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Supporting visionary renewable energy projects

West Coast NOAA Meeting

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re vision consulting, LLC

Contributors
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PCCI
Pacific Ventures

Outline

- Resource Fundamentals
- Generation Potential
- Grid Feed-in Limitations
- Technology Status
- Moving Forward

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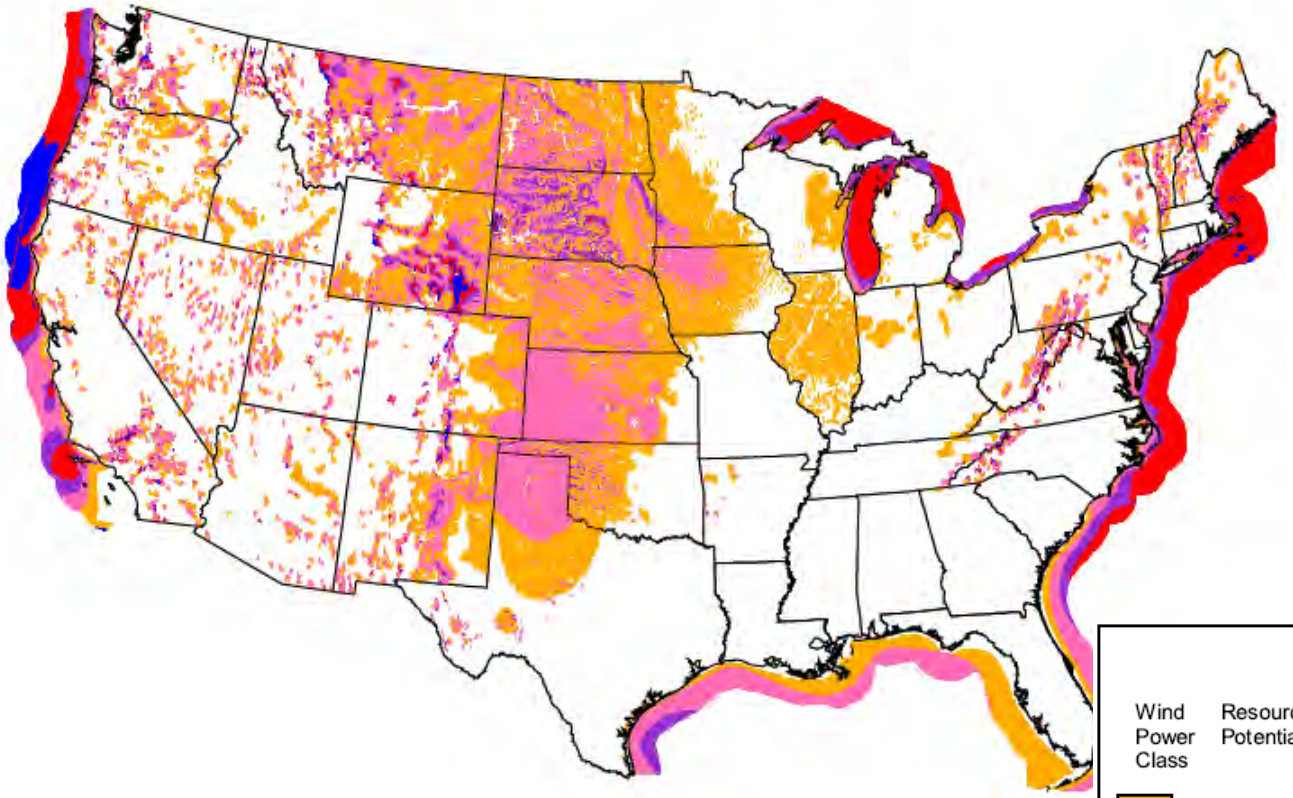
Wind Energy – Power Density



Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed [a] at 50 m m/s	Wind Speed [a] at 50 m mph
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

[a] Wind speeds are based on a Weibull k value of 2.0

Wind Power Densities in the US at 50m elevation (Source: NREL)

Weibull k value of 2.0

Area up to 50nm from shore

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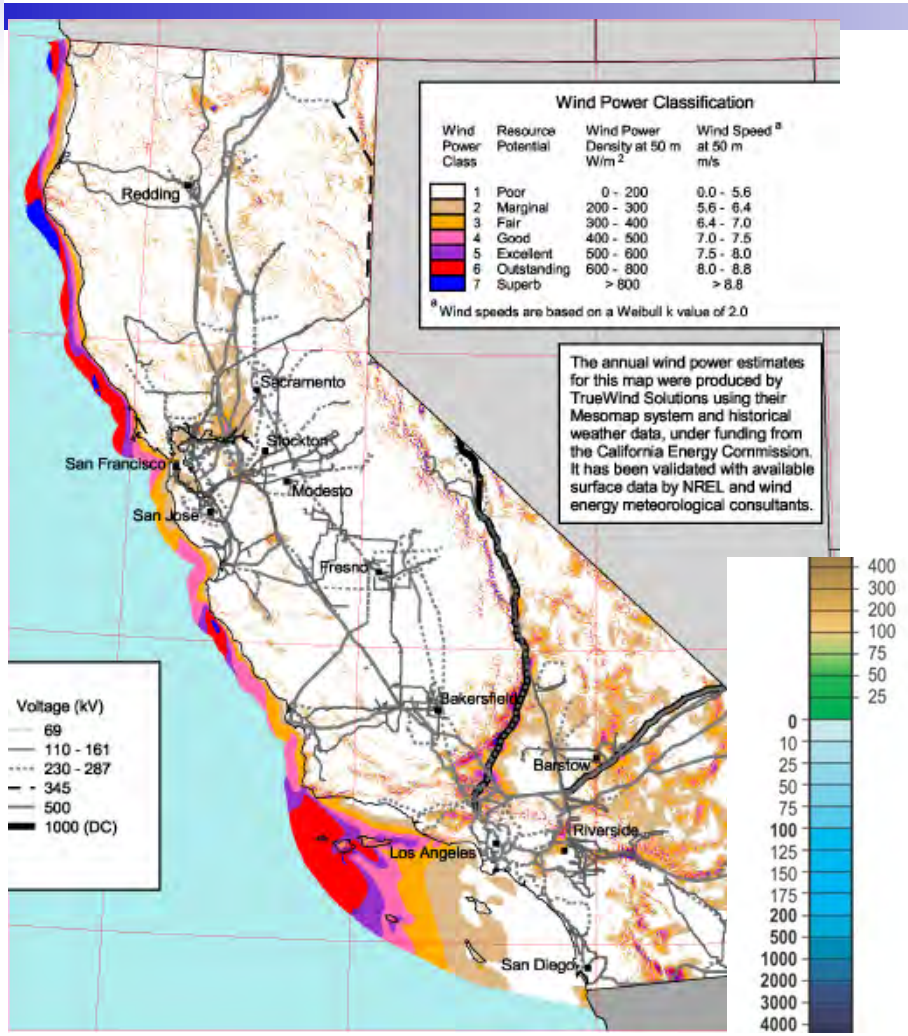
Wind Resources – CA



