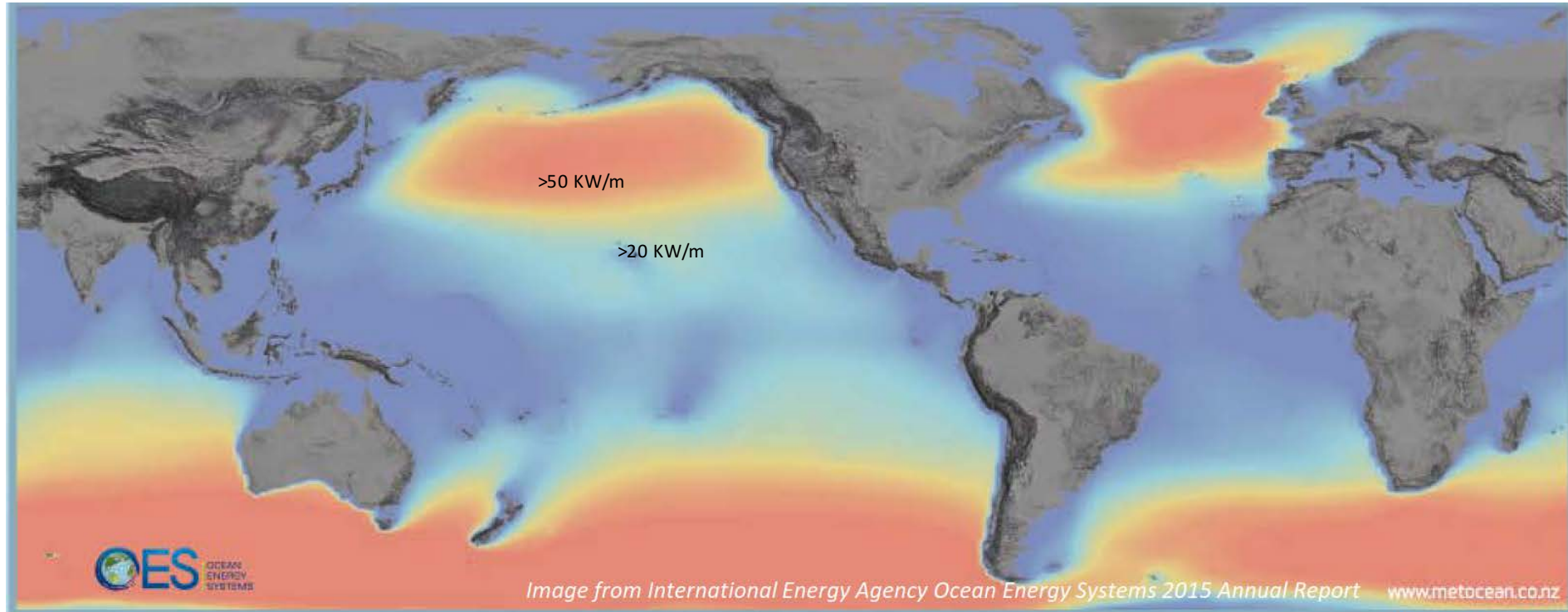


# HYDROGEN FROM RENEWABLE WAVE ENERGY

by  
Dr. Vladimir Shepsis  
Applied Ocean Energy Corporation

# Global Distribution of Annual Mean Wave Power

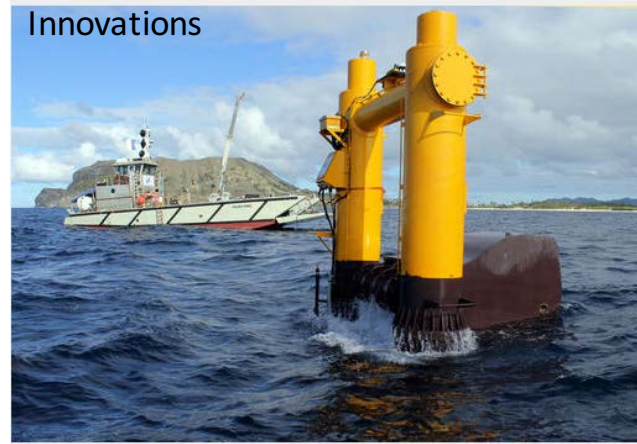


**50 KW/h Electrical Energy + 9 Liters of Water =  
1 Kg of Hydrogen (H<sub>2</sub>) + 8 Kg of Oxygen (O<sub>2</sub>)**

2012, Columbia Power Technologies, Inc.



