

# MARINE RENEWABLE ENERGY: A NORTHWEST OPPORTUNITY



## 3 TAKEAWAYS:

1. SIGNIFICANT PROGRESS TOWARD COMMERCIALIZATION.
2. BETTER UNDERSTANDING OF THE OPPORTUNITY.
3. MARINE RENEWABLES OFFER BENEFITS FOR:
  1. ENERGY/GRID SYSTEM
  2. RESILIENCE
  3. ECONOMIC DEVELOPMENT.

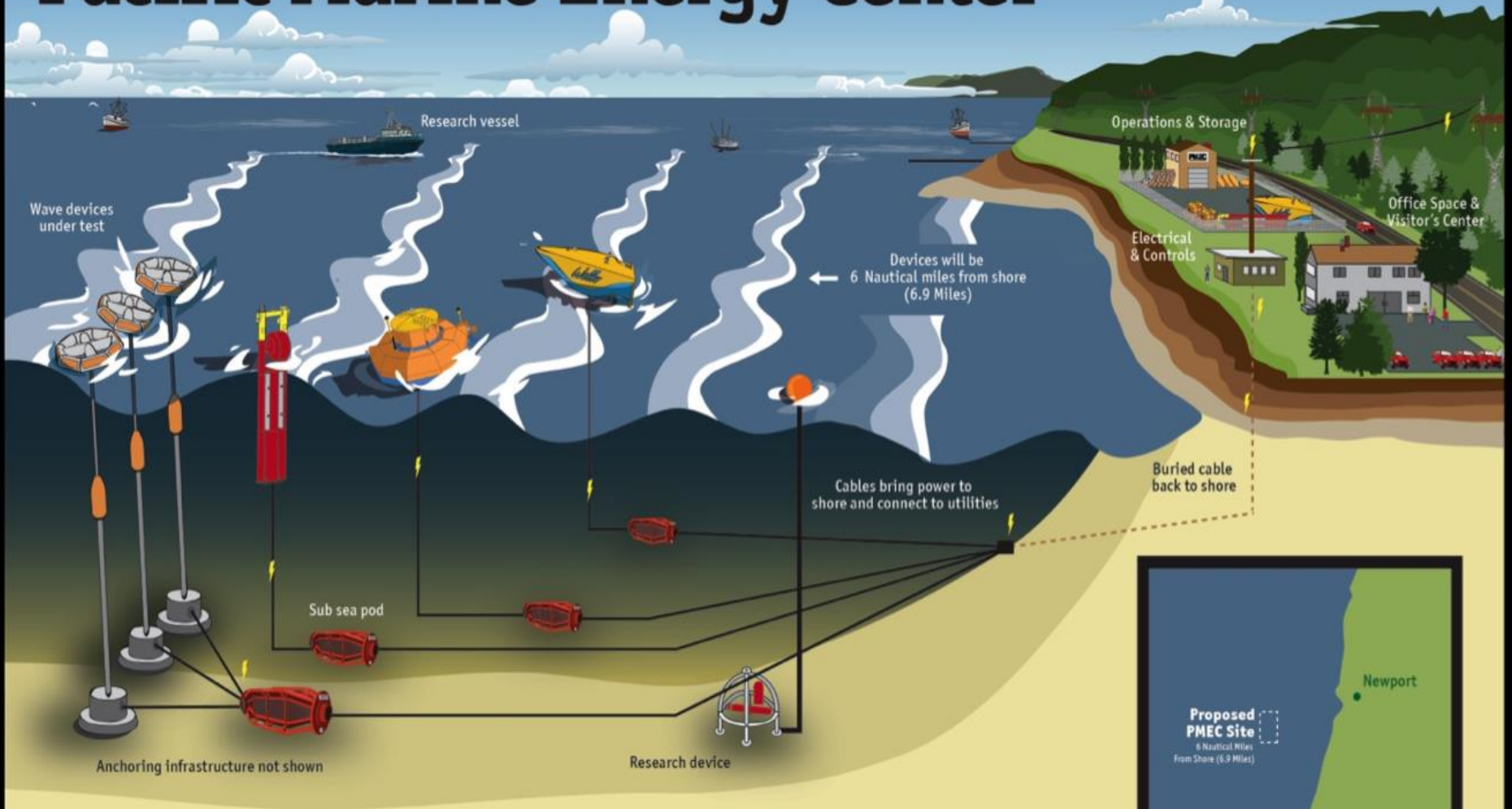
# PAVING THE PATH TO COMMERCIALIZATION

- PACIFIC OCEAN ENERGY TRUST/OREGON WAVE ENERGY TRUST
- LEVERAGED ABOUT \$30,000,000
- OREGON ADOPTED TERRITORIAL SEA PLAN – WA IN PLANNING EFFORT
- SET UP ESSENTIALLY A ONE-STOP PERMITTING PROCESS
- NATIONAL CONFERENCE
- KEY ENVIRONMENTAL RESEARCH
- BROUGHT EXTENSIVE TECHNOLOGY R&D TO THE REGION
- SUPPLY CHAIN DEVELOPMENT FOR PERMITTING, MANUFACTURING, AND OPERATIONS

# PAVING THE PATH TO COMMERCIALIZATION

- NORTHWEST NATIONAL MARINE RENEWABLE ENERGY CENTER
- INCLUDES OSU, UW, AND UA FAIRBANKS
- NNMREC HAS BROUGHT IN \$95,000,000
- ABOUT 20 MASTERS AND PHD STUDENTS
- ABOUT 20 PROFESSORS PART OF NNMREC
- UW'S APPLIED PHYSICS LABORATORY AND NAVY
- PACIFIC MARINE ENERGY CENTER TESTING FACILITIES
- DOE GRANT FOR \$40,000,000 FOR TEST CENTER
- CONGRESS ALREADY ALLOCATED \$35,000,000