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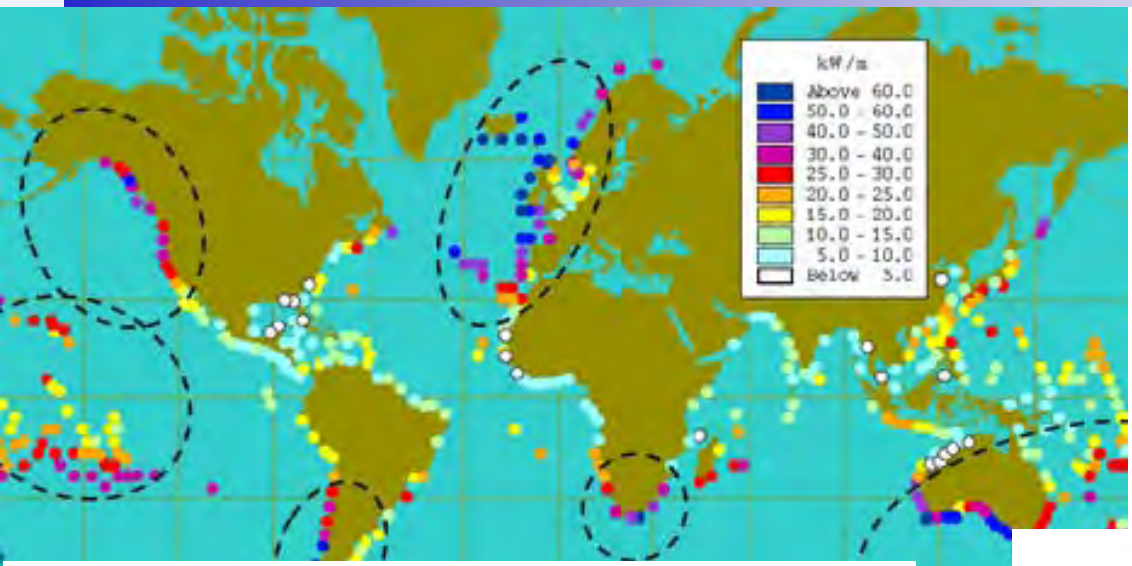
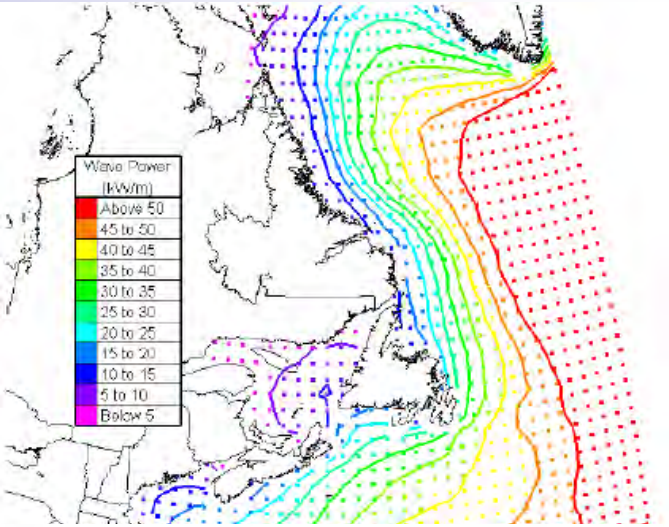
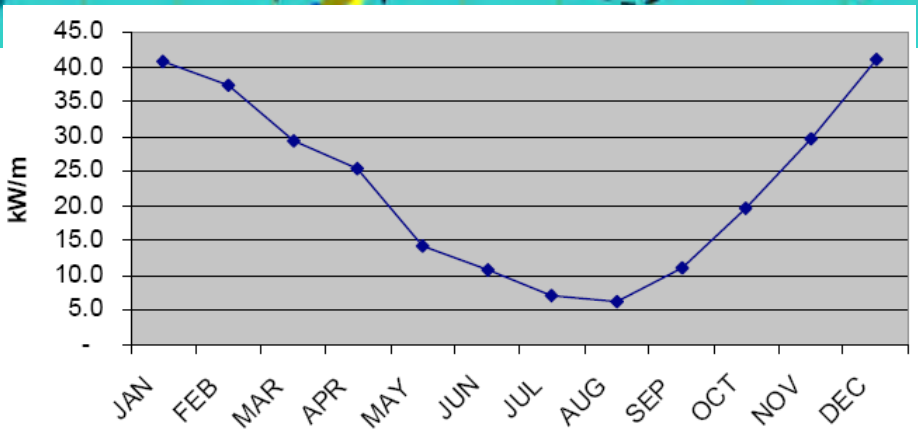
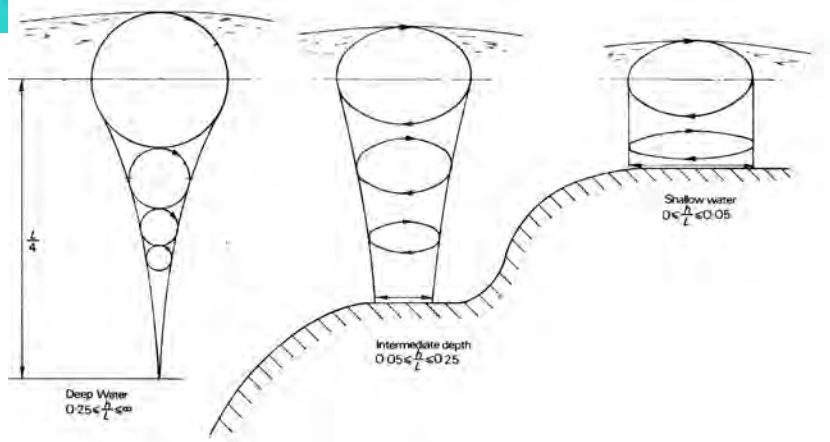
Wave Energy Resource Characteristics









