

# OPT

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## OCEAN POWER TECHNOLOGIES



PRESENTATION TO NHA CONFERENCE

April 2011

# Ocean Power Technologies



**Tuckerton, New Jersey  
2005-2006; 2007-2009**



**Marine Corp Base Hawaii  
Dec 2009 - present**



**Undersea Substation (Pod)**

- Headquarters - Pennington, NJ
- Sale of turnkey wave power stations, plus related maintenance contracts for utility and autonomous applications
- Founded in 1994
- Ocean-tested and proprietary technology – 56 Patents issued and pending
- Most technologically advanced, best-capitalized wave energy company - listed on Nasdaq
- Commercialization underway

## Wave Energy and the Advantages of OPT's Systems

**Wave energy is the most concentrated form of renewable energy:**

- Widespread throughout the U.S., U.K., Europe & other parts of the world
- Close to population centers
- Predictable & dependable, and can be fed into the power grid or stored
- Relatively small “footprint”

**Using OPT's PowerBuoy® technology to convert wave energy to electrical energy has several advantages:**

- Capacity factor of 30% to >45% higher than solar and wind
- Environmentally benign & non-polluting
- No exhaust gases, no noise, minimal visibility from shore, safe for sea life
- Scalable to high capacity power stations (100MW+)

# Competitive Advantages

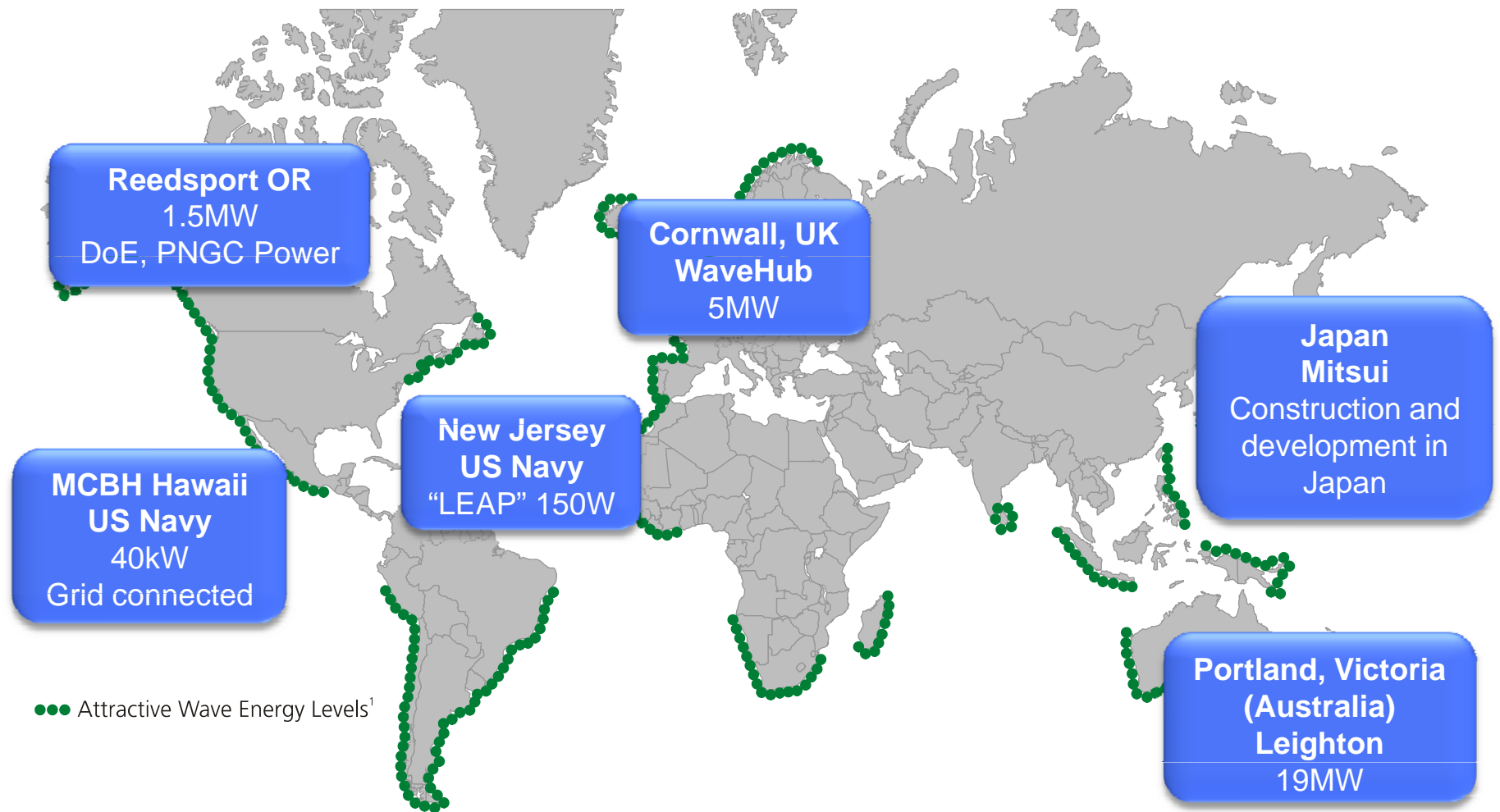
- PowerBuoy is based on ocean-going buoys, primarily below the ocean surface
- Extensive in-ocean experience, including successfully withstanding hurricanes and winter storms
- Electronic “tuning” capability to optimize power output in changing wave conditions
- Flexibility of core technology, which is scaleable for utility and autonomous applications
- Strong partners: US Navy, Lockheed Martin, Iberdrola (Spain), PNGC Power (US), Leighton Contractors (Australia), Mitsui (Japan), US DoE
- Third party commercial validation: environmental assessment, grid connection, PB150 structure and mooring, PowerBuoy insurance coverage
- Strong capital base