2015, Northwest Energy Innovations



2016, Norwegian Co



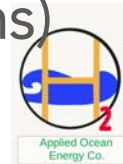
2017, Wave4Power, Norway



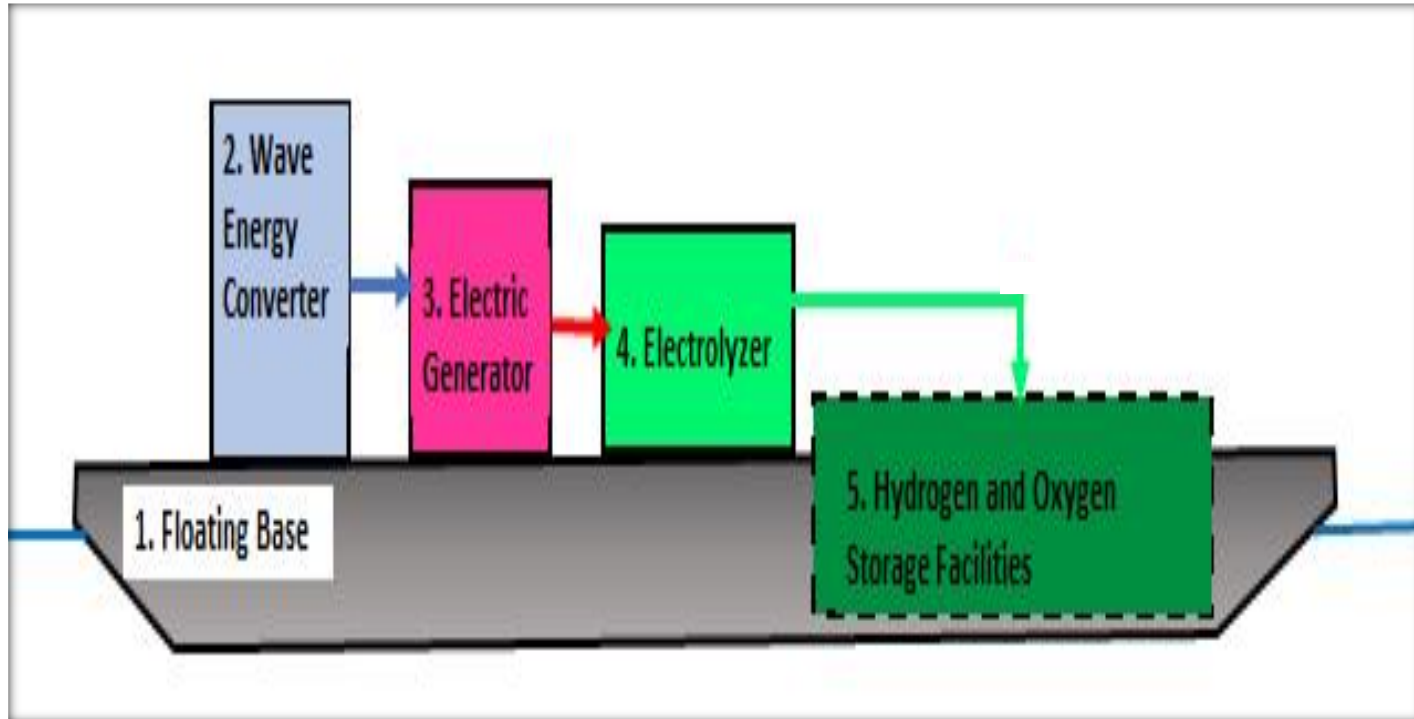


# Applied Ocean Energy Criteria

- Perform all operations remotely offshore with no hardware connection to shoreline: Off Grid Technology
- Use electricity from renewable ocean wave energy for water electrolysis to produce hydrogen and oxygen (as by-product)
- Do not use any parts that extends into the water column, meaning that converter shall be always above the water
- Maximize effectiveness of single device to avoid multiple installations
- Safe operation in a wider range of wave conditions (small waves and big storms)