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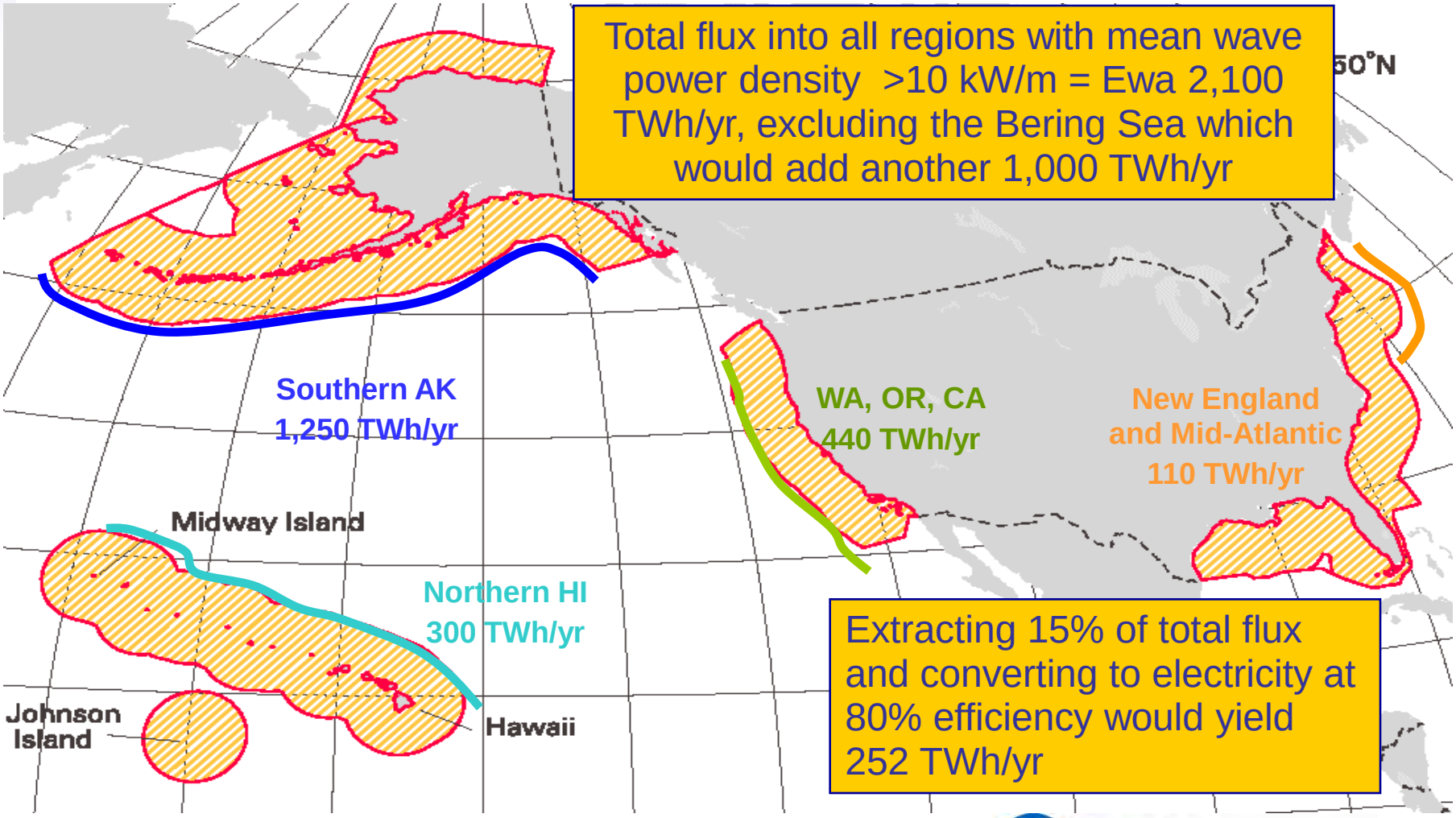
U.S. Offshore Wave Energy Resources