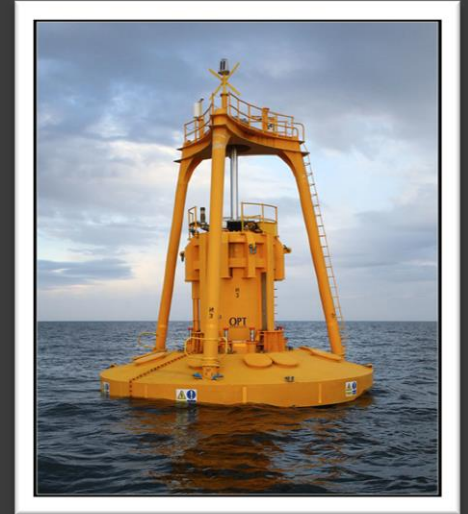
# Pacific Marine Energy Center



# TYPES OF OCEAN ENERGY TECHNOLOGY

- Marine and Hydrokinetic (MHK)
  - Motion of the Ocean
    - Wave Energy – West Coast
    - Tidal Energy – requires the right geography
      - Riverine hydrokinetic – non-impoundment
    - Ocean Current Energy – e.g., California Current
  - Offshore Wind – floating wind only – steep ocean shelf
  - Ocean Thermal Exchange, Salinity

# THE TECHNOLOGIES



# Ocean Power Technologies





# AQUAMARINE





# Pelamis Sea Snake












Fred. Olson Renewables  
Lifesaver Technology  
Wave Hub testing facility, U.K.



Ocean Energy, USA – Oscillating Water Column



A yellow wave energy converter device is mounted on a black buoy in the ocean. The device consists of a tall, cylindrical yellow structure with various components, including a circular hatch and a small platform. The buoy is partially submerged in the water. In the background, there are mountains and a sunset sky with clouds. The sun is low on the horizon, creating a bright glow and casting long shadows. The water is dark blue with some whitecaps.