# AOE Technology



# Hydrogen Production and Transportation Industry

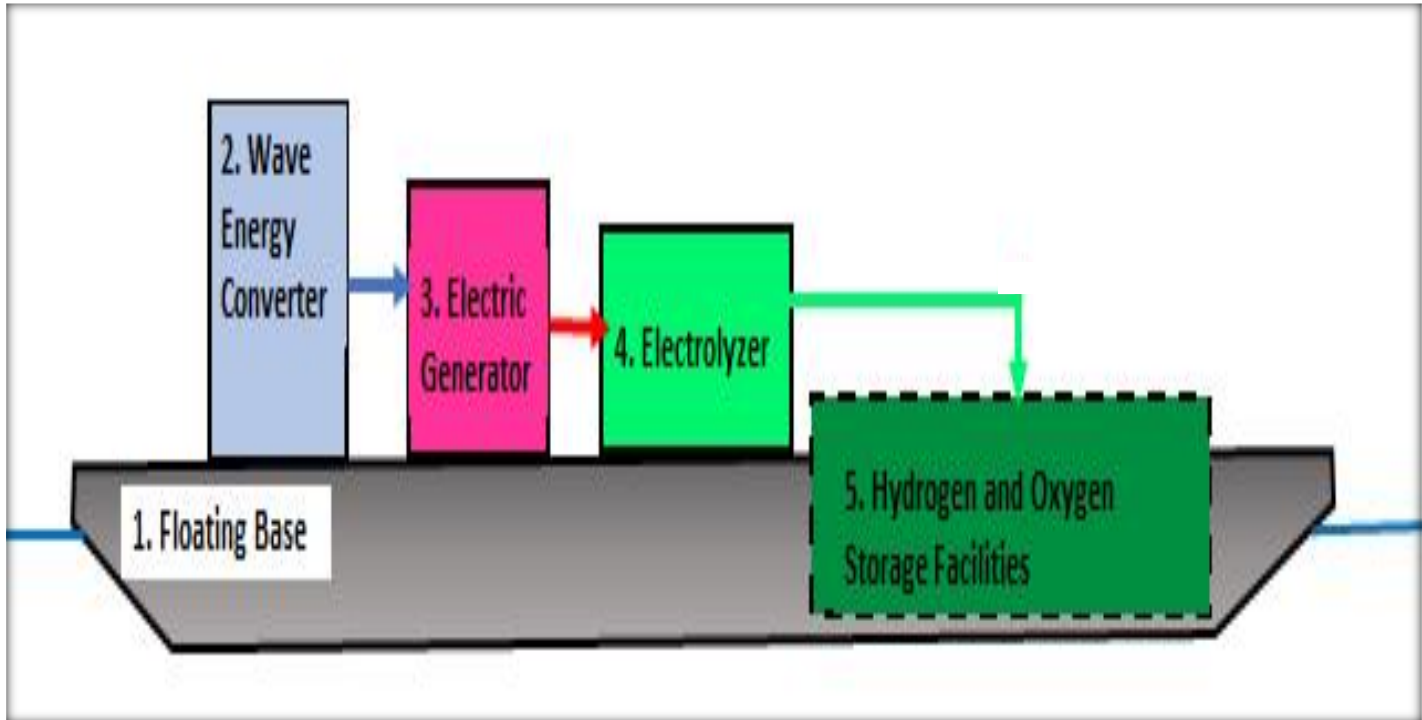
## HYDROGEN GENERATOR, 500ML/MIN.