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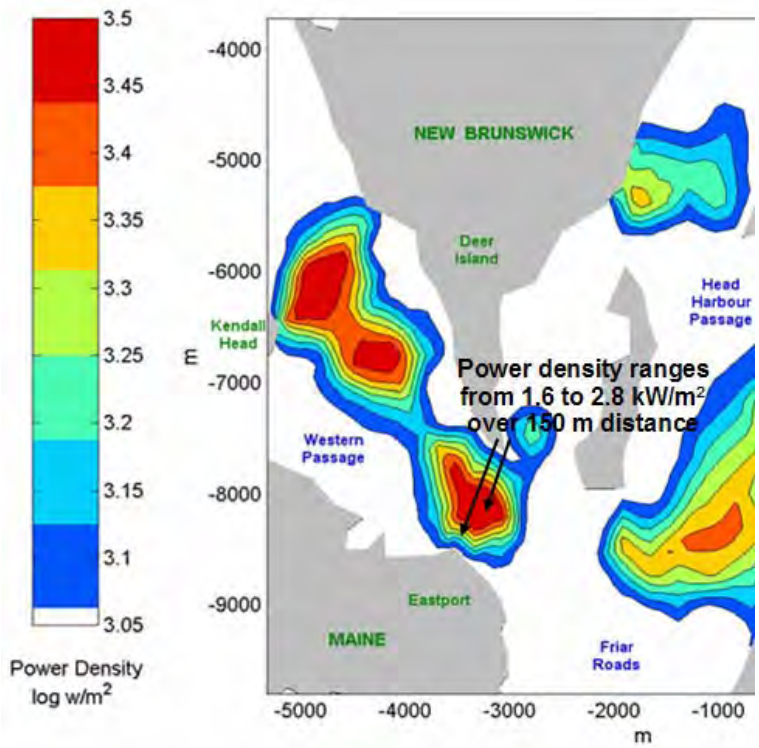
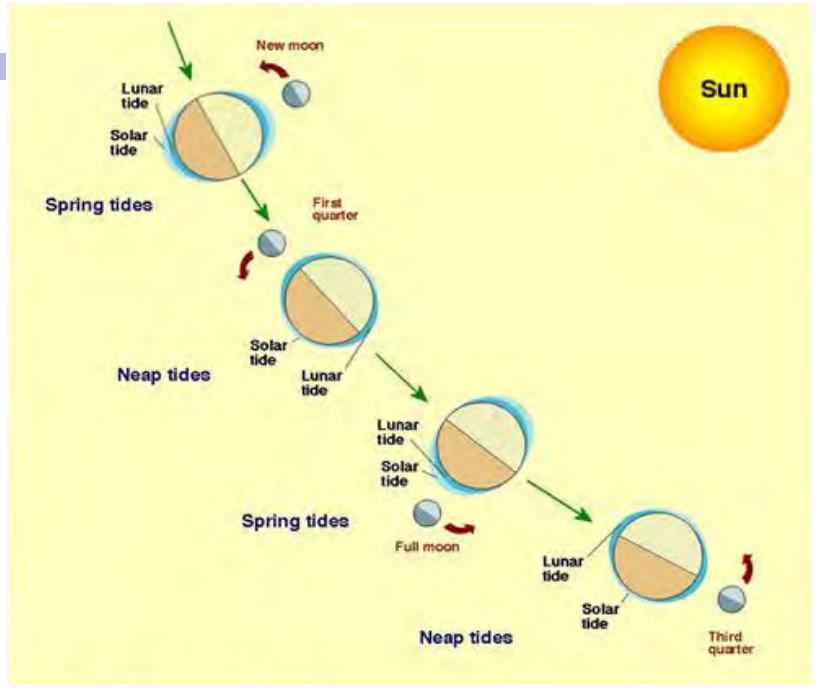
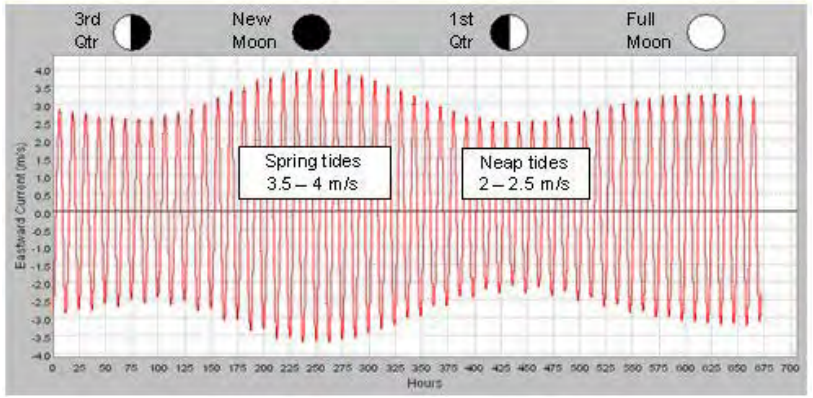
Tidal Energy Resource Characteristic

Highly Predictable

- Gravity Driven
- Very localized
- Power = *f*(v^3)







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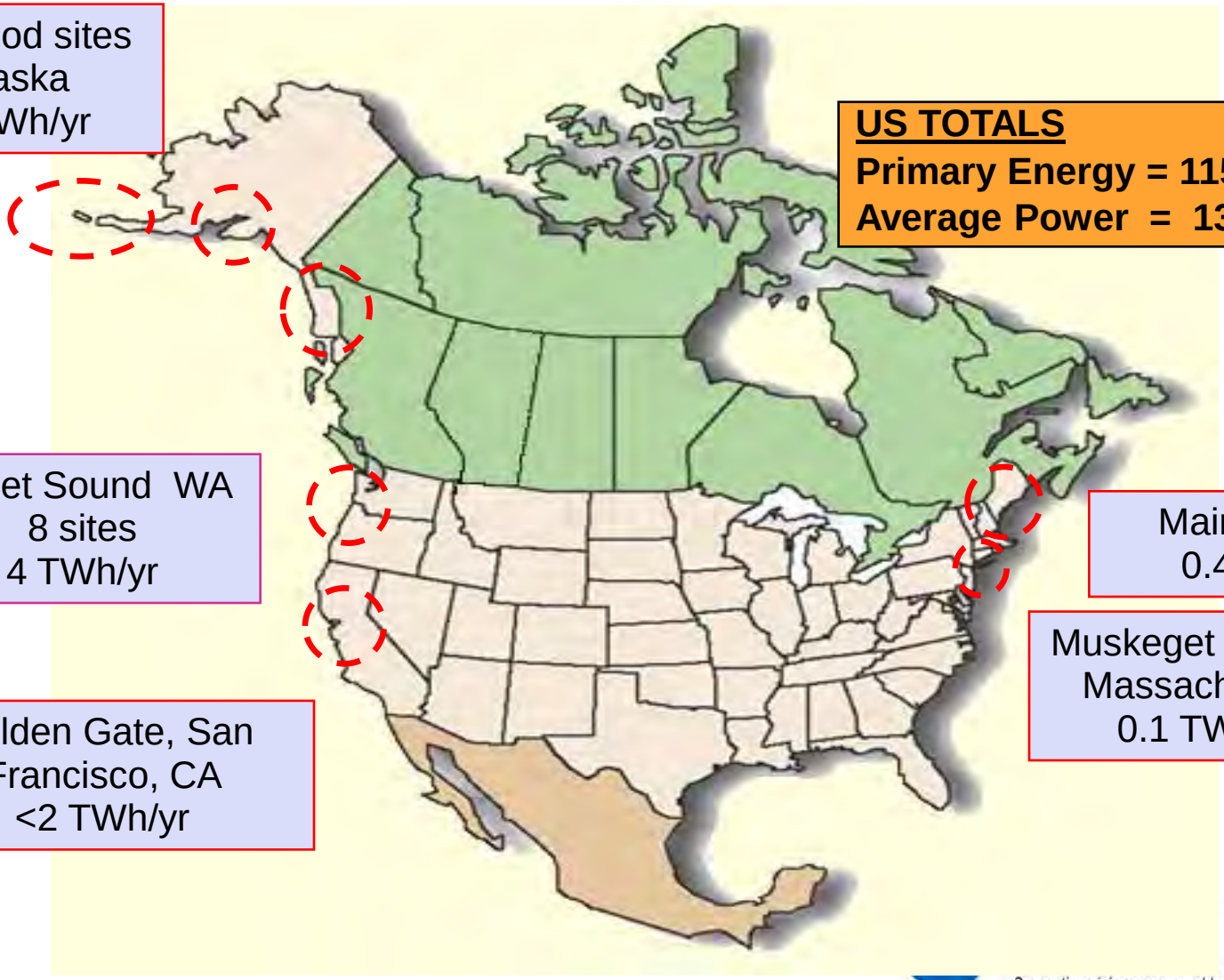
Tidal Current Energy

