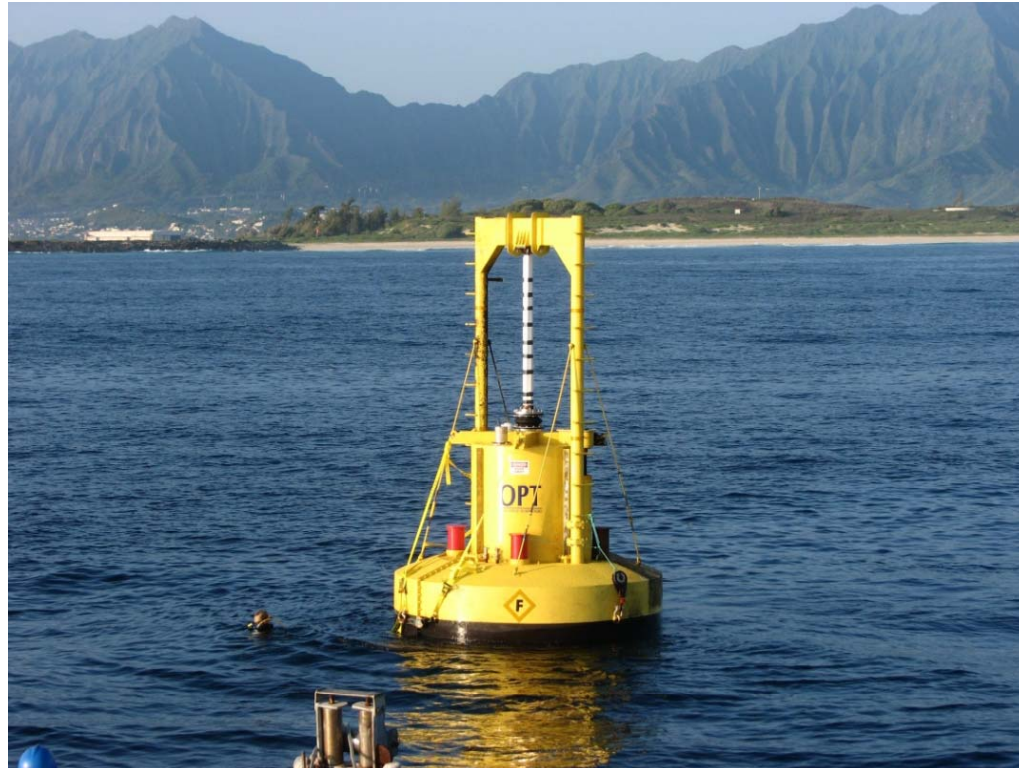


# OPT

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## OCEAN POWER TECHNOLOGIES



**Defense Energy Conference**  
US Navy & US Marine Corps Energy Policy Procurement and Technology  
Washington, DC

February 9, 2011

# Ocean Power Technologies - History

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<b>1994</b>	Began operations in Pennington, New Jersey
<b>1995</b>	Awarded 1 <sup>st</sup> SBIR Contract from Office of Naval Research to develop a PowerBuoy for AUV recharging at sea
<b>1997</b>	Began ocean testing of PowerBuoy at LEO-15 site (US Navy & Rutgers University) in New Jersey
<b>1998 To Present</b>	Continued development and ocean testing for ONR, NAVFAC, and NAVSEA of PowerBuoys in the Atlantic (New Jersey) and Pacific Oceans (Washington State and Hawaii)
<b>2007 To Present</b>	Began commercialization of PB40 and PB150 PowerBuoy for utility grid connected power and autonomous (non-grid) applications

