



ELECTRIC POWER
RESEARCH INSTITUTE

Global Marine Renewable Energy Conference

Session 1 Technology Characterization Ocean Wave and Tidal Energy

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Plan for Session

- Moderator Overview – Roger Bedard, EPRI, USA
- Panelist Presentations
 - Tony Lewis, University College Cork, Ireland
 - Kim Nielsen, Ramboll, Denmark
 - Jochen Bard, ISET, Germany
 - Henry Jeffrey, University of Edinburgh, UK
- Panelist Response to a Moderator Question
- Audience Questions

What is Marine Renewable Energy?



CURRENTS

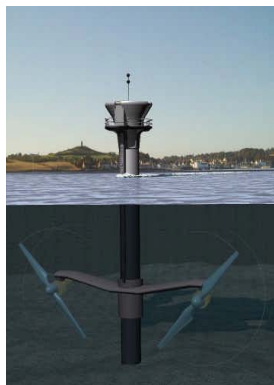
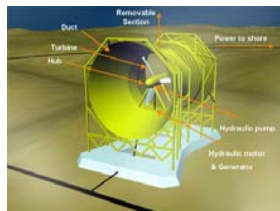
- Tidal, river, and ocean variants
- Conversion technology is wide variety of water turbines

WAVES

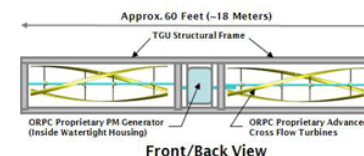
- Conversion technology is a wide variety of floating and submerged devices

Ocean Thermal and Salinity Gradient excluded from scope of this session

Tidal Current Turbine Technology



- Clean Current (h-axis, shrouded rotor)
- GCK (vertical-axis, Gorlov helical rotor)
- Lunar Energy (h-axis, shrouded rotor)
- Marine Current Turbines (h-axis, open rotor)
- Open Hydro (h-axis, shrouded open rotor)
- Ocean Renewable Power Corp (Xflow- axis)
- Ponte de Archimeda (v-axis)
- SeaPower (vertical axis, Savonius rotor)
- SMD Hydrovision (h-axis, open rotor)
- UEK (h-axis, shrouded rotor)
- Verdant Power (h-axis, open rotor)



Wave Energy Conversion Technology

- Able Technologies - Electricity Generation Wave Pump
- Finavera (AquaEnergy) - AquaBuOY
- AWS Energy - Archimedes Wave Swing
- Ecofys - Wave Rotor
- OceanLinx (Energetech) - Uiscebeathe
- Independent Natural Resources Inc - SeaDog™
- Pelamis Wave Power - Pelamis
- Ocean Power Technologies - PowerBuoy®
- Ocean Energy – OEBuoy
- Oregon State University – Direct Drive Point Absorbers
- Renewable Energy Holdings - Cylindrical Energy Transfer Oscillator (CETO)
- Wavebob Ltd - Wavebob WEC
- Wave Dragon Ltd - Wave Dragon
- Wave Energy - Sea Wave Slot-Cone Generator
- Wave Star Energy - Wave Star