Northwest Energy Innovations  
Azura Technology  
Wave Energy Test Site - Hawaii

# Wello Oy Penguin



# Resolute Marine Energy



M3 Wave, LLC

Contingency marker buoy

Recovery Lift Line Can

Acoustic pinger



# DOE WAVE PRIZE: THE THIRD GENERATION

- M3 WAVE ENERGY LLC
- CALWAVE POWER TECHNOLOGIES
- OSCILLA POWER
- SEA POTENTIAL
- RTI WAVE POWER
- SEWEC
- WAVESWING AMERICA
- HARVEST WAVE ENERGY
- **AQUAHARMONICS - \$1.5 MILLION WINNER**
- WAVE ENERGY CONVERSION CORPORATION OF AMERICA
- MOCEAN ENERGY

# ANDRITZ HYDRO HAMMERFEST



# LOCKHEED MARTIN - ATLANTIS







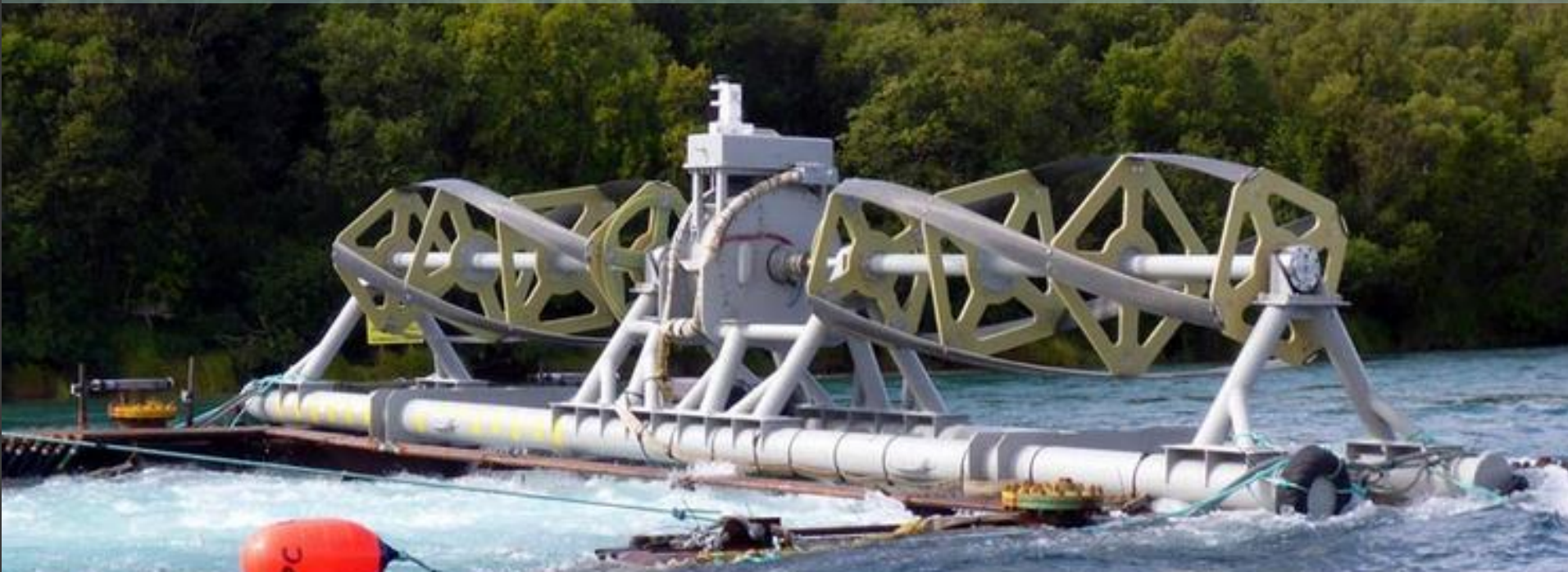
# OPEN HYDRO



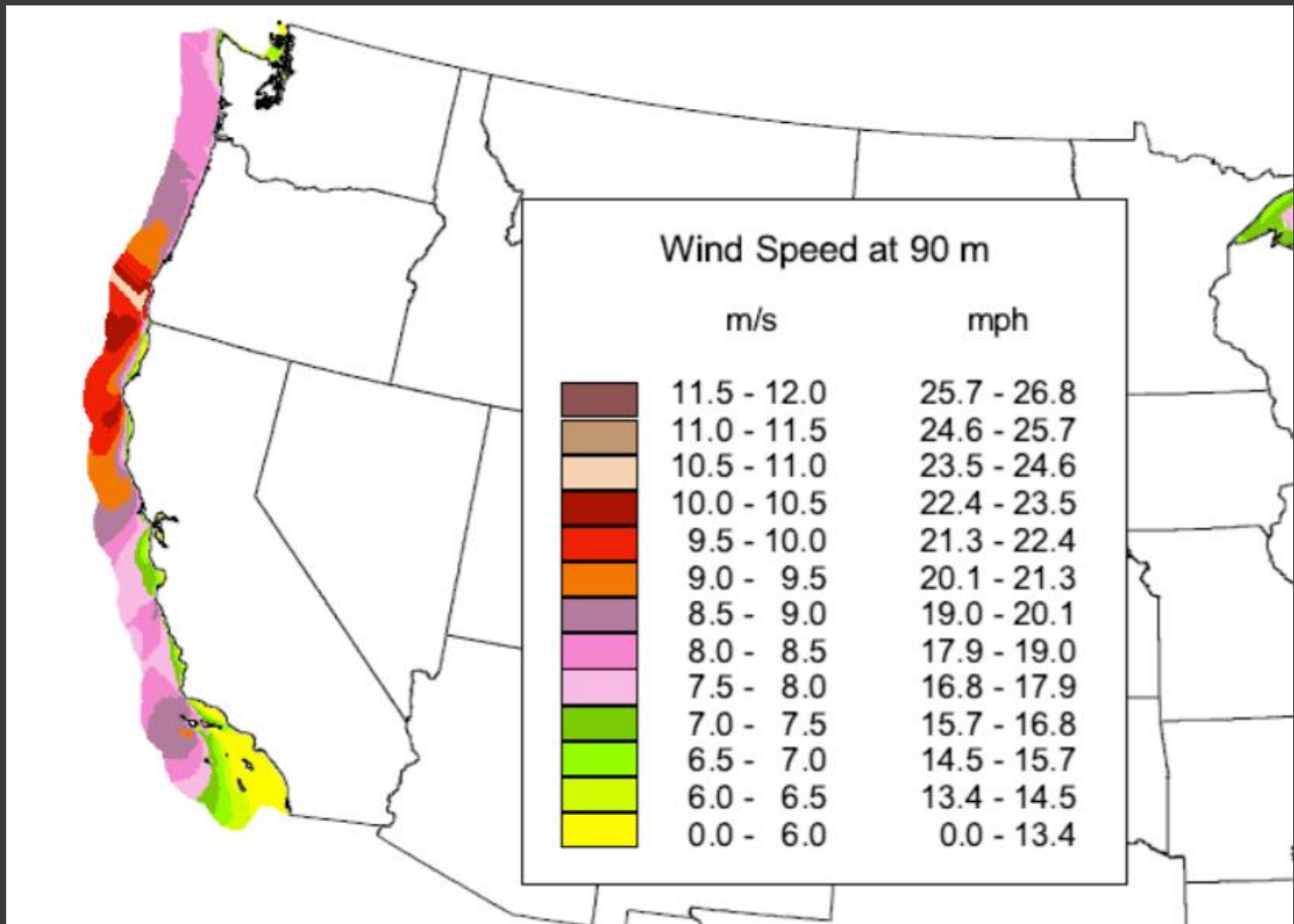
# OPEN HYDRO



# OCEAN RENEWABLE POWER COMPANY



# OFFSHORE WIND RESOURCE













QUESTIONS?

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