# Ocean Power Technologies



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



**OPT PowerBuoy  
deployed for Iberdrola  
in Spain 2008**



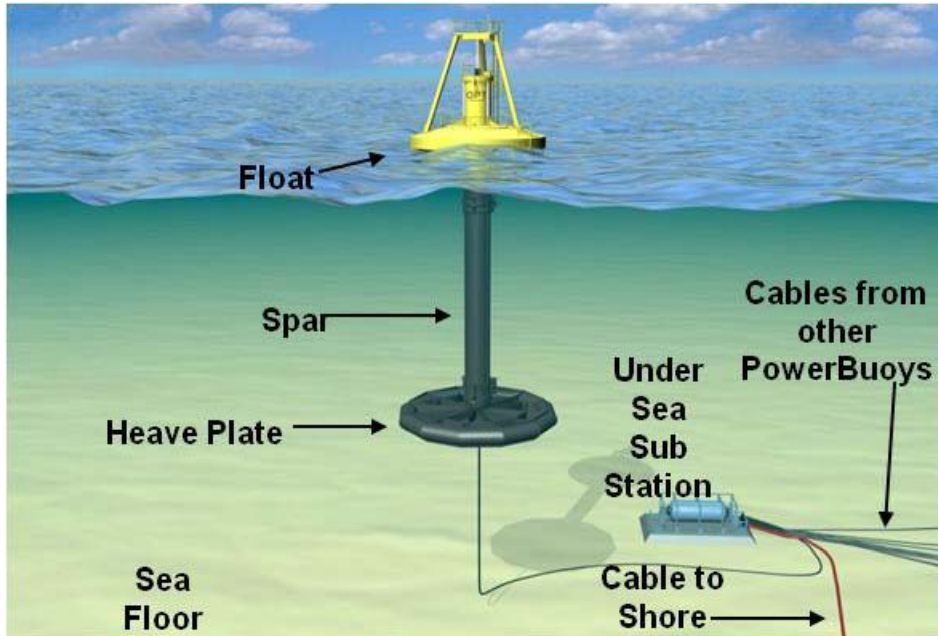
**Marine Corp Base Hawaii  
June 2007**



**Marine Corp Base  
Hawaii Dec 2009**

- Headquarters - Pennington, NJ
- Focus on electrical power generation from ocean waves
- Over 10 years experience in producing electrical power from ocean waves
- Ocean-tested and proprietary technology – 45 Patents issued & 11 pending
- Listed on Nasdaq
- Developing large wave parks for utility applications
- Developing autonomous PowerBuoys for Navy non-grid connected maritime security applications

# The PowerBuoy



- Buoy structure based on maritime industry design certified by Lloyd's Register
- Moveable float on stationary spar follows waves to produce electricity
- Patented electronic tuning system optimizes power output by matching generator impedance to wave impedance on a wave-by-wave basis
- Output collected in undersea substation for transmission to shore
- Scalable and modular for MW-sized wave parks

# Wave Energy and the Advantages of OPT's Systems

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

- Widespread throughout the US, U.K., Europe & other parts of the world
- Close to population centers and hence the grid
- Predictable & dependable, and can be fed into the power grid
- Relatively small “footprint” – an OPT wave power station requires only one-tenth the area of wind power station of comparable capacity

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

- Load factor of 30-45% versus solar and wind load factors of 10%-35%
- Environmentally benign & non-polluting
- No exhaust gases, no noise, minimal visibility from shore, safe for sealife
- Scalable to high capacity power stations (100MW+)
- Targeted to be cost competitive with fossil fuel (without subsidies)



# PowerBuoy Applications

## 1. 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

### Customers:

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



Site of Navy project in Hawaii

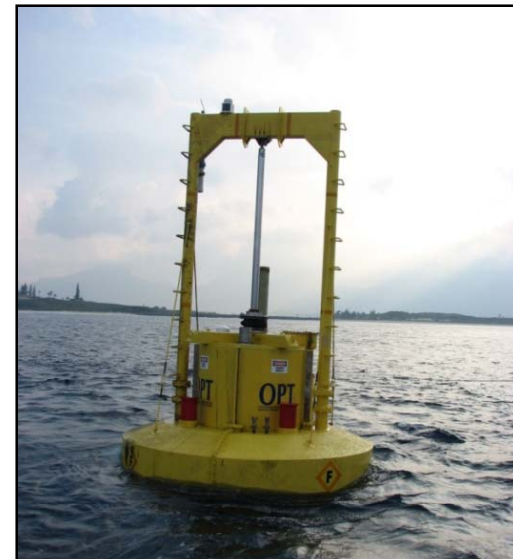
# Wave Energy Technology (WET) Program at Marine Corps Base Hawaii & PB40 PowerBuoy