OceanLinx Oscillating Water Column



Pelamis Linear Attenuator



Ocean Power Technologies Point Absorber



Wave Dragon
Overtopping



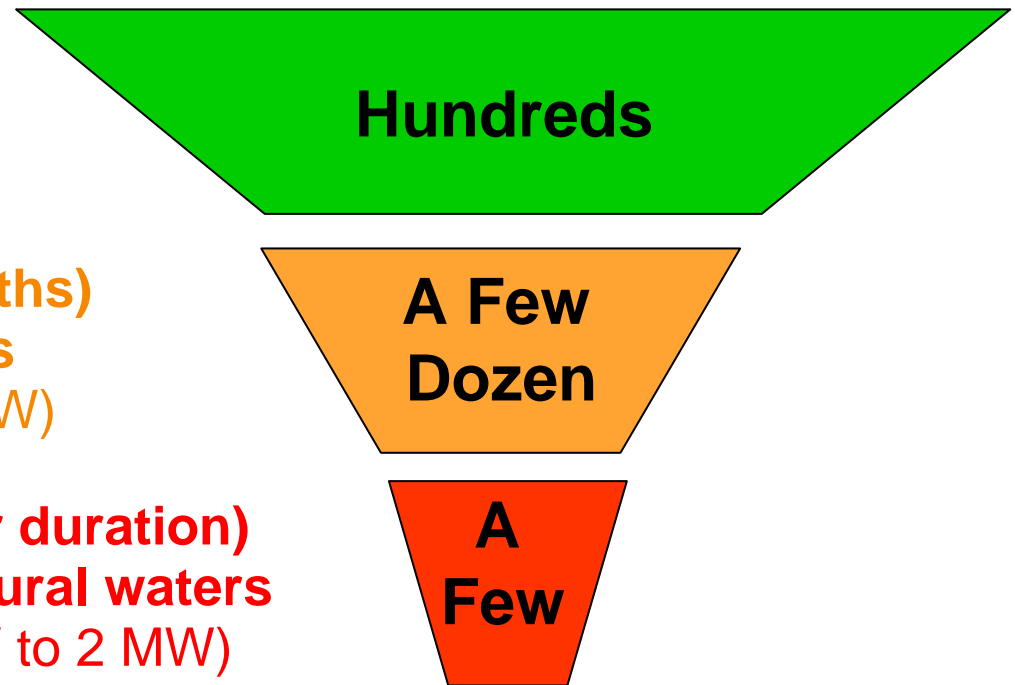
Technology Development Status

**Rigorous laboratory
tow- or wave-tank
physical model tests
(1/50- to 1/5-scale)**

**Short-term (days to months)
tests in natural waters
(typically 10 kW to 100 kW)**

**Long-term (>1 yr duration)
prototypes in natural waters
(typically 100 kW to 2 MW)**

Thousand of concepts and patents on ocean energy conversion technology

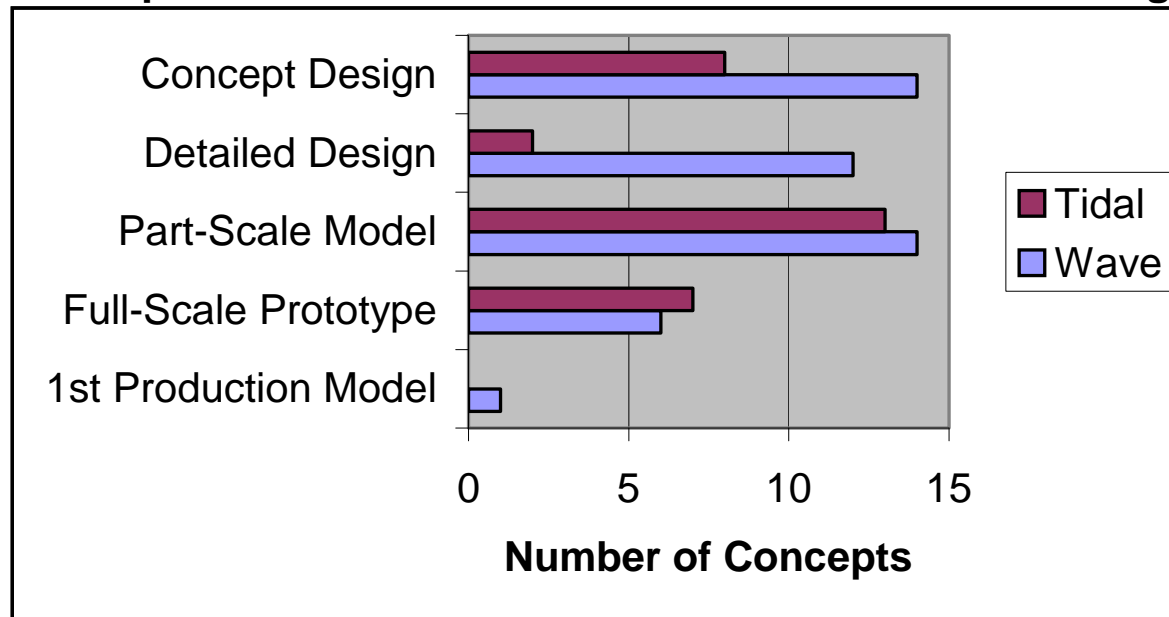


It typically takes 5 to 10 years for a technology to progress from concept-only to deployment of a long-term prototype

What is the Technology Development of Marine Energy?

- Emerging Technology – Various Devices in Various Stages of Development

Development Status of Wave and Tidal Stream Technologies



Data from the Carbon Trust Report titled “Future Marine Energy: Results of the Marine Energy Challenge: Cost Competitiveness and growth of wave and tidal stream energy” January 2007