



Waveberg Development

Clean Energy Investment Presentation

New Energy Symposium 9 July 2009



Who we are

Only wave energy device developer based in Manhattan, a ways from the ocean

- Paul T. Wegener, Principal
Caltech, Johns Hopkins, serial entrepreneur
First Waveberg investment in 1991
- John Berg, Inventor of technology
Builder, machine shop owner, spent 30 years
- Bob Stevens, CFO
Business strategy
- Recent events:
Electric Power Research Institute survey 2004
Worked with Europeans 2005+
Tank tests in Ireland 2006 – 2009
Irish grant for validation testing 2009
US DOE grant application 2009:
Total project \$3,000,000, 50% cost share



The market opportunity

*“I may speculate on technologies, but I never speculate on markets.”
Andrew Karr*

Ocean wave energy – largest renewable resource
(after deep geothermal)

IEA Ocean Energy Systems – most senior world authority:

“Available global Ocean Energy resource is in the same order of magnitude of the present electricity production worldwide.”

Waves represent >80% of that resource

Hawaii: Agreement with Dept of Energy to develop alternatives

Europe: three countries subsidize wave energy:

Portugal: €0.28 (\$0.39 per kWh) for first 3 MW, €0.22 for next 17 MW

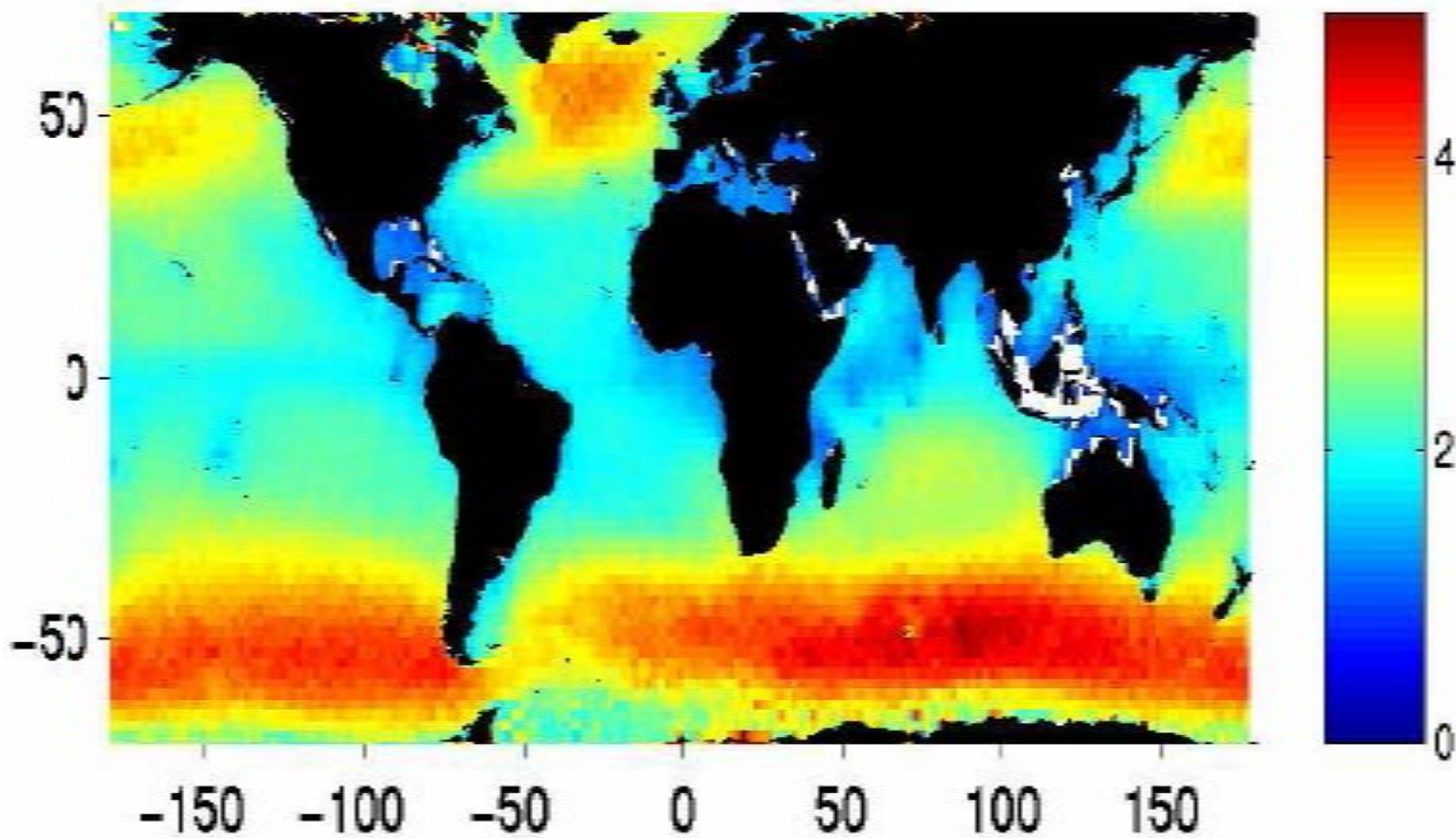
Ireland: €0.30 (\$0.42 per kWh) for first 75 MW (subsidy+price of electricity)