*First grid-connected wave energy system in the U.S.*

## Accomplishments Working with the Navy

- Advanced PB40 PowerBuoy operating since mid-Dec 2009
- Survived severe storms
- Confirmed OPT's predictive models of power characteristics vs. wave climate
- Validated design for PB150 and PB500 larger buoys



# Third Party Commercial Validation

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



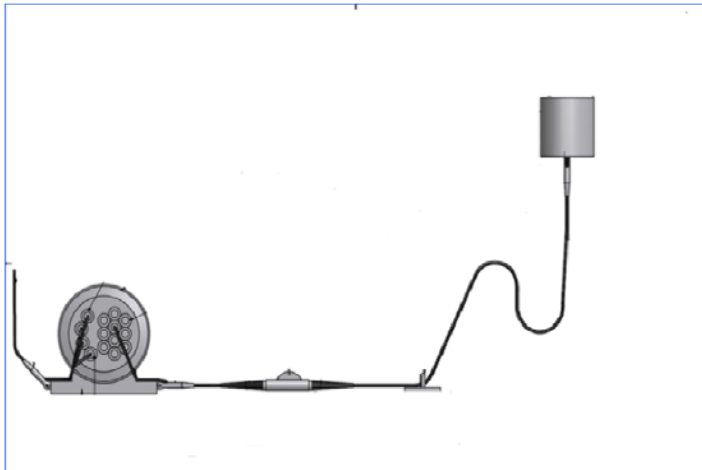
# OPT Cable Laying at MCBH



Hawaii PowerBuoy

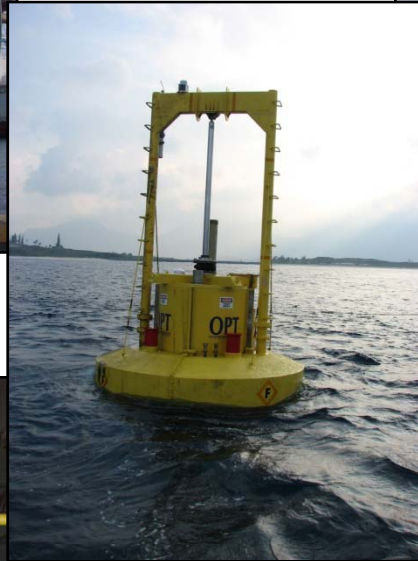


Laying Submarine Cable



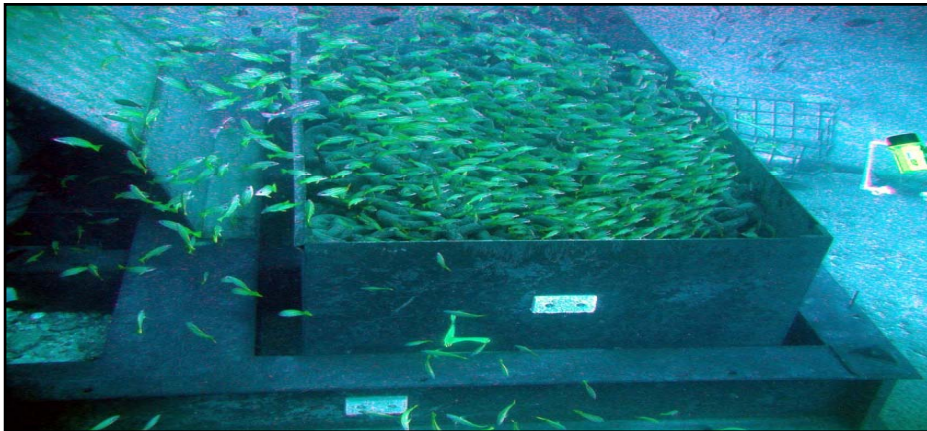
Landing Cable at Beach

# PowerBuoy Deployment at MCBH





# Environment & Permitting



- OPT is Leader in wave energy permitting: Hawaii, Oregon, Australia
- Proactive Approach
  - Sensitive to regional concerns
  - “Do it right”
  - Appreciation of commercial time frame
