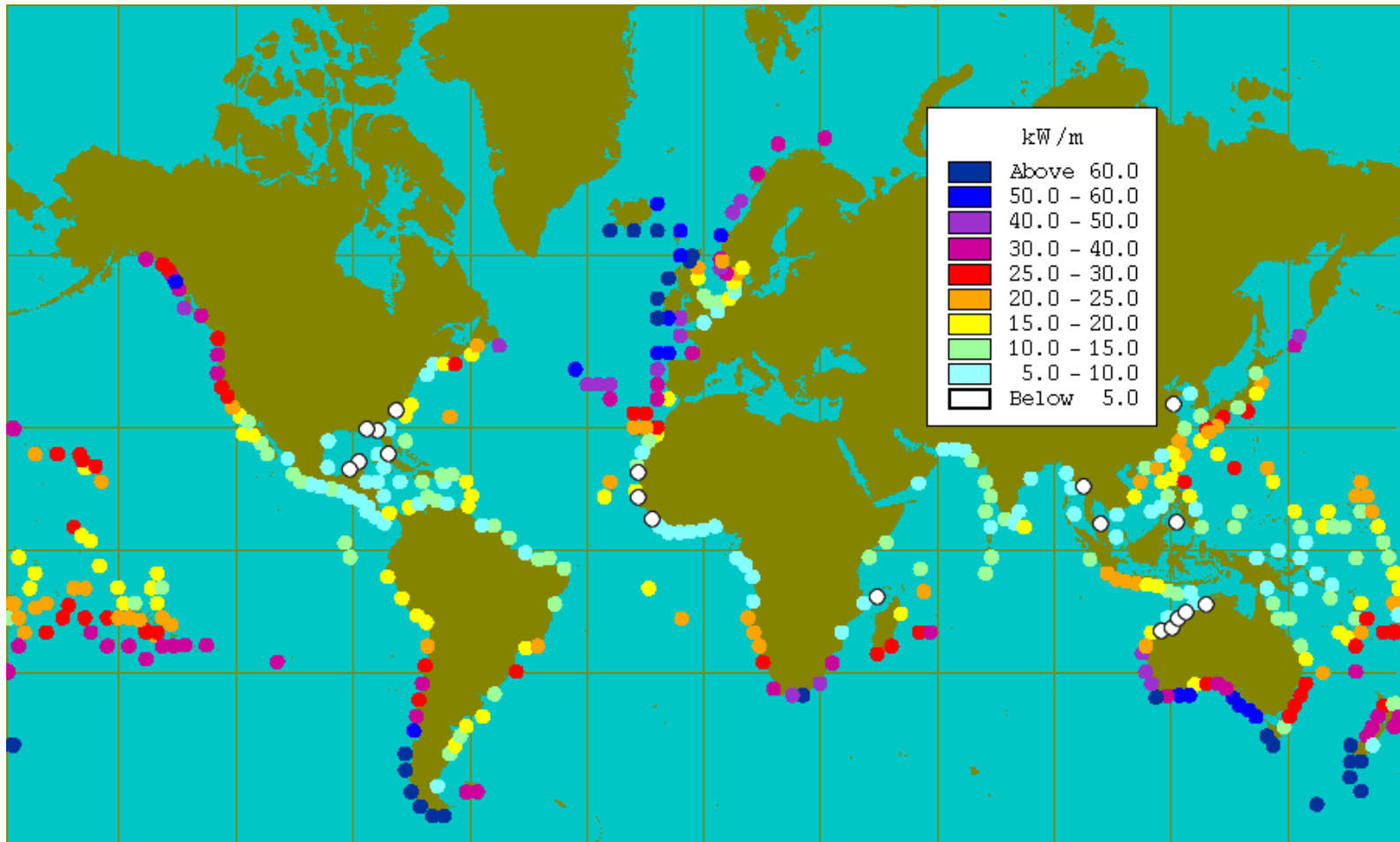




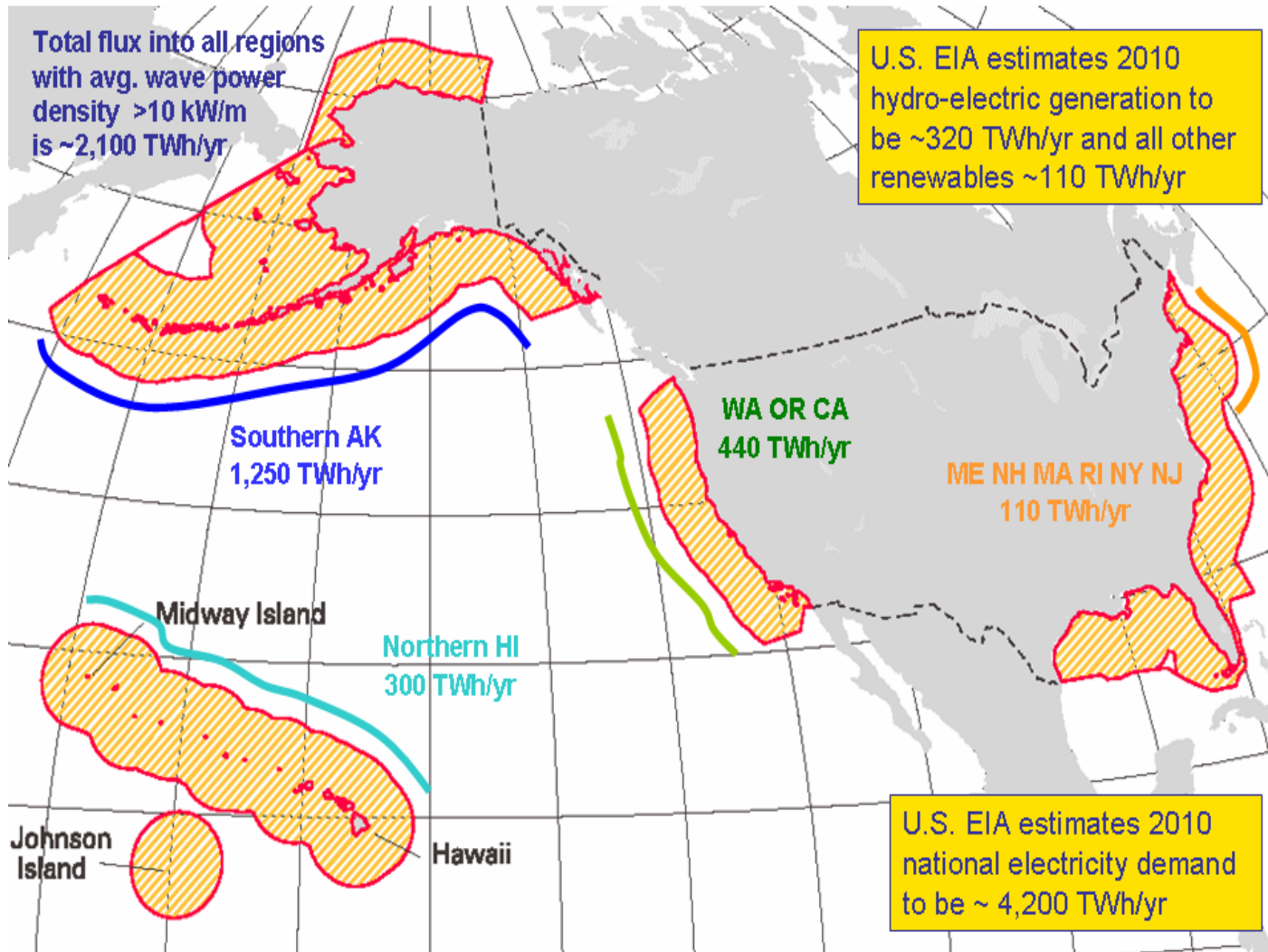
OregonWaveEnergy  
TRUST

# NW Hydropower Association

October 29, 2009



Annual average wave energy flux per unit width of wave crest  
(kilowatts per m)