PARKER HANNIFIN | ZORO #: G4060309 | MFR #: 60H

0.0 No Reviews | Write the First Review



# AOE Technology





Ocean Renewable  
September 18-19, 2018

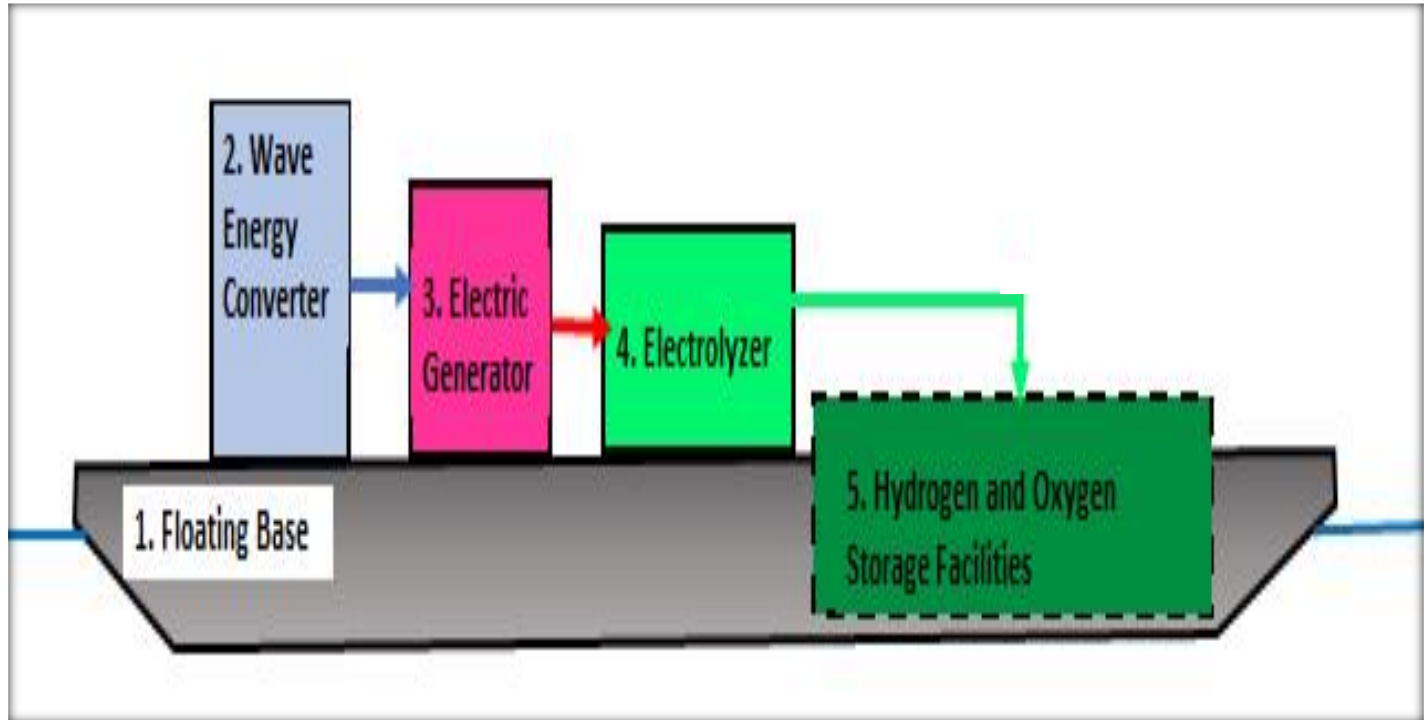
Applied Ocean  
Energy Co.