# Third Party Commercial Validation

*OPT's technology has received more testing & validation by independent parties than any other wave energy company*

- Certification by Lloyd's Register of PB150 structure and mooring system
- Independent Environmental Assessment in Hawaii under direction of US Navy resulted in "Finding of No Significant Impact" – highest rating
- Grid connection certified by Intertek (IEEE standards)
- PowerBuoys insured by Lloyd's syndicates for over 10 years for property loss and third party liability

# Current OPT Wave Energy Projects



# Autonomous PowerBuoy Applications

- **Individual and small non-grid connected arrays** – sizes range from 10 watts to 150 kilowatts
- \$10 Billion estimated annual market worldwide
- Government Application:
  - US Navy and Homeland Security maritime surveillance and ocean-based communications
- Commercial Applications:
  - Off-shore oil and gas
  - Desalination
  - Open-ocean aquaculture
  - Oceanography
  - Ocean-based communications





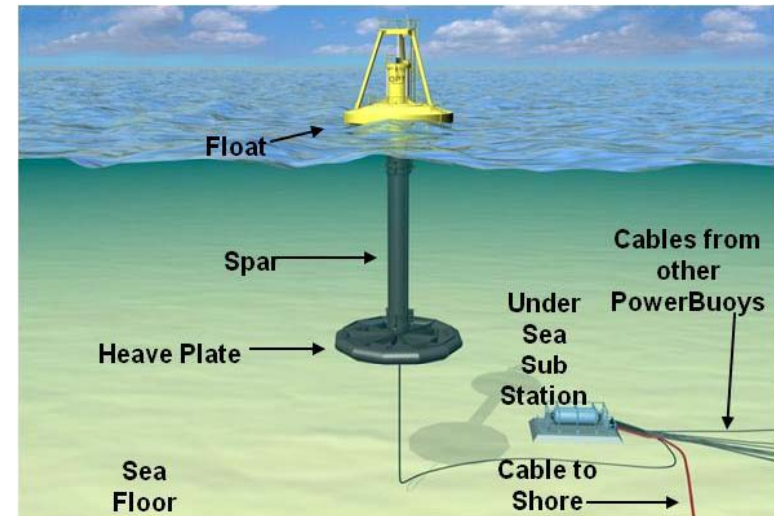
# Utility PowerBuoy Applications

## ■ Power for the utility grid

- Large arrays of PB150's, graduating to PB500's
- Grid connected
- Produce wave power stations ranging in size from 5 MW up to 100's of MW
- Addressable renewable utility market estimated at \$50 Billion per year

## ■ Customers:

- Commercial utilities and independent power producers
- US Navy and other DoD bases





