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The Business of  
**Marine Energy**

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# Wave Energy and the Oceanlinx Experience

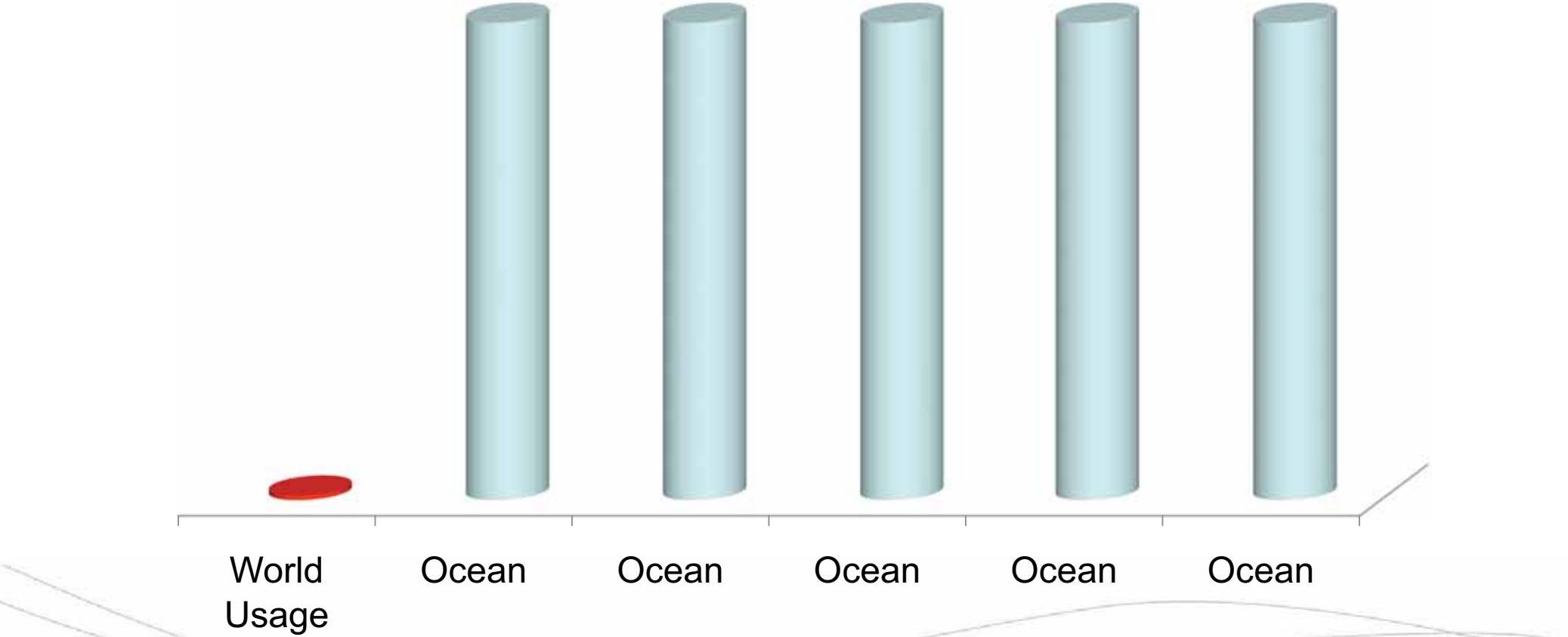
**May 2011**

**Dr Tom Denniss**

**Chief Technology Officer**



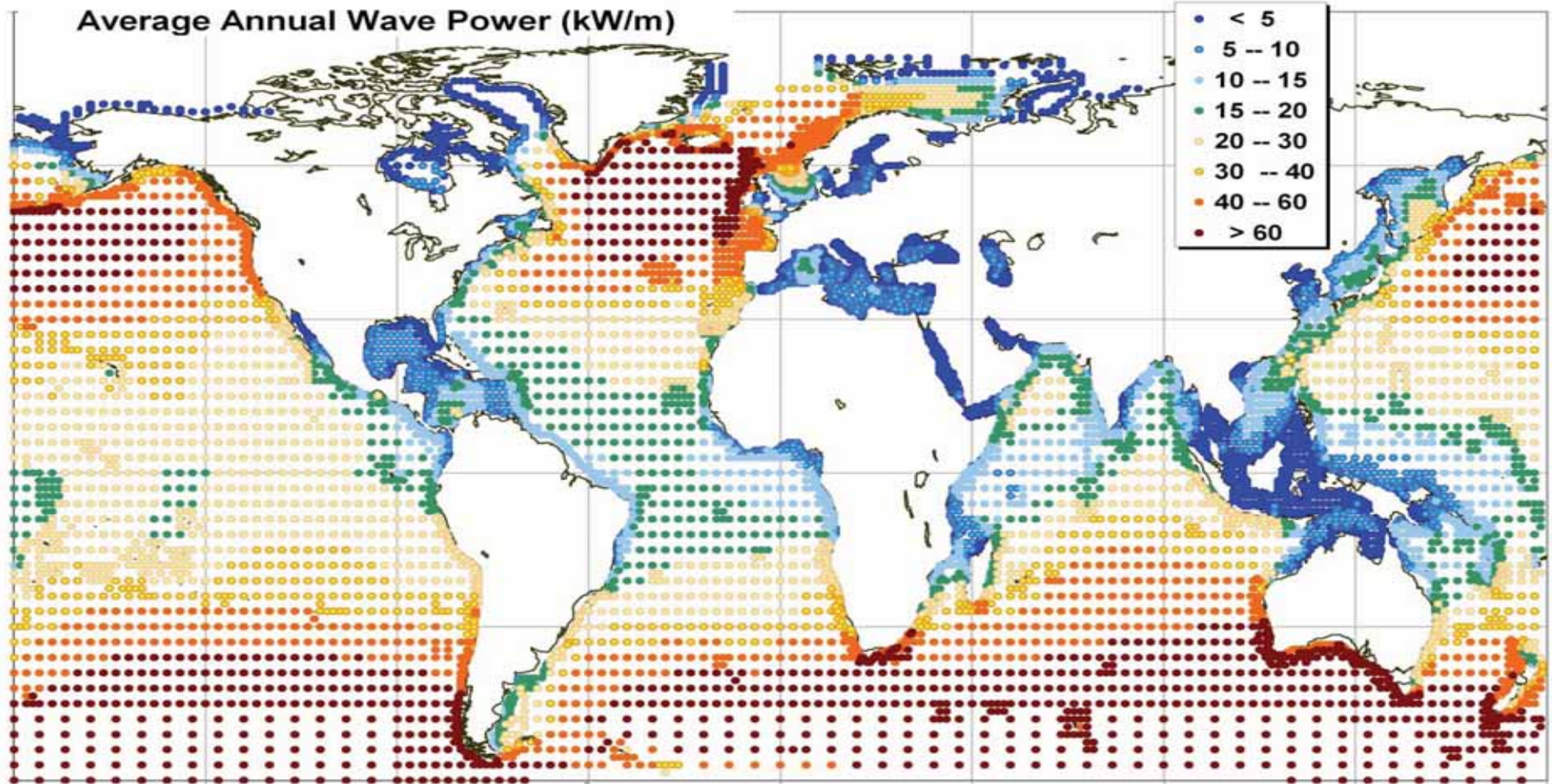