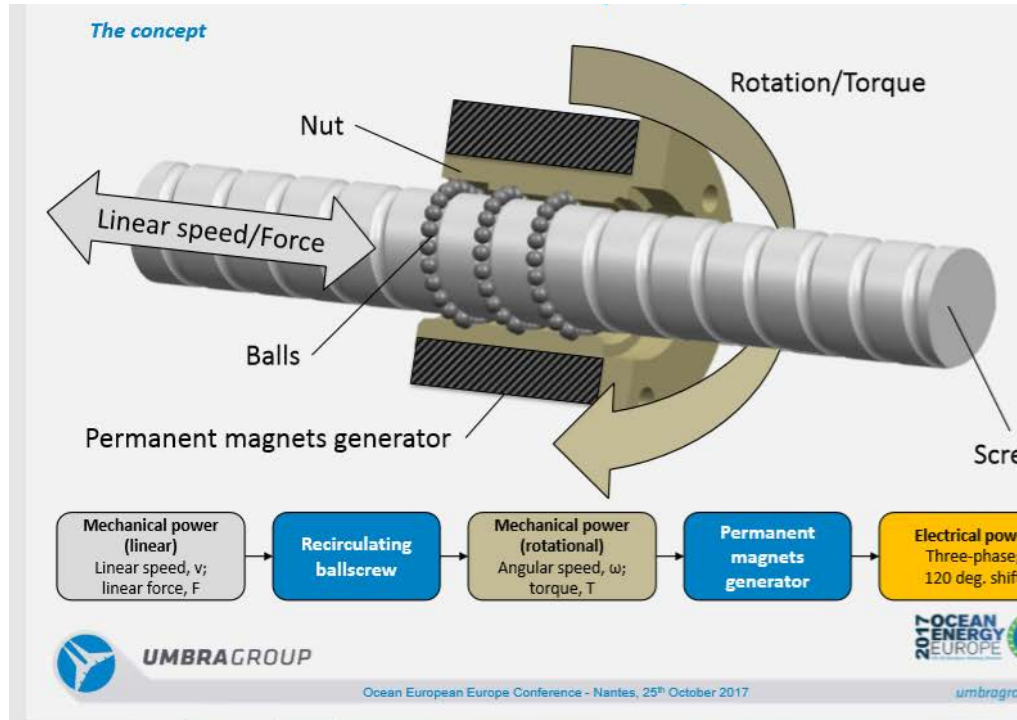
PACIFIC OCEAN ENERGY TRUST



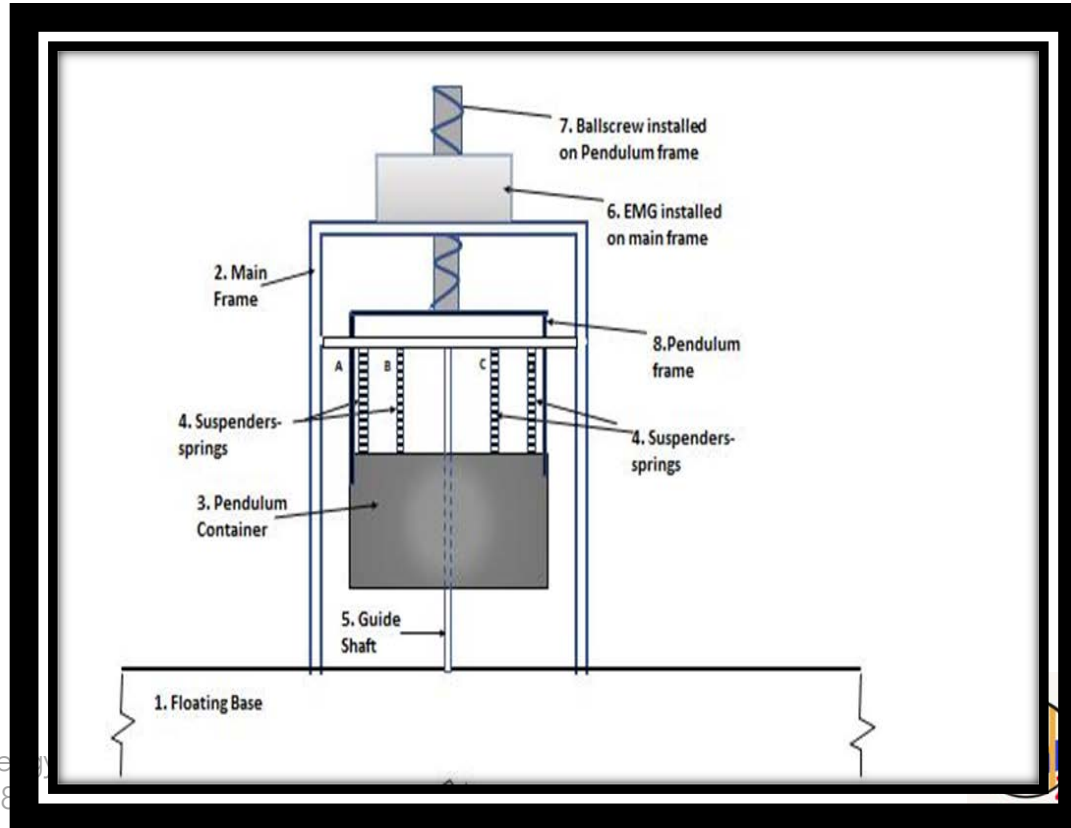
# AOE Technology



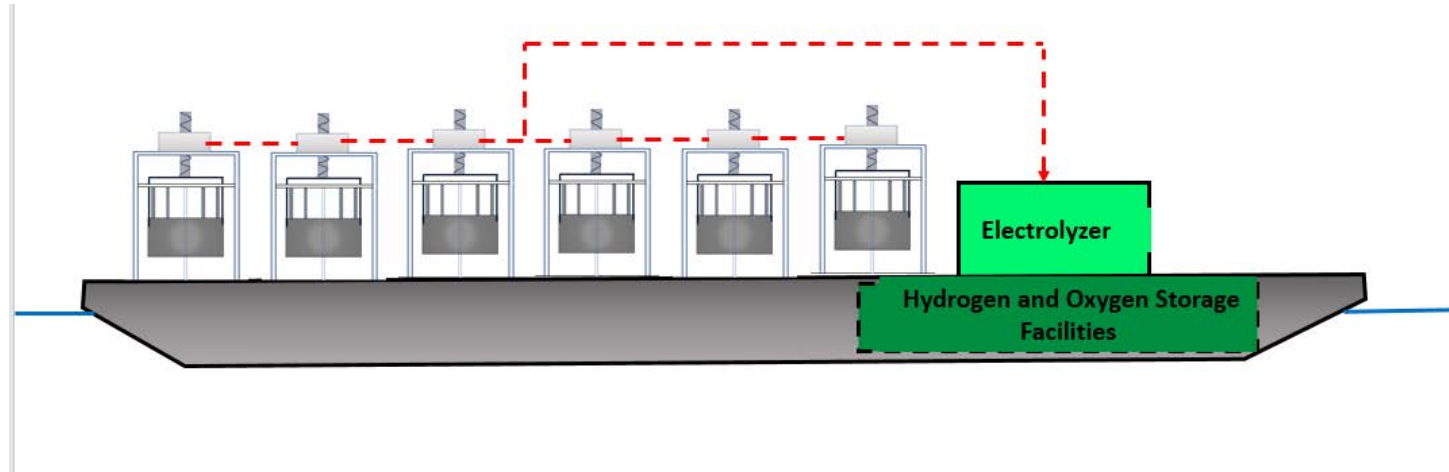
# Linear Electro-Magnetic Generator, UMBRA GROUP spa



# Wave Energy Converter & Electro Magnetic Generator



# AOE Technology



# AOE Advantages

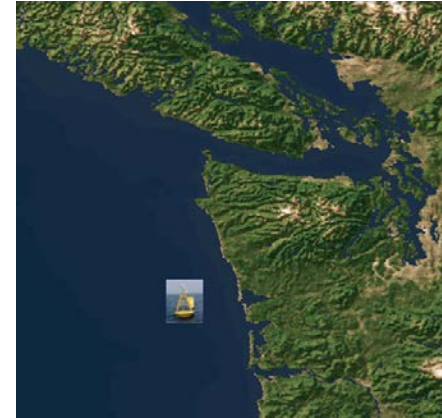
- Hydrogen production cost
  - comparable or lower than conventional methods of electrolysis.
- AOE is not energy grid connected
  - Provides for easy storage and transportation of hydrogen.
- AOE operates offshore
  - Minimizing time and effort necessary for environmental permits.
- Minimal environmental impacts
  - Fixed structural installations or cable energy transmission not required.
- AOE is not subject to corrosive impact of waves or floating debris
  - Hull of the floating base is certified to operate in open ocean





# Field Test – Grays Harbor, WA

- Prototype-scale floating base equipped with AOE technology.
- Long-term field study 3 miles offshore and near NOAA Buoy Station to measure and record incident wave parameters hourly.
- Measuring devices will remotely transmit the measured data to the Test office at the nearby port in Grays Harbor.
- Apparently only BOEM and US Coast Guard Permits would be required.



# Project Team

- Applied Ocean Energy Corp.
- Foss Maritime: naval architect and marine engineering company.
- UMBRAGROUP spa: aerospace and industrial manufacturing company producing electro-mechanical generators.
- Local communities: Port of Grays Harbor, Port of Willapa Harbor, Port of Ilwaco, Pacific County, Quinault Indian Nation, other



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*THANK YOU*