# PowerBuoy Deployment Process

*Deployment in Oregon planned for this later this year*



# Wave Energy Program at Marine Corps Base Hawaii

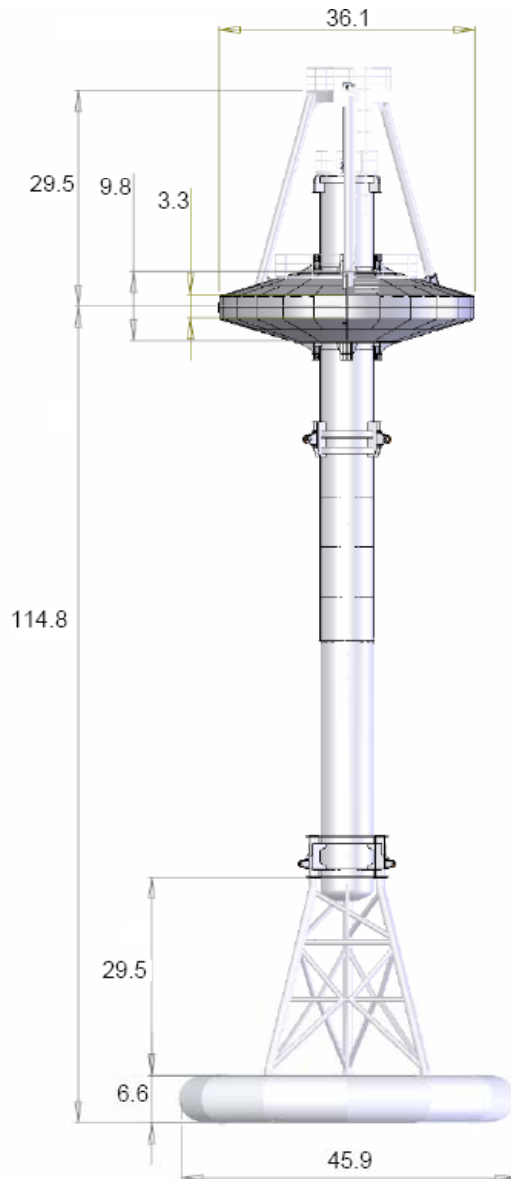
## *First grid-connected wave energy system in the US*

- Built and operated with support from the US Navy
- PB40 PowerBuoy operating since Dec 2009
- Survived severe storms
- Confirmed OPT's predictive models of power characteristics vs. wave climate
- Validated design for PB150 and PB500 larger buoys



**OPT**  
OCEAN POWER TECHNOLOGIES

# OPT's PB150 PowerBuoy for Utilities



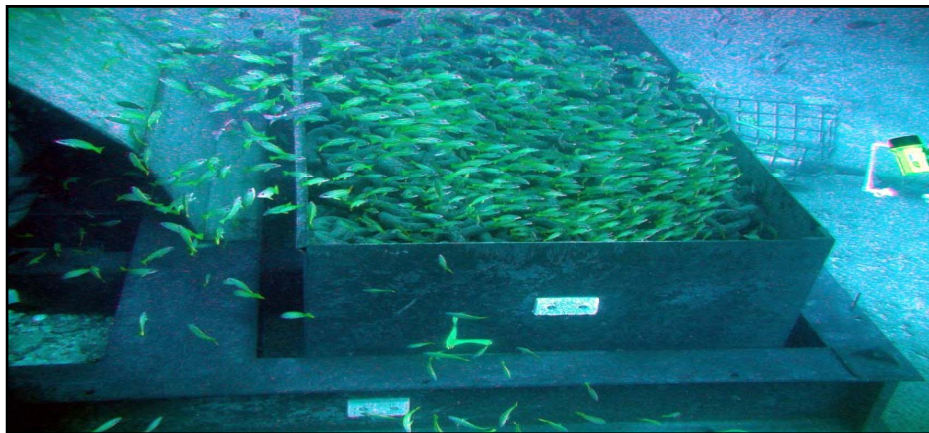
- Peak-rated output of 150 kW
  - Power factor of -0.9 to +0.9.
  - Typical capacity factors between 30% to >45%, depending on location
- Generates power with wave heights between 1.5 and 7 meters (4.9 to 22.9 feet).
- Typically configured in two- to three-row arrays, minimizing the footprint of the project
- Provides grid quality electricity and is independently certified to meet all required interconnection standards
- Has fiber optic communications and Supervisory Control and Data Acquisition (SCADA) systems.

