

Marine Energy in Washington: Lessons Learned and a Path Forward

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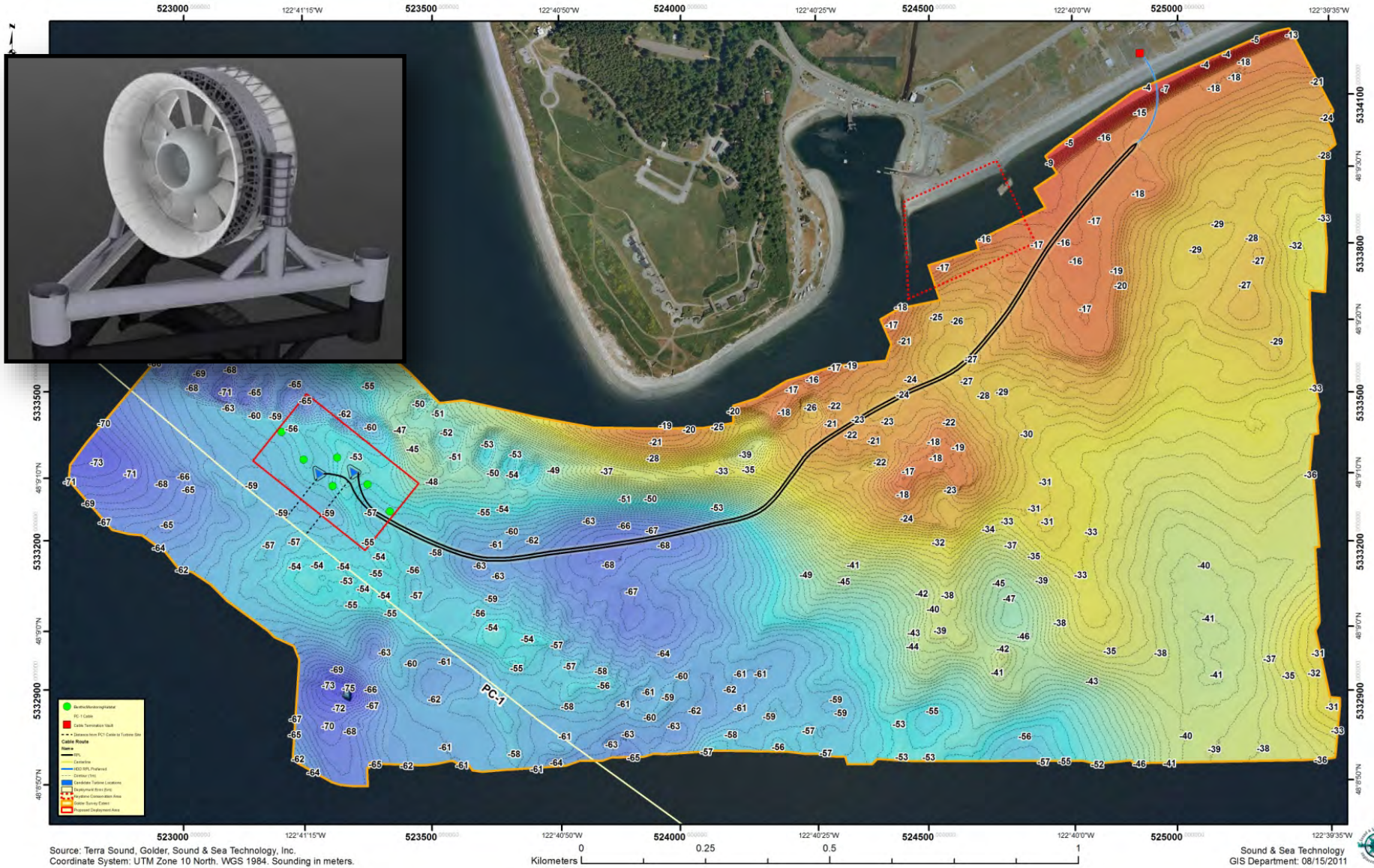
Marine Energy: Then and Now

- **In 2006:** Preliminary permits for tidal energy development in Admiralty Inlet, Tacoma Narrows, Deception Pass, Agate Pass, Spieden Channel, San Juan Channel, Willapa Bay, and Grays Harbor.

Permits described several thousand turbines with several hundred MW of generation capability

- **In 2017:** No active tidal or wave energy projects

Admiralty Inlet Demonstration Project



Source: Terra Sound, Golder, Sound & Sea Technology, Inc.
 Coordinate System: UTM Zone 10 North, WGS 1984. Sounding in meters.