- Two stage permitting process
  - 1) Community Involvement
    - Identify stakeholders
    - Inclusive constructive dialog
    - Consensus-based process
    - “Settlement Agreement”
  - 2) FERC Licensing
    - Will be first in USA
    - Currently in last stage of achieving FERC License for Wave Power Station in Oregon

# PowerBuoy Applications Continued

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## 2. AUTONOMOUS APPLICATIONS

- Individual and small non-grid connected arrays – sizes range from 10 watts to 40 kilowatts

### Customers:

- US Navy and Homeland Security  
Maritime Surveillance and ocean based communications  
Examples: LEAP (NUWC), TOME (NRL), MicroBuoy (NAVSEA)

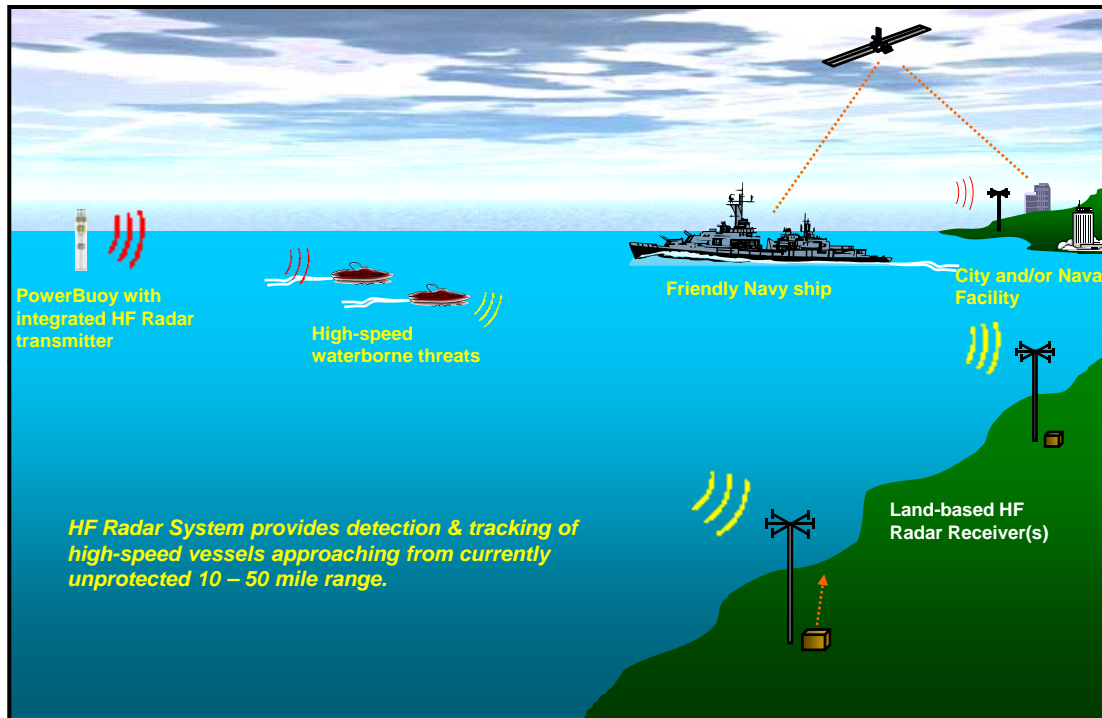
### Commercial Applications:

- Desalination
- Off-shore Platforms
- Open Ocean Aquaculture
- Oceanography
- Ocean Based Communications