UK – Scotland: 5 ROCs’ ~ \$0.45 per kWh plus Saltire Prize of £10 million



Global wave height distribution

most places get 2 m waves or less, except Europe and Australia





The market opportunity without subsidies

- Islands and oil rigs pay \$0.15 (Oahu) to \$0.50 (oil rigs) for diesel fuel to generate electricity and desalinate water
- US Navy has supported wave energy development for bases
Diego Garcia in the Indian Ocean
Marshall Islands in the Pacific
- Total annual revenue within five years: over \$300 million
 - Europe: 100 MW at \$0.30 per kWh: \$100 million
 - Hawaii: 100 MW at \$0.18 per kWh: \$ 70 million
 - Pacific Islands: 100 MW at \$0.35 per kWh: \$150 million
 - Other locations (Namibia, US Virgin Islands, New Zealand)
- Ultimate revenues in the billions.



South Pacific has ideal waves and no alternatives to diesel for electricity generation

\$0.40 cost per kWh for generation

Ideal waves for generation 95% of the time

No typhoons from 20° South to 20° North





What is a Waveberg?



The Waveberg system: a set of floats and pumps that use the movement induced by the waves to pressurize sea water, which is piped to standard hydro-electric equipment on shore.

Typical Project Scale: 2 – 200 MW

Per unit: 100 – 300 KW rating, depends on local wave climate

Works well on the common 1 meter to 2 meter waves

Design utility factor:70%



Economics of Wave Energy

- Fuel is free

Main costs are capital cost repayment and maintenance

Payback time of capital investment is driven by price received versus costs per kWh.

- Waveberg cost per kWh ~ \$0.06 right now, less later

- Competitors cost per kWh:

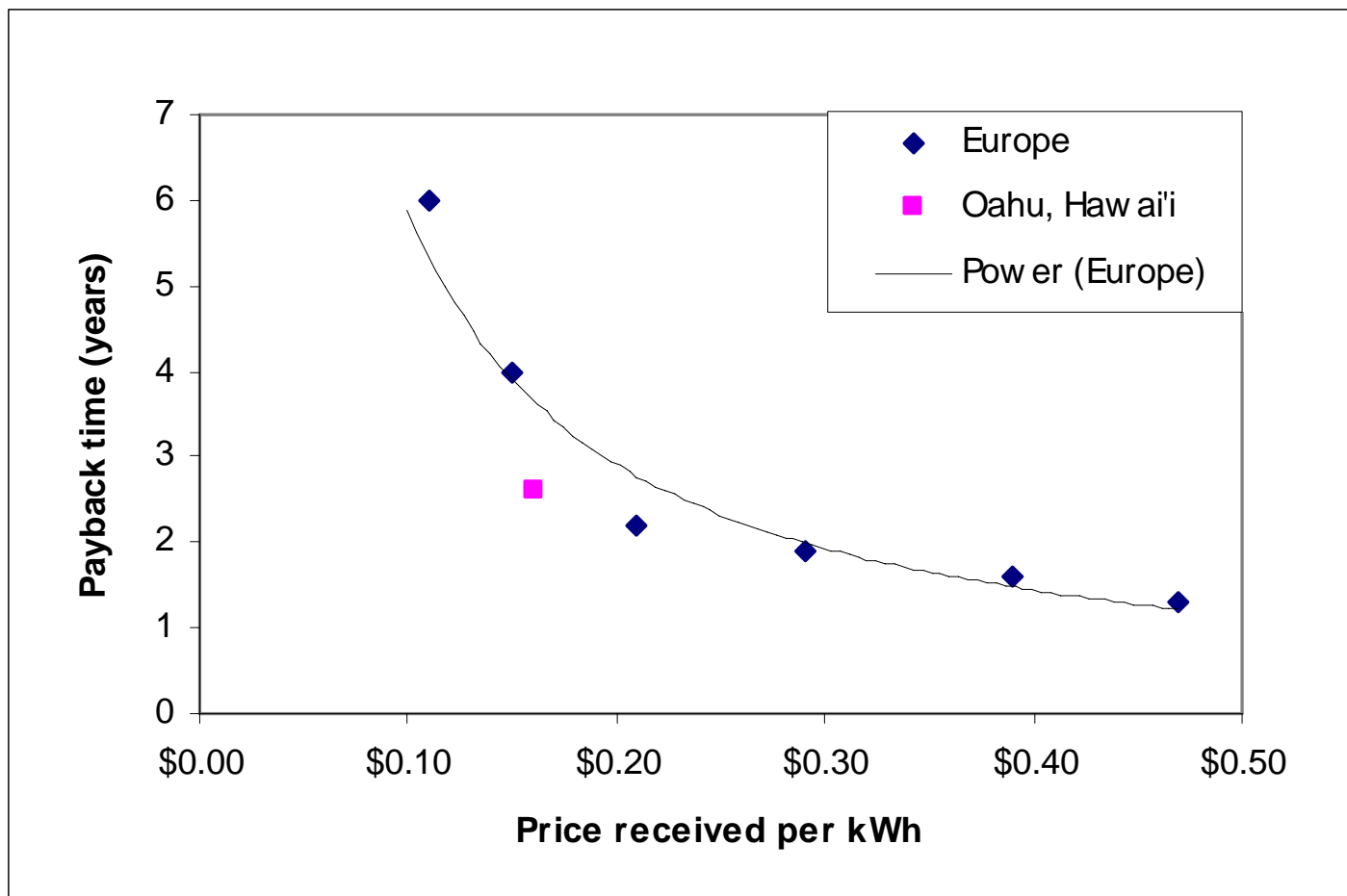
Ocean Power Technologies, New Jersey \$0.015