# World Power Usage versus Ocean Power



# The Wave Resource

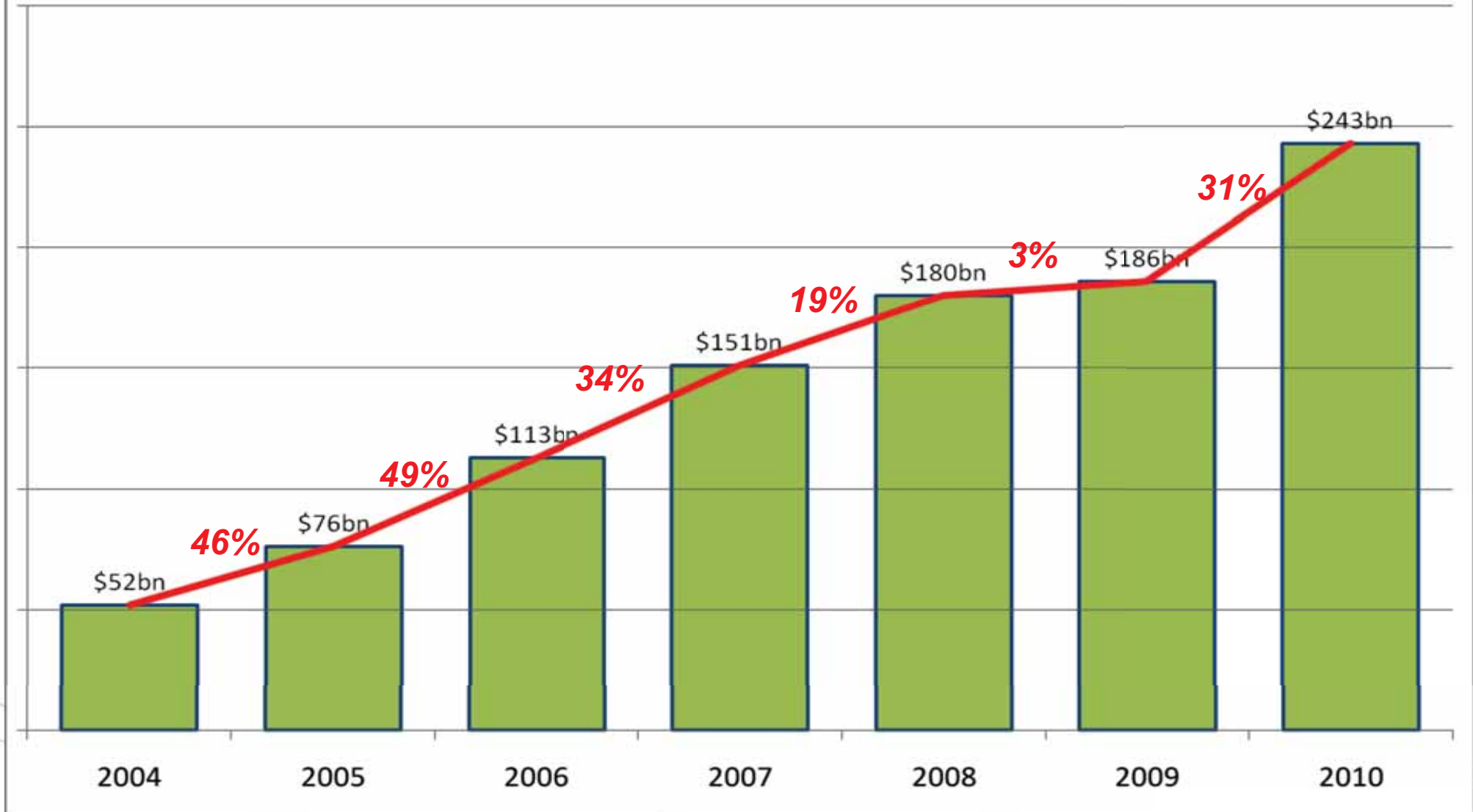
- The world currently uses about 15 trillion kWh of electricity per annum
- This is only 0.02% of the energy contained throughout the world's oceans
- If a coin represents world energy usage, then the energy in the oceans is equivalent to a stack of coins the height of a three story building





"The data originate from the ECMWF (European Centre for Medium-Range Weather Forecasts) WAM model archive and are calibrated and corrected (by OCEANOR) against a global buoy and Topex satellite altimeter database."

Global Total New Investments in Clean Energy 2001-10 (\$BN)