Many good sites
in Alaska
109 TWh/yr



US TOTALS
Primary Energy = 115 Twh/yr
Average Power = 13,000 MW

Puget Sound WA
8 sites
4 TWh/yr

Maine 7 Sites
0.4 TWh/yr

Muskeget Channel
Massachusetts
0.1 TWh/yr

Golden Gate, San
Francisco, CA
<2 TWh/yr

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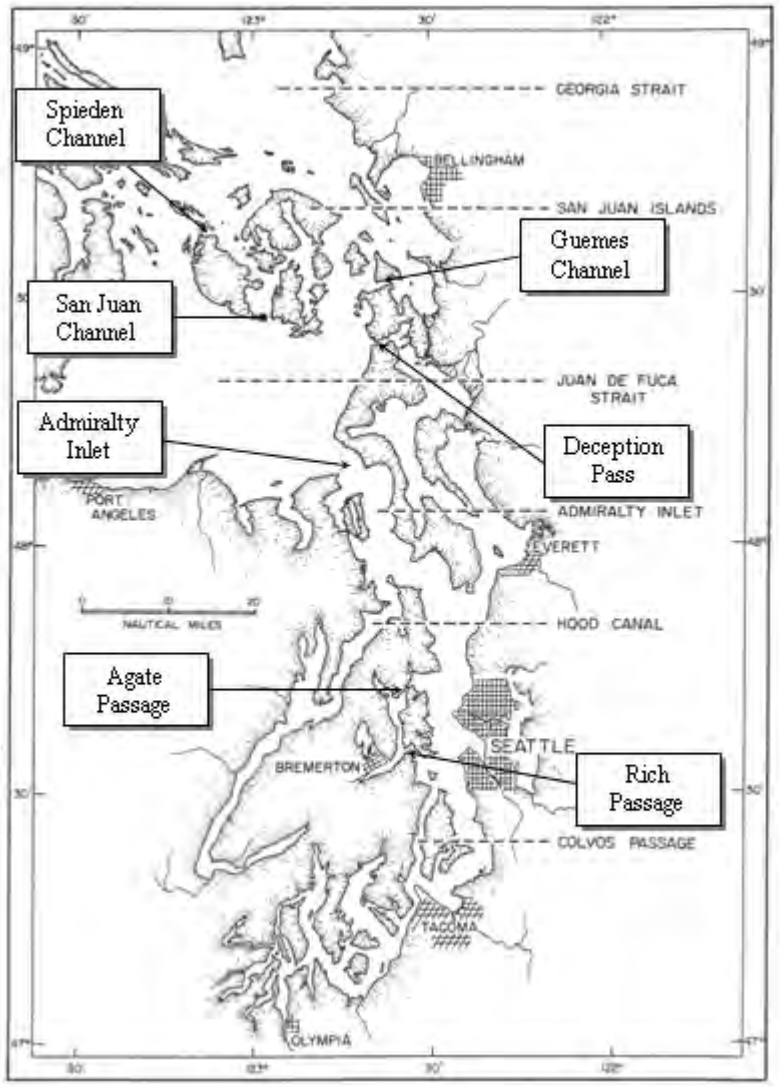
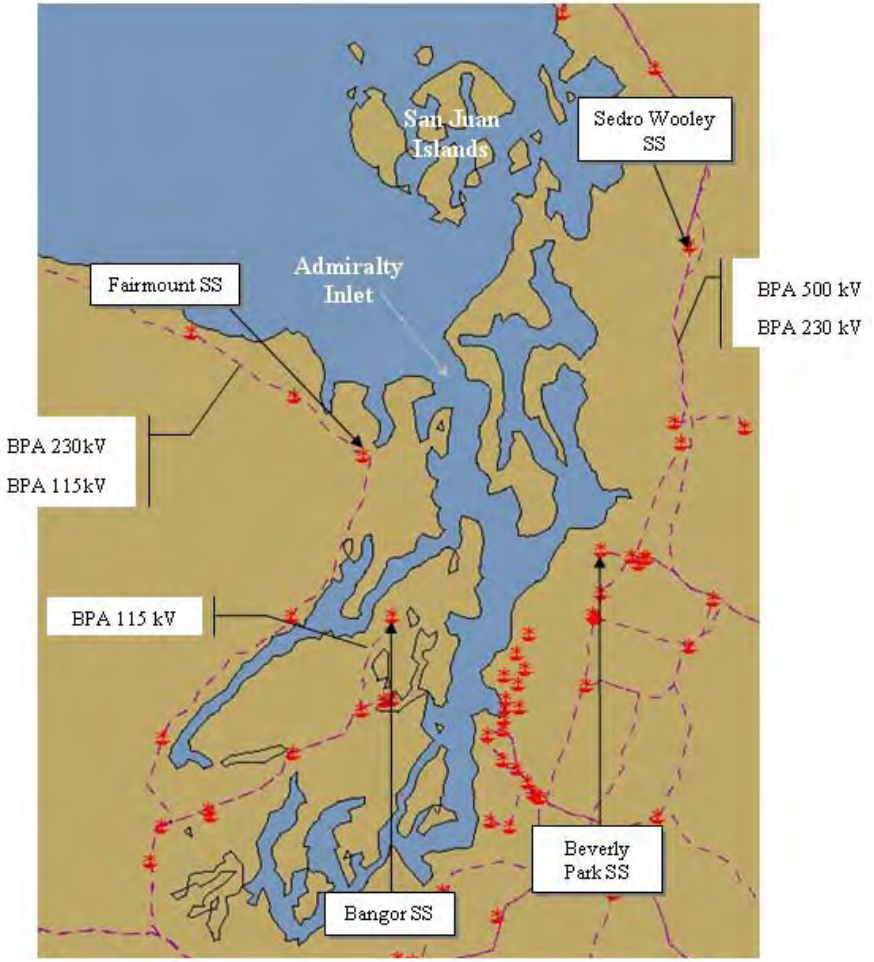
Puget Sound - Washington





