



## WET-NZ Multi-Mode Wave Energy Converter Advancement Project

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## Challenges, Barriers and Knowledge Gaps

- ❖ **Performance Predictions:** No validation of WET-NZ models.
- ❖ **Multi-mode Functionality:** Need to verify wave impedance matching ability of the current WET-NZ design.
- ❖ **Cost of Energy Calculations:** Need better input(s) of Net Energy.

## Alignment to Program's Mission and Objectives

- ❖ Developing and demonstrating a new technology through:
  - Tank testing and open sea trials;
  - Technology evaluation and modifications.
- ❖ Acceleration of clean, affordable energy generation that is both economically viable and environmental responsible.

## Integration with Other Programs

- ❖ Links to existing WET-NZ programs in New Zealand
  - Concept creation of research program in 2003;
  - Akaroa deployment in 2011.

## Project Objective and Technical Approach

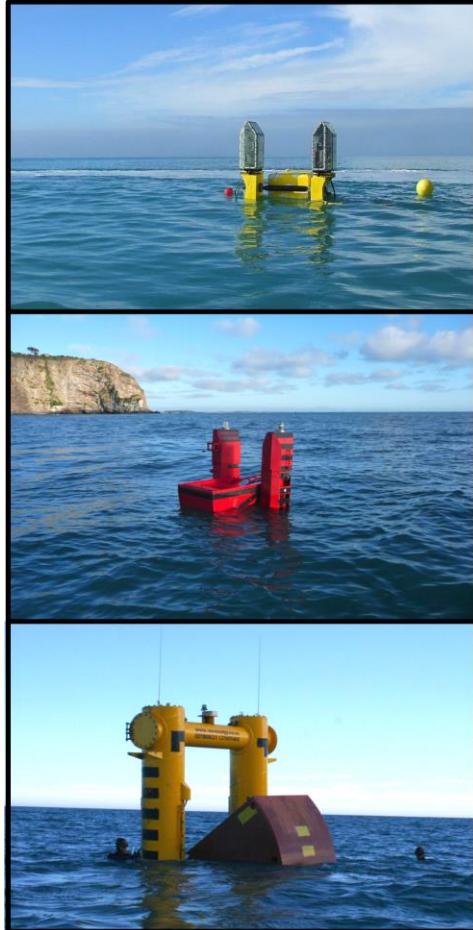
- ❖ **Project Objective:** Verify multi-mode functionality of the WET-NZ device.
- ❖ **Technical Approach:** Wave tank testing, open ocean deployment, synthesis and analysis to confirm TRL 5/6 status (details on following slide).

## Key Issues To Be Addressed and Their Significance

- ❖ **Model Verification:** Need validation of performance predictions via wave tank and open ocean testing in order to refine estimates of Net Energy Production in a wide variety of wave inputs.
  - *Significance – provides required input to go/no go for continued investment from public and private sources.*

## Unique Aspects of Approach

- ❖ Collaborative effort between NZ research institute.
- ❖ NZ investment in US based demonstration program.



- ❖ **Akaroa, NZ Open Ocean Testing** – Design, fab, and ocean test the first generation 1:2 WET-NZ device (part of effort funded by other program).
- ❖ **Wave Tank Testing** – Design, fab, and test model at OSU based on Akaroa ocean testing results.
- ❖ **Redesign** – Design second generation 1:2 WET-NZ device based on Akaroa and OSU testing.
- ❖ **Fabricate** – PowerPod in NZ, Hull and Float in Oregon.
- ❖ **Oregon Open Ocean Testing** – Conduct ocean testing of second generation 1:2 WET-NZ device in Oregon.
- ❖ **Data** – Synthesize all data to validate performance models.

## Schedule

- ❖ Initiation date: April 1, 2011
- ❖ Planned completion date: March 31, 2013

## Major Milestones

- ❖ MS #1 – Akaroa, NZ Ocean Testing – October 2011
- ❖ MS #2 – OSU Wave Tank Testing – November 2011
- ❖ MS #3 – Redesign of 1:2 Model – January 2012
- ❖ MS #4 – Oregon Ocean Testing – Summer 2012
- ❖ MS #5 – Synthesis of Data – Spring 2013

## Go/no-go decision points for FY12 and FY13 – TBD

## Budget

- ❖ No variances at this time.
- ❖ Estimated Expended Budget to Date: \*To be provided at Peer Review.

Budget History					
FY2009		FY2010		FY2011	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
		\$ 909,260	\$ 606,400	\$ 909,259	\$ 606,400

## Milestone #1 – Akaroa, NZ Ocean Testing

- ❖ Completed design of 1:2 scale PowerPod, Hull and Float;
- ❖ Completed fab of PowerPod, Hull, Float, and Integration;
- ❖ Completed deployment;
- ❖ Completed initial testing and data analysis;
- ❖ Initiated redesign based on test results.



**Status: Milestone is on schedule and budget**

# Accomplishments and Results



## Milestone #2 – OSU Wave Tank Testing

- ❖ Completed design and fabrication of Model – September 2011
- ❖ Completed testing at OSU – October 2011
  - Tests conducted at Tsunami Wave Basin at OSU;
  - Physical Model and Set-up;
  - Date Acquisition Analysis;
  - Physical model testing (7 days of testing);
  - Demobilization;
  - Reporting.
- ❖ Initiated Data Analysis – November 2011

Pictures to be added before Peer Review  
(testing commences the week of October 11)

## Fabrication

- ❖ Challenge – Uncertainty of fabrication costs for 1:2 model.
- ❖ Resolution – Initiated conversations with industry partners to better understand methods for device fabrication.

## Deployment

- ❖ Challenge – Uncertainty of deployment technique and costs.
- ❖ Resolution – Initiated conversations with industry partners to better understand methods for construction and deployment.

## NEPA

- ❖ Challenge – DOE NEPA not complete for OSU test site.
- ❖ Resolution – close coordination with OSU's NEPA process.

## **MS #3 - Fabrication of 1:2 Model – March 2012**

- ❖ Status – Initiated, waiting for wave tank results.
- ❖ Challenge – Need to complete quickly so that final design and fab of second generation WET-NZ device can commence in Spring 2012.

## **MS #4 – Oregon Ocean Testing – Summer 2012**

- ❖ Status – Initiated value engineering process with Oregon Iron Works, need final design from Milestone #3.
- ❖ Challenge – Cost estimate cannot be finalized until final design is complete.

## **MS #5 - Synthesis of Data – Spring 2013**

- ❖ Status – Initiated COE model development.
- ❖ Significance – This milestone will integrate all data to validate TRL 5/6 status and to determine if WET-NZ can provide cost effective utility scale power.

**Future Scope – TRL 7/8 to confirm commercial viability.**