# PB150 - Scotland





# Environment & Permitting



- OPT is leader in wave energy permitting: experience in Hawaii, Oregon, Australia
- Proactive approach, sensitive to regional concerns
  - Community involvement
  - “Settlement Agreement”
  - Adaptive Management approach
- FERC license application pending for wave power station in Oregon
  - Expected to be first in USA

# OPT Experience Installing Wave Power Infrastructure

- OPT has installed undersea infrastructure in demanding environments
- Undersea Substation Pod
  - Unique features – open platform
  - Enables field development of marine energy devices
  - Lowers cost per MW installed



Undersea Substation Pod readied for deployment



Laying Submarine Cable



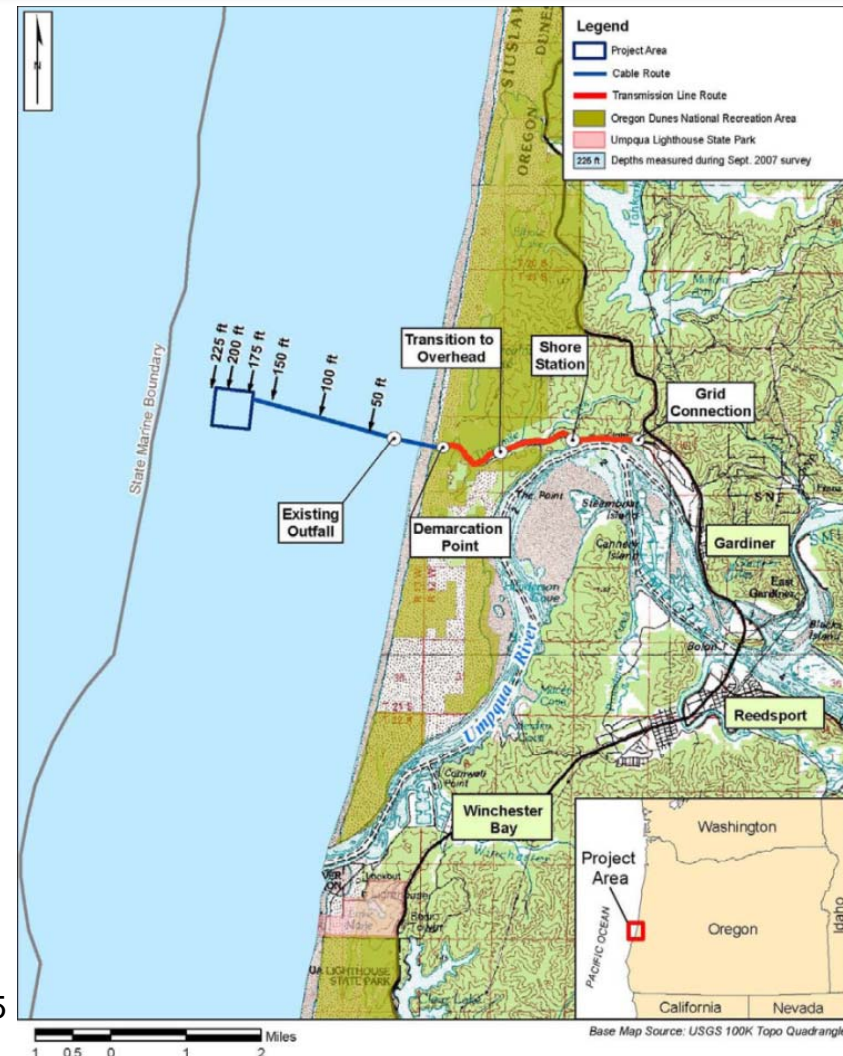
Landing Cable at Beach



# Reedsport, Oregon 1.5 MW Wave Farm

*Expected to be first US commercial array of wave power devices*

- Commercial scale equipment
- Phase 1: Single PB150 expected to be deployed later this year
- Phase 2: Ten PowerBuoys, grid connected (full FERC license pending)
- Phase 3: Expansion up to 50 MW (preliminary FERC permit granted)
- Volume production using PB150's projected to result in a cost of:
  - \$4 MM per MW
  - 15¢ per kWh



# Manufacturing of PB150 - Oregon





# “Green” Job Creation in the US

- **Jobs that cannot be outsourced abroad:** PowerBuoy is fabricated, integrated, and tested near coastal site (e.g. Oregon)
  - **50+ jobs in hard-hit manufacturing and marine services for first buoy**
  - **Additional jobs for deployment and recurring maintenance**
- Power take-off and control system (“smart-part”) built in New Jersey
  - **40 related, highly skilled jobs**
- Potential jobs created by a 200 MW/year industry >12,000



Fabrication at Oregon Iron Works, Oregon



Power Take-Off & Control System  
at OPT, New Jersey