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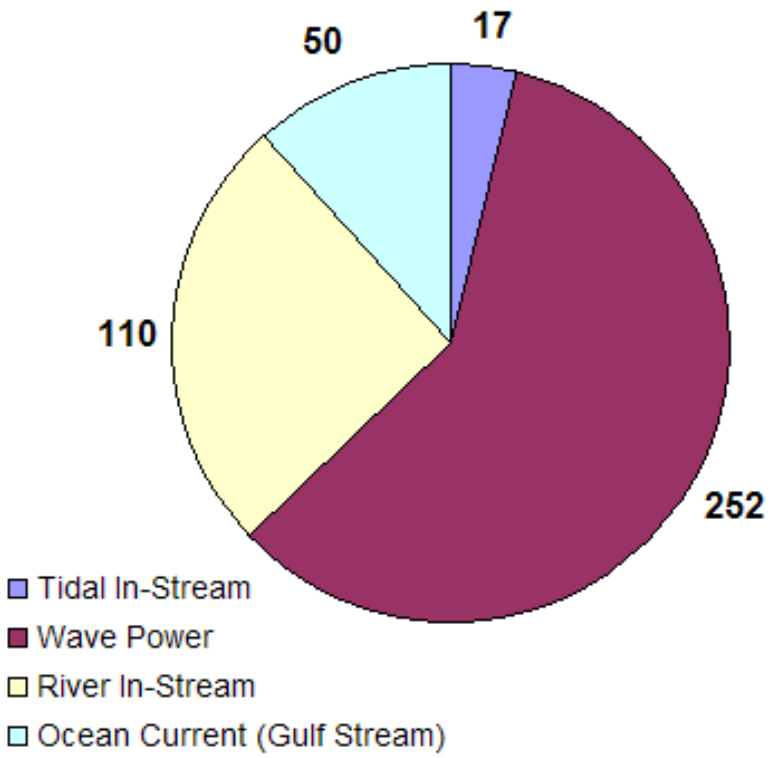
U.S. Hydrokinetic Energy Resource Potential



Assumptions

Ocean Wave – 15% of incident wave energy.

Tidal Current estimated from aggregate siting studies; 15% extraction permitted – could be significantly larger; Significant further work is needed to define extractable potential.

River Current estimated in 1986 NYU study; EPRI has estimated a few specific sites. Based on results, practical potential may be significantly smaller.

Ocean Current estimate from Florida State University, *Coriolis Study* and by *Aquantis;* Miami/Gulf Stream region only.

Total Generation Potential = 429 TWh => 49GW average electrical power
=> About 10% of the US electric power needs

Source: Electric Power Research Institute, re vision consulting, LLC

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10

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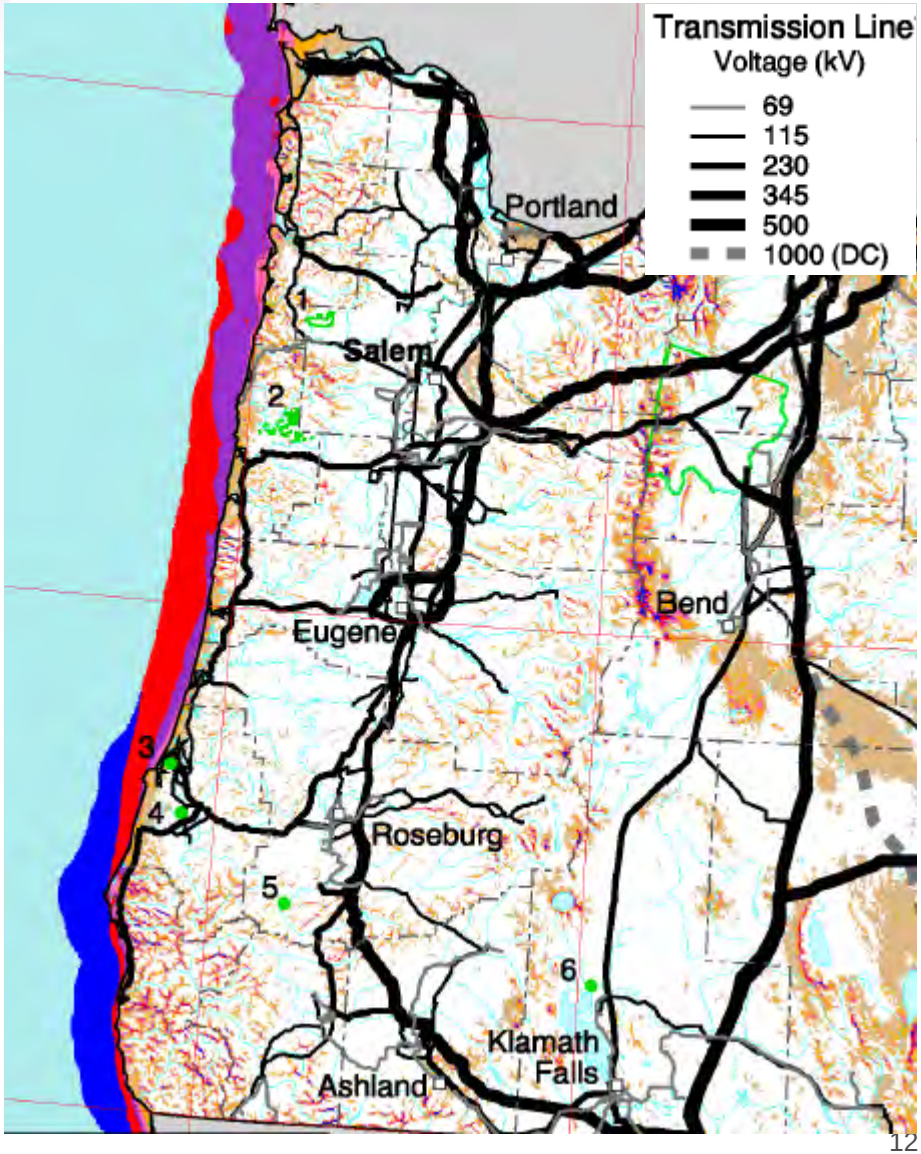
Grid Infrastructure OR/WA