Sound & Sea Technology
 GIS Department: 08/15/2011

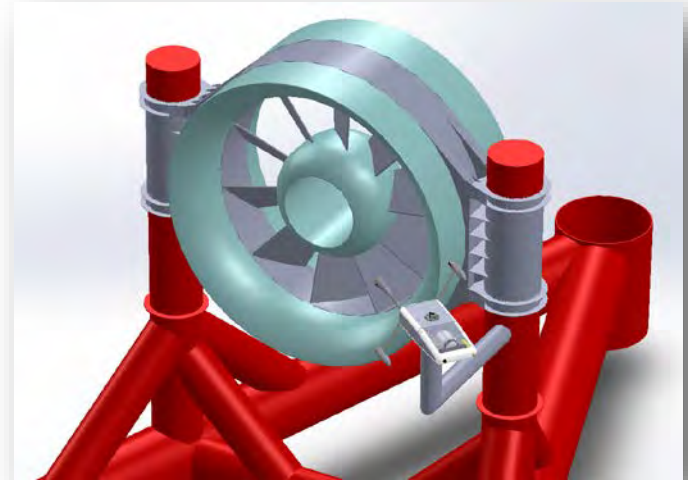
Cost Estimates over Time

- **In 2006:** Expectation that 1 year demonstration cost would be < \$5 M
- **In 2009:** Expectation that 5 year demonstration cost would be ~ \$20 M (*kind of*)
- **In 2014:** 3 year project cost \$40+ M
 - MeyGen (first commercial project) was deploying 100x capacity for \$80 M

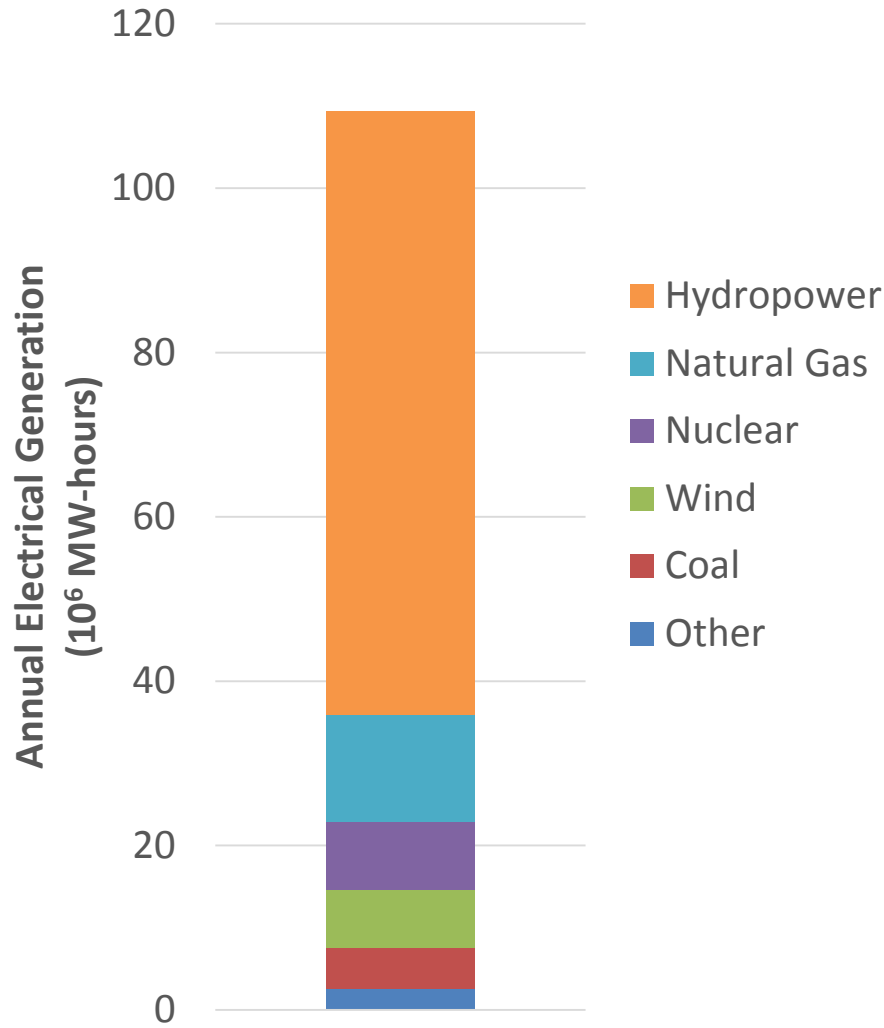
What drove the cost increase?

Sources of Cost Increases

<i>2009 Estimate</i>	\$20 M
+ Jones Act	\$3 M
+ Environmental Monitoring	\$7 M
+ Shore Interconnection	\$1 M
+ “Zero Risk Premium”	\$9+ M
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<i>2014 Estimate</i>	\$40+ M



Marine Energy Opportunity in WA?