*HOW BIG?*  
Wave energy flux  
in the US

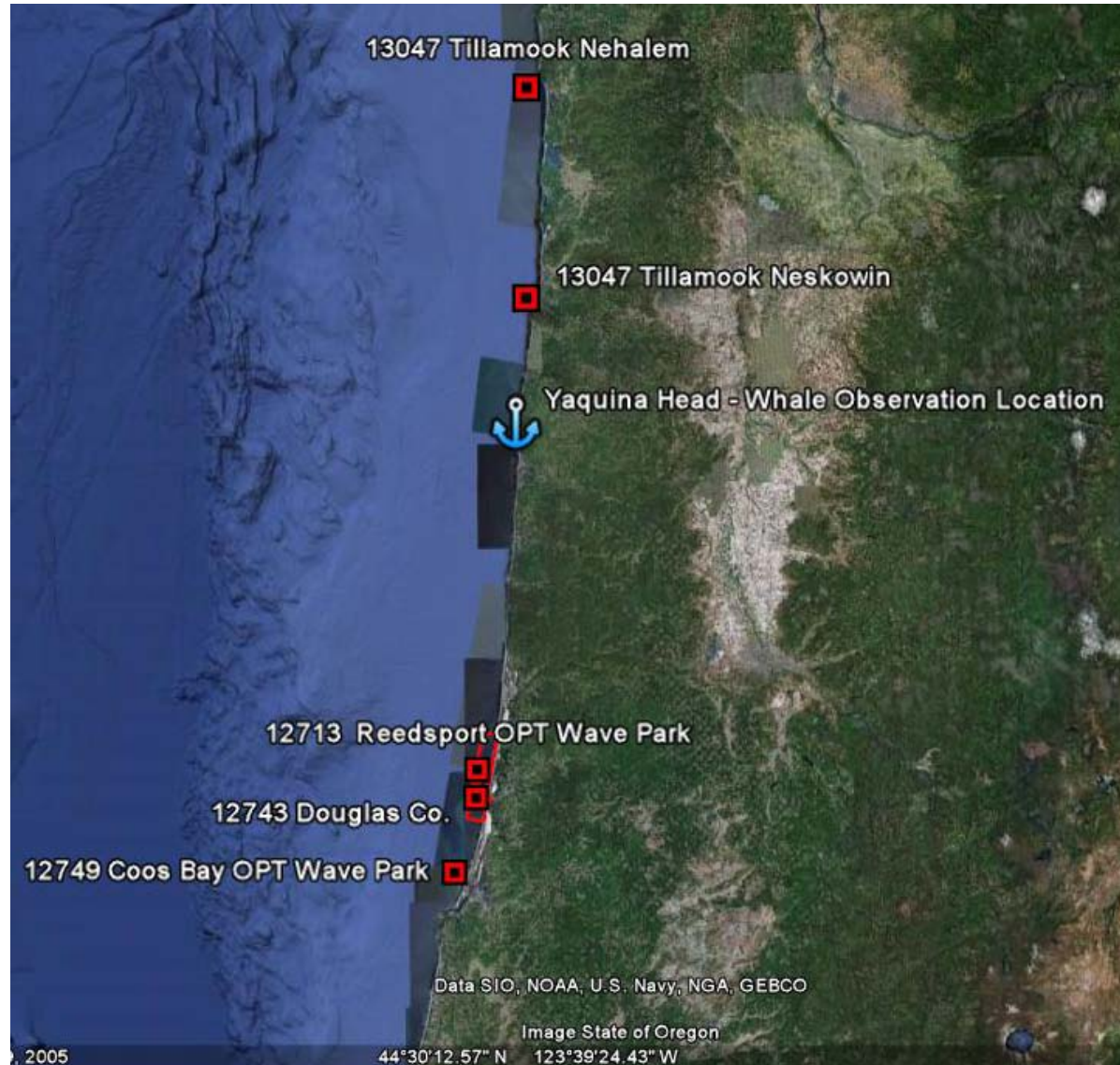
## Advantages of Wave Energy

### Ocean Energy has the potential to supply 10% of the world's energy needs

- Density (water 1000X as dense as air)
- Availability (a 24/7 resource)
- Predictability (lead time for utility schedulers)
- Close to sources of load
- Ability to bypass transmission constraints
- Low visual impact
- No fuel volatility (price or political)
- No emissions

*“Ocean waves have tremendous potential as an energy source. The energy density in water is much higher than it is in air. We can get more power with less space, and we can know within a ten-hour window what our energy capabilities are, and we can match them to the need.”*

*-Annette von Jouanne  
Professor, School of  
Electrical Engineering,  
OSU*



## Oscillating Water Column

Water enters through a sub-surface opening into a chamber with air trapped above it – a pneumatic device

- Water column moves like a piston
- Air forced through an opening connected to turbines

Testing in UK,  
Australia, plans  
for UK and Spain  
installations

Shoreline & offshore



## Attenuators

Devices oriented parallel to direction of waves - hydraulic

- Changes in wave height causes flexing
- Flexing connected to hydraulic pumps or converters

Commercially  
operating off  
Portugal

Shoreline, offshore &  
deepwater



## Overtopping

Waves elevated to a reservoir above sea level

- Water is released through of turbines
- Turbines transform energy into electricity

Testing off UK  
and Denmark  
Offshore





## Point Absorber

Buoy floats above or below the water surface - hydraulic

- Buoy inside a fixed cylinder and moves relative to wave action
- Motion drives energy converters



Prototypes  
operating in  
Hawaii, New  
Jersey, OR  
deployment

Offshore

## Industry Imperatives

- Balance new and existing ocean uses
- Establish consistent and appropriate regulatory process
- Understand project effects – environmental and socioeconomic
- Coordinate industry needs and prioritize research and development
- Identify resource gaps – workforce and maritime infrastructure
- Develop market support

### Blue Power

The ocean is the largest, most concentrated source of renewable energy on Earth



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