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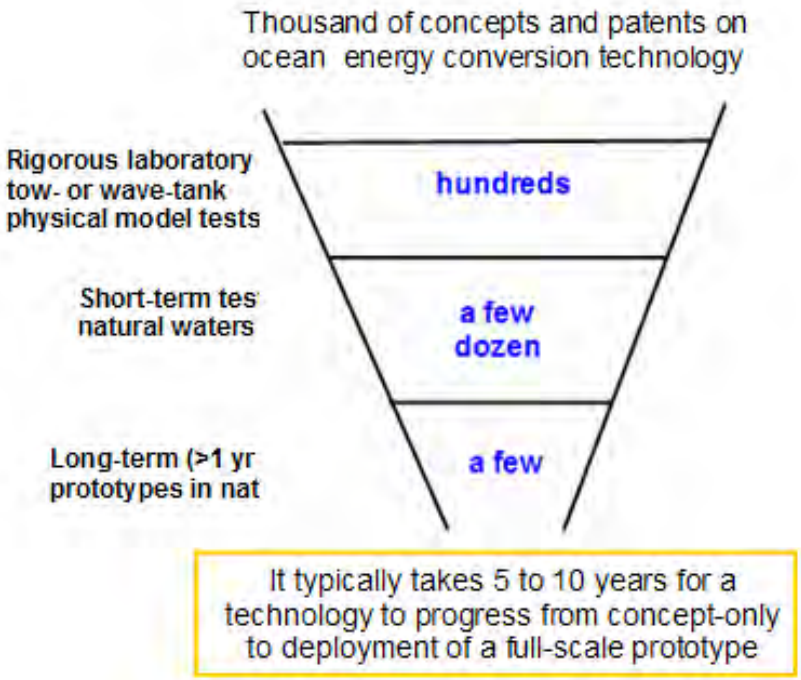
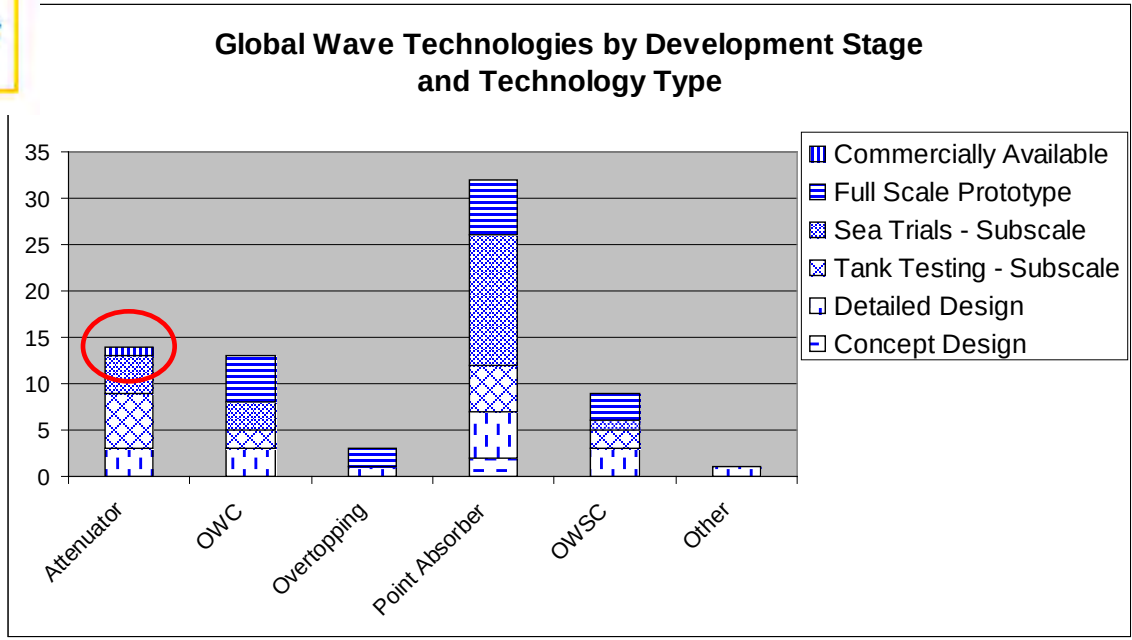
Fundamentals - Industry Status