WA electricity prices are low

- 7.4 ¢/kWh (2015)
- Cheapest in the US

Marine energy is expensive

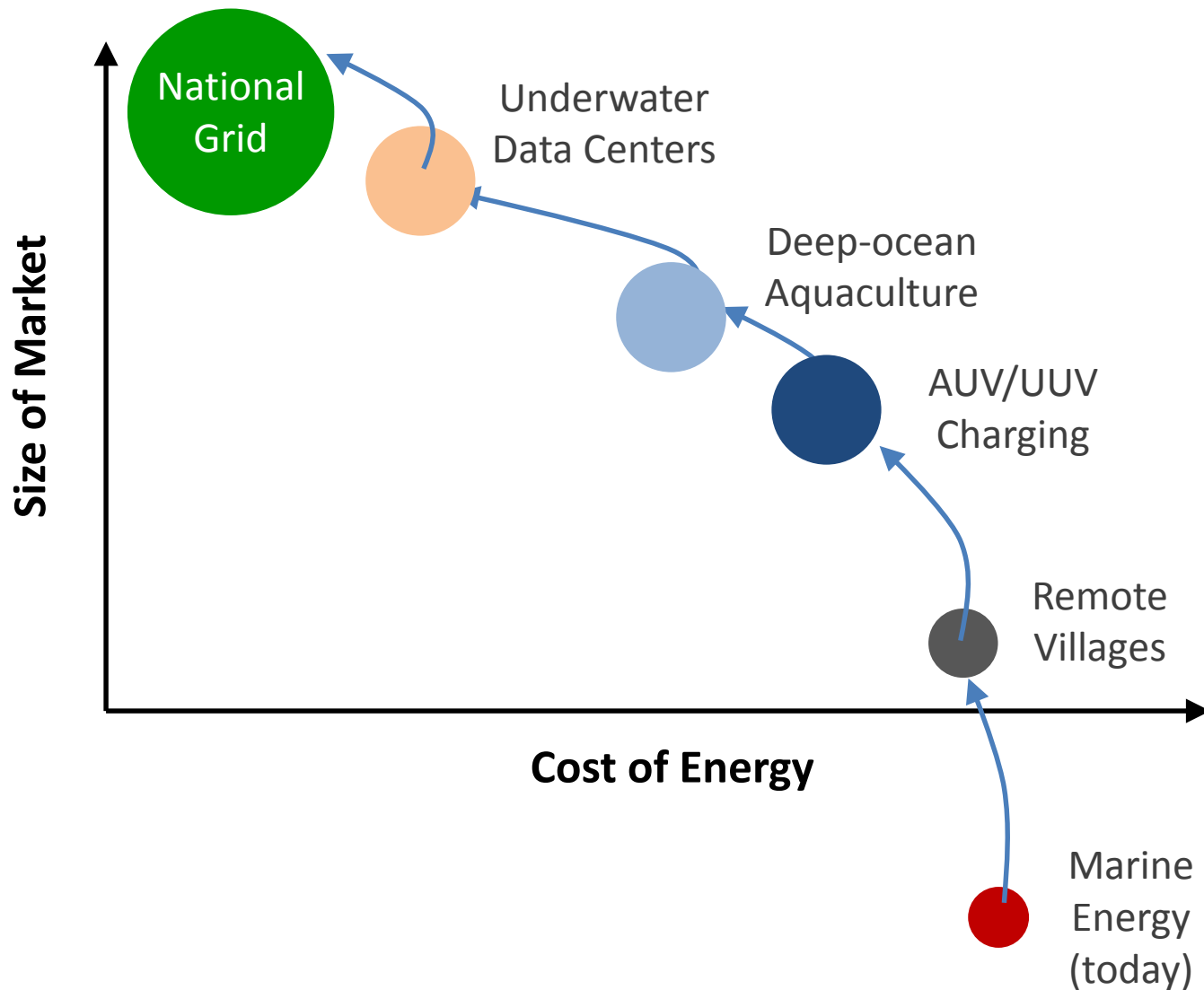
- Deep-water offshore wind: ~16 ¢/kWh
- Tidal energy: 21-47 ¢/kWh
- Wave energy: 21-67 ¢/kWh

Sources:

US Department of Energy Information Agency (2015)

International Energy Agency Ocean Energy Systems (2015)

Target Cost of Energy?



So, was it all for nothing?

Definitely not!

- Motivated exploration of ecologically important regions that “sane oceanographers avoid”
- Methodologies for site characterization have been used globally for tidal energy
- Laid out the critical environmental questions that needed answers *and* highlighted the technology gaps