Pelamis, Scotland >\$0.010 per kWh



Price alone determines payback time

Hawaii gives better economics than Europe





Key Milestones

Bare minimum development plan

Phase		Goal	Completion date (from financing)	Funds Required
1	1:12 Scale Prototype	Develop materials specifications and assess forces	3 months	\$400,000
2	Quarter scale Prototype	Testing power take-off and output, "real world" survival	8 months	\$1,200,000
3	Full Scale Prototype	Test total device including output and survivability, Publicity and "coming out"	16 months	\$900,000
4	3 MW Demonstration Plant in Portgal Local partners contribute \$10 million (\$3,300 per KW)	Test and refine generating system Build supply chain and management.	30 months	\$4,500,000
Total				\$7,000,000



Intellectual Property

- US Patent 6,045,339 expires 2018, horizontal pumps
- WO 2005/094450 expires 2024, use of hydrofoils & lifting shapes
- New patent to be submitted with first investment:
 - New configuration, tank tested – 40% lower cost
 - New mooring conception
 - 5 other substantial innovations
- Continual improvement in design and manufacturing will lower cost as we gain experience; current 6¢ per kWh, future 3 - 4¢



Financing needed

- Waveberg Development Ltd has a unique, protected technology for harvesting ocean wave energy to generate grid level electricity
 - Business model: share in revenue with project developer
 - Better than competing approaches for cost and simplicity
- Waveberg seeks \$3 million to deliver a full-size prototype, \$4 million for market roll-out
 - Anticipated return to first-round investors of 40% per annum
- Exit in 2015 with IPO or sale of company



Why Invest in Waveberg?

- Economics are favorable, better than wind or solar in target markets
- Early stage investment—competition has already finished later rounds at high valuations
- Low technology risk—not a technology play—breakthroughs have already occurred
- Oil prices rising—wave energy replaces diesel fuel
- Opportune timing
 - Competitors have demonstrated feasibility of sector
 - Worldwide generation capacity of wave energy still < 5 MW
 - Waveberg demo can be in public eye in two years



Team

- John Berg—inventor—has invested \$1 million
- Paul Wegener—entrepreneur in technology ventures; Caltech/Johns Hopkins
- Dr. Geza Nagy—UCSD professor, President InfraComp, materials engineering
- Bob Stevens—strategy consultant, CFO; ex-Mercer; on board of Axsys Technologies
- Partnerships:
 - Wave Energy Center (Portugal)
 - HMRC (Ireland)
 - OREC –Ocean Renewable Energy Coalition
 - Univ. New Hampshire, Chase Ocean Engineering Lab