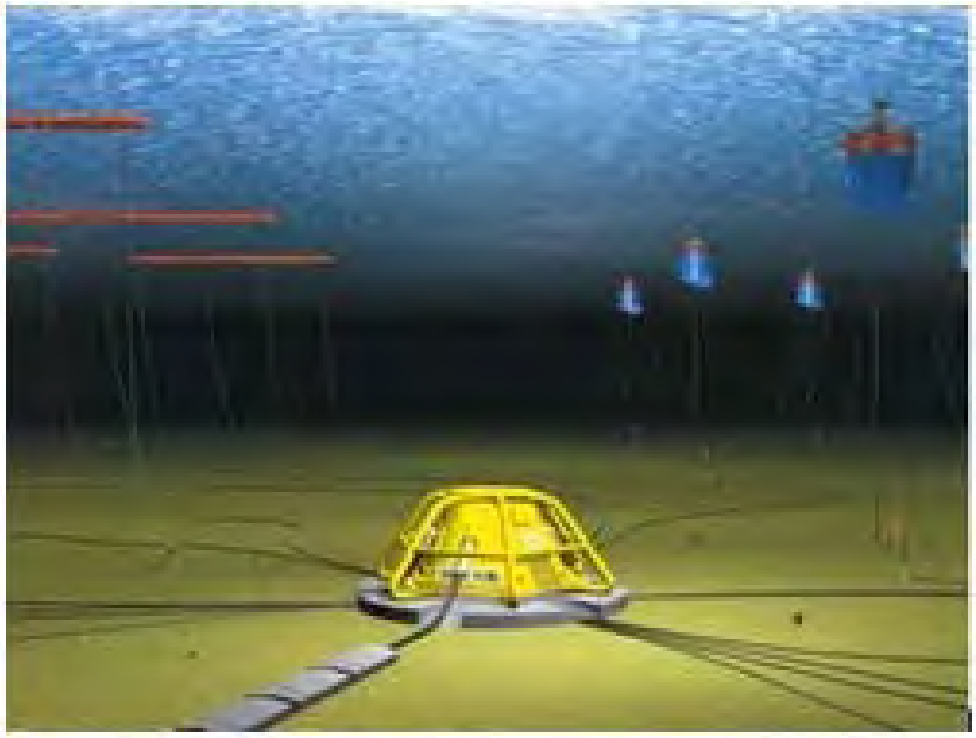
Industry Need – Scaling Technology

Life-cycle understanding of Technology

- Technical
- Operational
- Environmental
- Regulatory

Scale-up

- Single Unit
- Small Farm
- Commercial



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- DoE Market Acceleration

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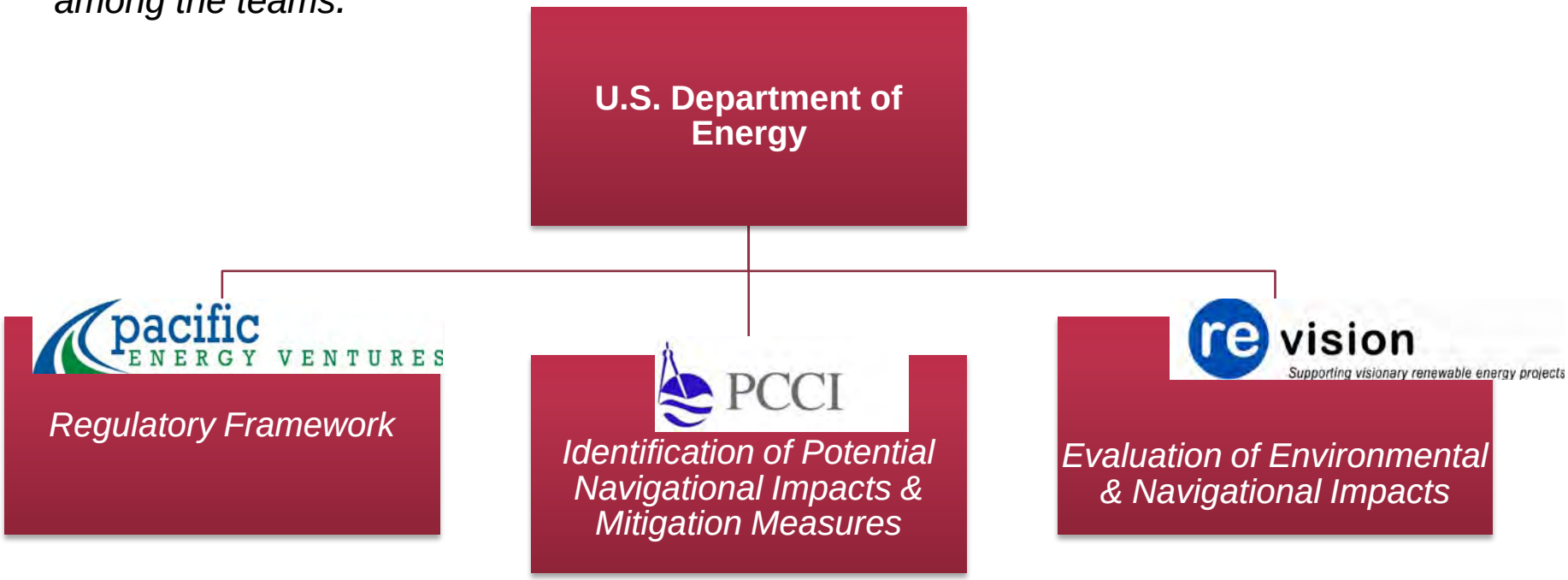
DoE Market Acceleration

The three teams- Pacific Energy Ventures, PCCI and re vision- are integrating their projects to optimize benefits to the ocean energy industry. All three teams are coordinating with government agencies involved in the siting process, requiring a high degree of collaboration among the teams.



Focusing specifically on issues associated with siting wave, tidal and other current projects, the teams' initial efforts are in areas of the U.S. that are already involved in these types of projects.

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17

Scenario Analysis – Laying the Foundation

- Establishment of Site-Specific Deployment Scenarios
  - Capturing all Life-Cycle Elements
  - Capturing Major Technology Types and Deployment Scales
  - Working with representative “Real” Devices
- Navigational Assessment Framework
- Environmental Assessment Framework
- Evaluation of Scenarios using Created Framework

=> Final report due by the end of the year

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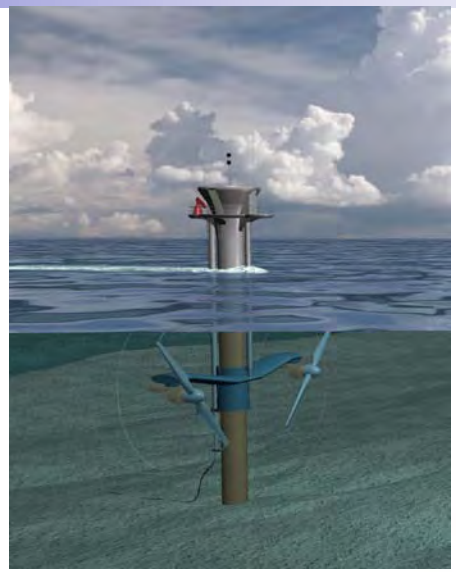
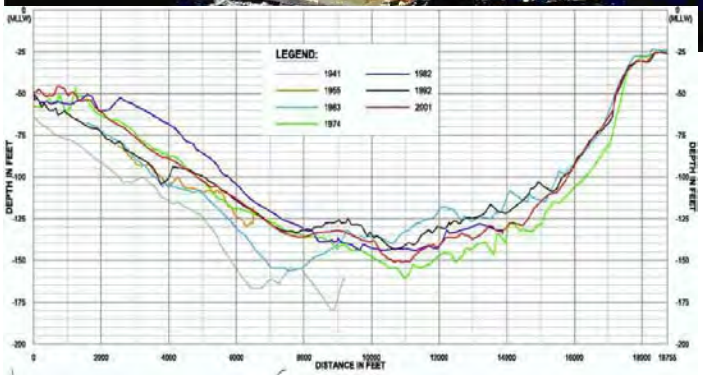
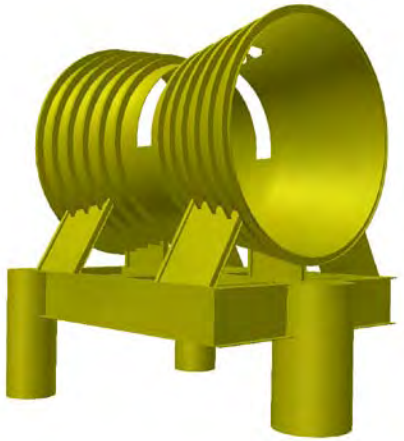
Thank you







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