OPT's PowerBuoy deployed 30 miles offshore  
for US Navy Test September 2004

# Littoral Expeditionary Autonomous PowerBuoy (LEAP) Program



## Mission:

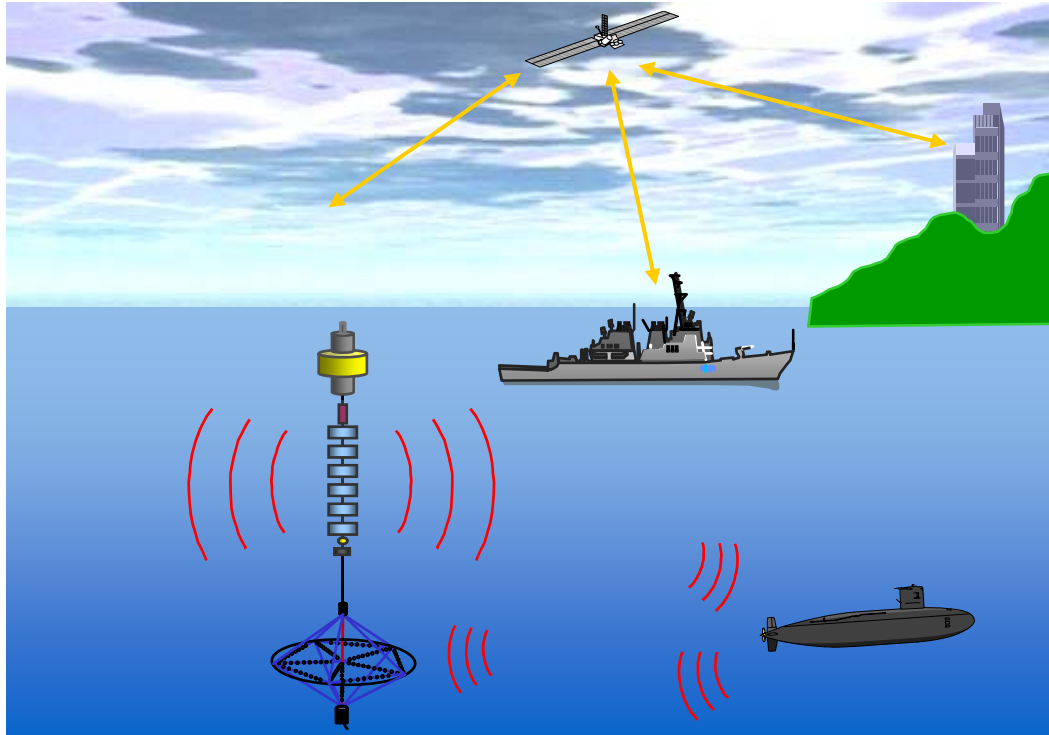
Persistent, dependable, long-term operation of a surveillance network to provide operational surface vessel tracking capabilities to prevent attacks from small, high-speed vessels

## Persistent Ocean Surveillance System

- OPT & Rutgers provide vessel detection for persistent maritime security
  - OPT PowerBuoy® wave energy converter
  - Rutgers Coastal Ocean Observation Lab
  - Rutgers advanced vessel detection & tracking software
  - CODAR Ocean Sensors HF Radar
  - Mikros Systems shipboard and communications expertise



# Deep Water Autonomous Deployable System



## DWADS Anti-Submarine Warfare (ASW) Program

- Unmanned, unattended, high-power system
- Provide wide area search and protection of Sea Base in very deep water without anchoring
- OPT PowerBuoy provides power for station keeping & supplemental power to arrays and communications
- OPT demonstrated power during initial Oct 2008 ocean test 30 miles off New Jersey coast

