important. Their responses are summarized:

- Fishing habitat impact - average of 5.2 pts
- mammal migration - average of 4.9 pts
- Acoustic profile - average of 3.5 pts
- EMF generation - average of 3.5 pts
- Sediment transport -average of 3.5 pts

Recommended Strategies

INTEREST IN TESTING FACILITIES:

1. Define the TARGET MARKET: Respondents have said that managing costs in the testing phase is a key consideration for how and where to test. Further, they were specific that the closer the test site is to production the cheaper the transportation costs for testing. Therefore, the target markets, in priority order, for the Oregon OTB should be:
 - a. U.S. and Canadian development companies needing to test their technologies.
 - b. European, Australian, and Canadian companies evaluating U.S. deployment.
 - c. European companies that cannot get into test centers in Europe.
2. EVALUATE the NEEDS of the target market: Establish a non-random sample of developers that may be interested in the test site. Using one-on-one phone interviews and a predetermined set of questions, conduct interviews to define key development requirements. Questions should focus on:
 - a. Key design needs of the developer
 - b. Other testing alternatives being considered by the developer
 - c. Incentives/benefits for Oregon testing that may be important to the developer
3. FINALIZE project DESIGN. Based on the Center's technical knowledge and informed by the C2C report and the assessment defined in #2, establish the final project design. Given the variability in requirements, it is unlikely that the OTB can meet all developers requirements. Therefore, NNMREC will need to either develop:
 - o Develop a design that meets the largest number of developer needs within a reasonable cost, *OR*
 - o Develop the two mobile modules with different specifications to accommodate a broader number of developer needs.
4. Consider what INCENTIVES/VALUE-ADD services may be needed. Evaluate options for additional services or benefits of the OTB that may attract developers from testing in other locations. Ideas include:
 - a. Be cost competitive as a testing center
 - b. Provide standard environmental studies that area accepted by U.S. resource and regulatory agencies (see 3c in "Environmental Impacts" below)
 - c. Offer a wide array of desired support services at reasonable cost
5. Implement a MARKETING STRATEGY. Given that only 2 respondents indicated that they would definitely test in Oregon, establish a communication and outreach strategy that would describe the attributes, timing, and availability of the OTB. Focus the communications and outreach on those individuals that fall into the target market identified above.

FUTURE TESTING AND SUPPORT SERVICES:

Additional work is needed on this issue. The responses from the survey were not consistent enough to make any final determinations about what services, if any, to offer. A couple of steps are suggested below:

1. Define the PURPOSE for offering services. Given that the responses to the survey were so varied on this issue, an evaluation of the purpose for these services might be warranted. Are services offered to make the OTB more attractive? Are they offered to provide professional

opportunities/experiences to Center employees? Are they offered to make money for the Center? Once the purpose for the services are defined, an approach for further evaluation can be developed.

2. Determine the LEAD TIME required for offering the services. A key question to explore is what the lead time is to have the expertise and equipment ready to offer these services. If there really isn't much lead time required, these services may be offered and defined at the time a developer makes a commitment to test. If a longer lead time is required in order to be prepared to offer these services, then more survey work may be required to determine what services are really of interest to developers.
3. Further EVALUATION. With purpose and lead time understood, some additional evaluation of services can be done. If there is lead time required for offering these services, some evaluation questions may be included in the evaluation described in Section 2 of "Interest in Testing Facilities" above.

ENVIRONMENTAL IMPACTS:

Additional work needs to be done on this issue. The question in the survey was not asked in a way that appropriately captures the needs of developers to assess and evaluate environmental issues. Further, developers at this stage of development may not be familiar with the environmental issues that they will need to address. These issues are informed mostly by federal and state regulatory and resource agencies.

1. Conduct a LITERATURE SEARCH. The environmental issues of key concern to federal and state regulatory and resource agencies have been described in numerous filings to FERC, comments to MMS, conference presentations, and other assessments conducted on behalf of OWET and DOE. A literature search could be used to summarize the key issues.
2. Pursue and ASSESSMENT AND SURVEY. If the literature search will not provide the level of detail desired or the Center would like to make thorough understanding of the environmental issues a high priority, an assessment of federal and state agencies could be conducted.
3. Develop ENVIRONMENTAL SERVICES AS VALUE-ADD. Addressing and offering services related to key environmental impacts could be a defining feature of the OTB. Some ways of providing value-add include:
 - a. Develop and offer study methods for assessing specific high priority impacts while testing at the OTB.
 - b. Have the Center actively participate in DOE's West Coast Wave Framework efforts. Use the work of the Framework effort to establish priorities and methods of evaluation for the Center.
 - c. Pursue a commitment from the state resource and regulating agencies that certain studies implemented at the OTB would be all the necessary information to support a future License Application for that technology on specific issues.