# MicroBuoy Compact Wave Energy Converter



Demo unit ocean test – May 2008



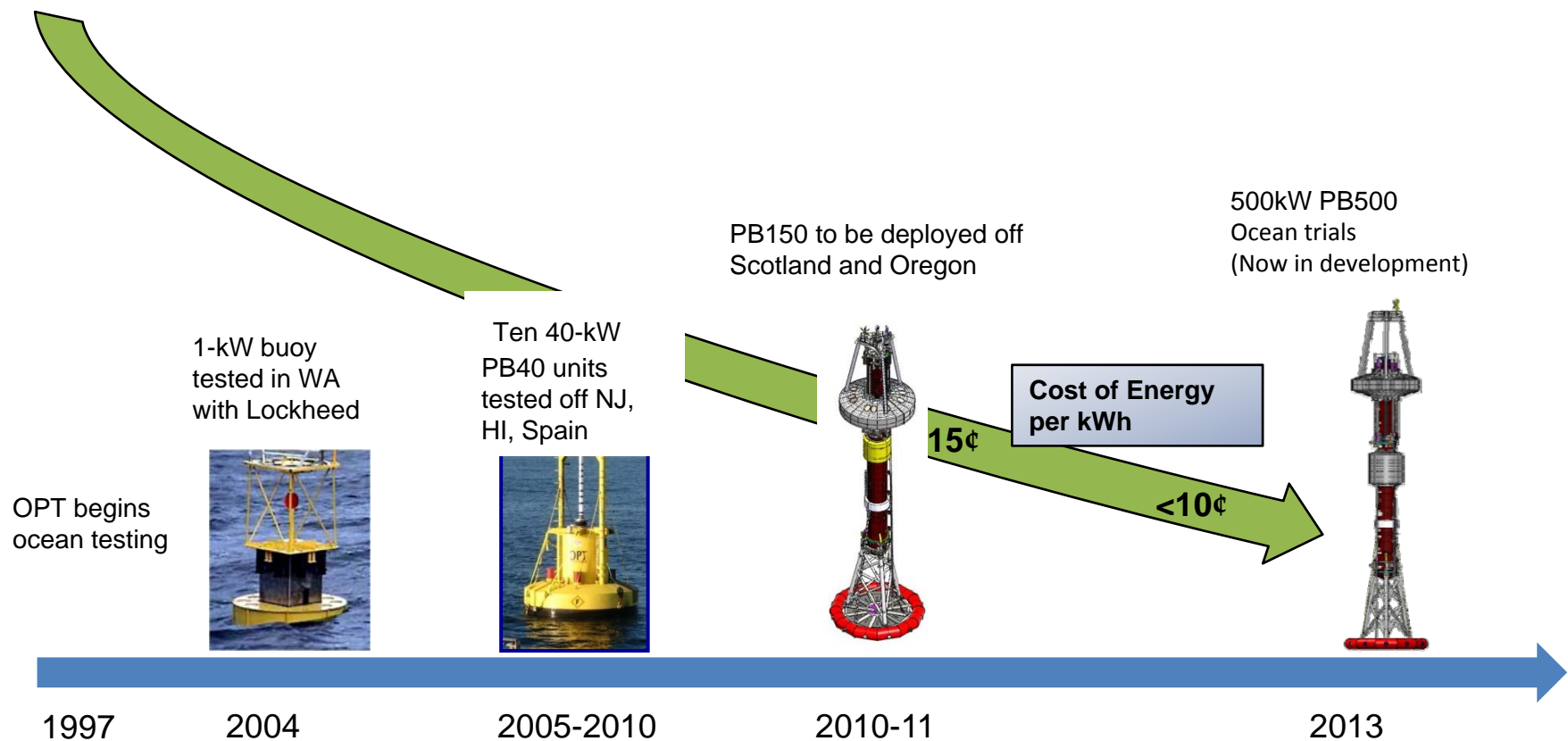
MicroBuoy technology can be embedded in other devices

## Communications Relay PowerBuoy

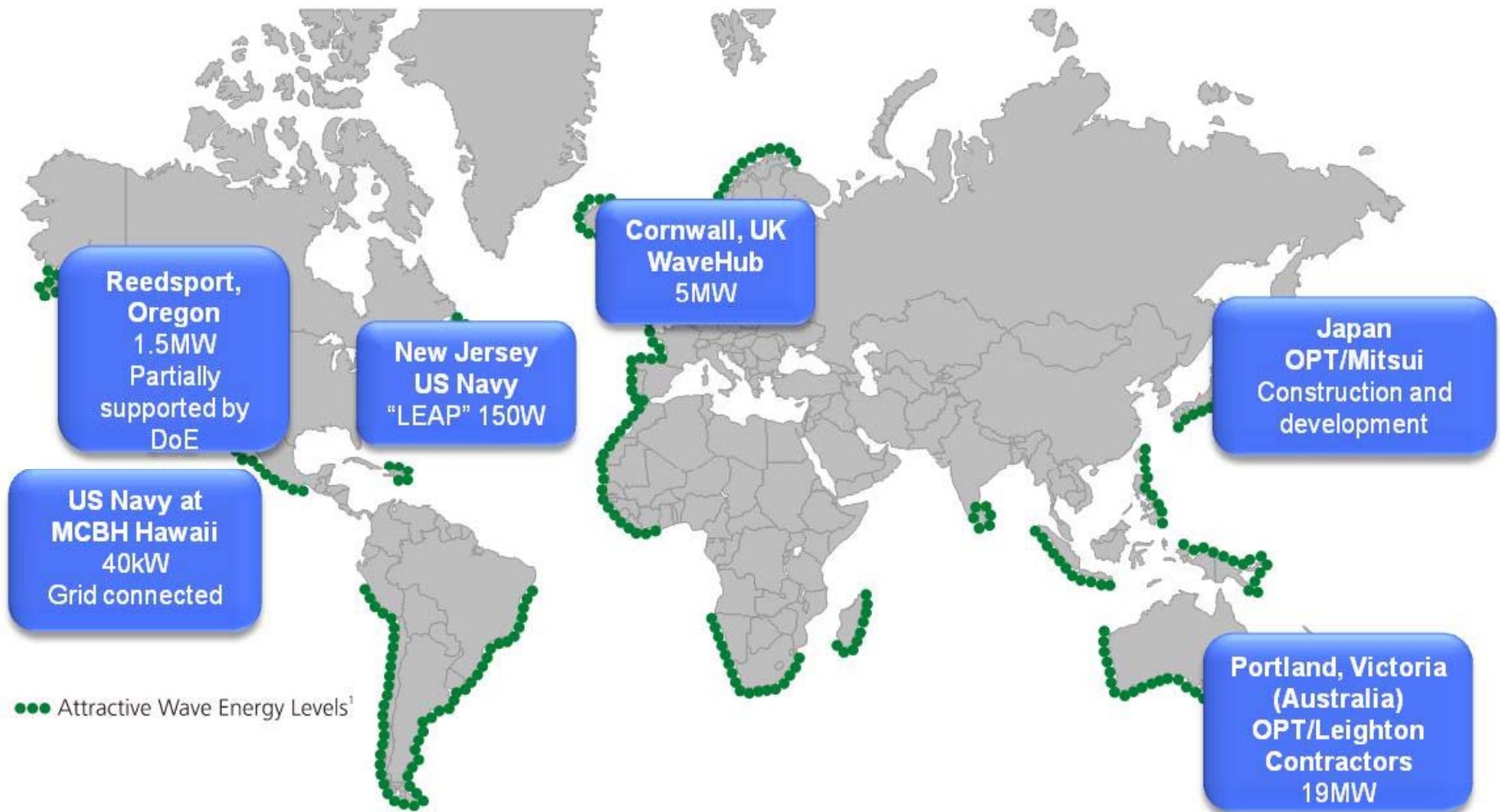
- Enables communications with submarine while submerged and traveling
- Wave energy harvesting contained in hermetically sealed Buoy
- Wave action forces Buoy up and down
- Tuned internal oscillator maximizes wave energy capture
- Scalable up from 3-inch diameter
- Free floating or moored

# Growth Path to Commercial Success

The PB150 is OPT's "workhorse" for commercial projects like Reedsport, Oregon



# Current OPT Wave Energy Projects



# Contact Information

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