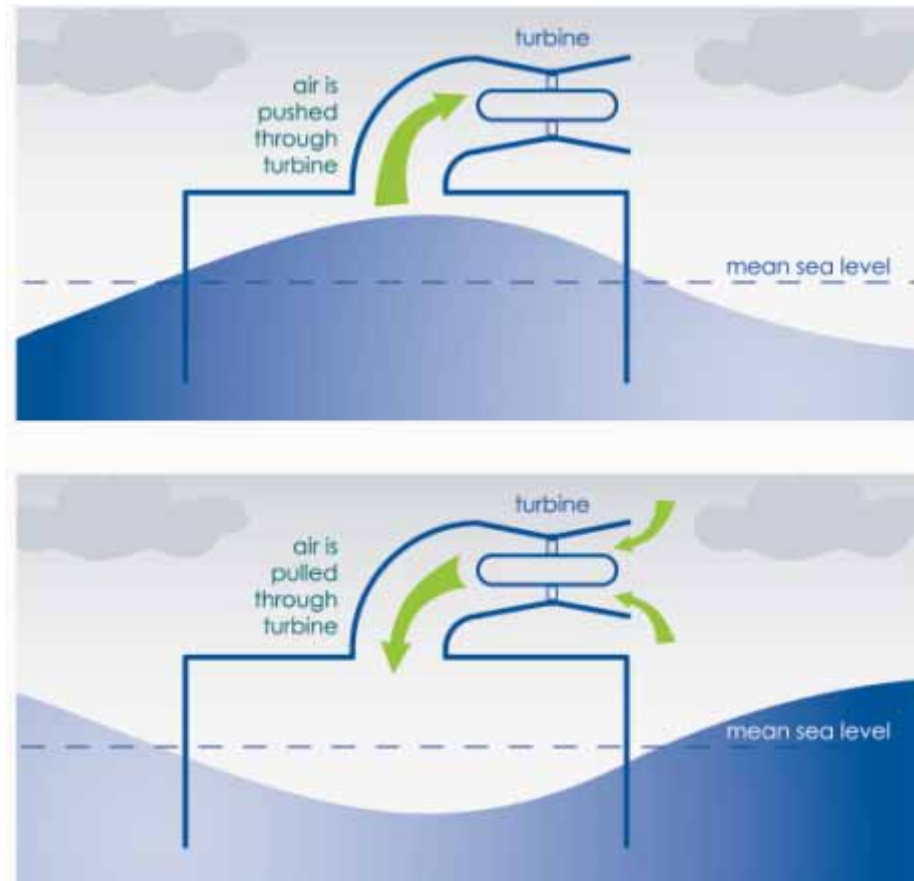
# Oceanlinx Limited

- Established in 1997
- Six subsidiaries throughout US, Europe and Australia
- Invested over \$80 million raised through venture capital, private equity, grants, and individual shareholders.
- Numerous patents
- Head office located in Sydney

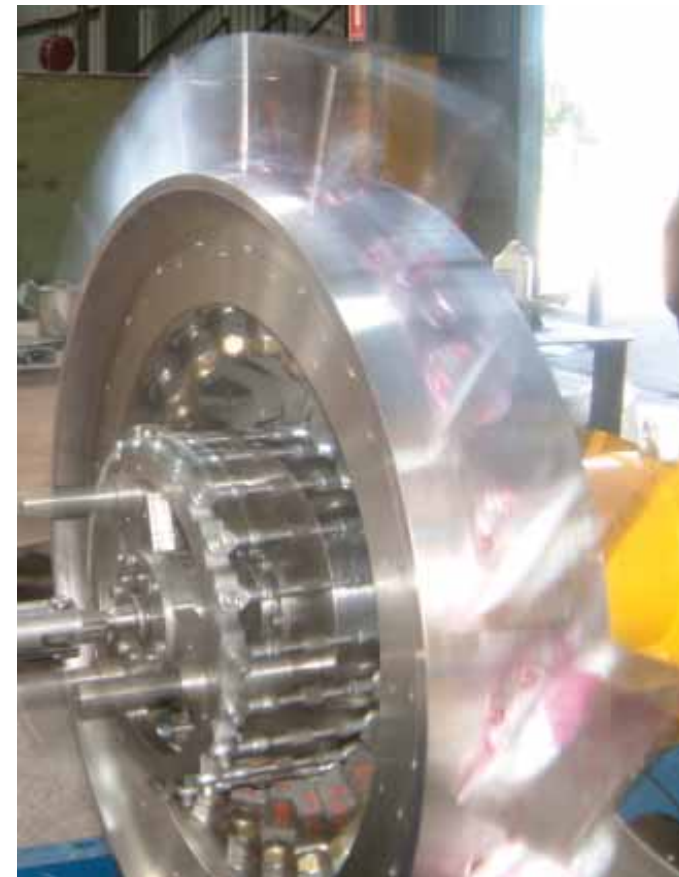




# Basic Concepts



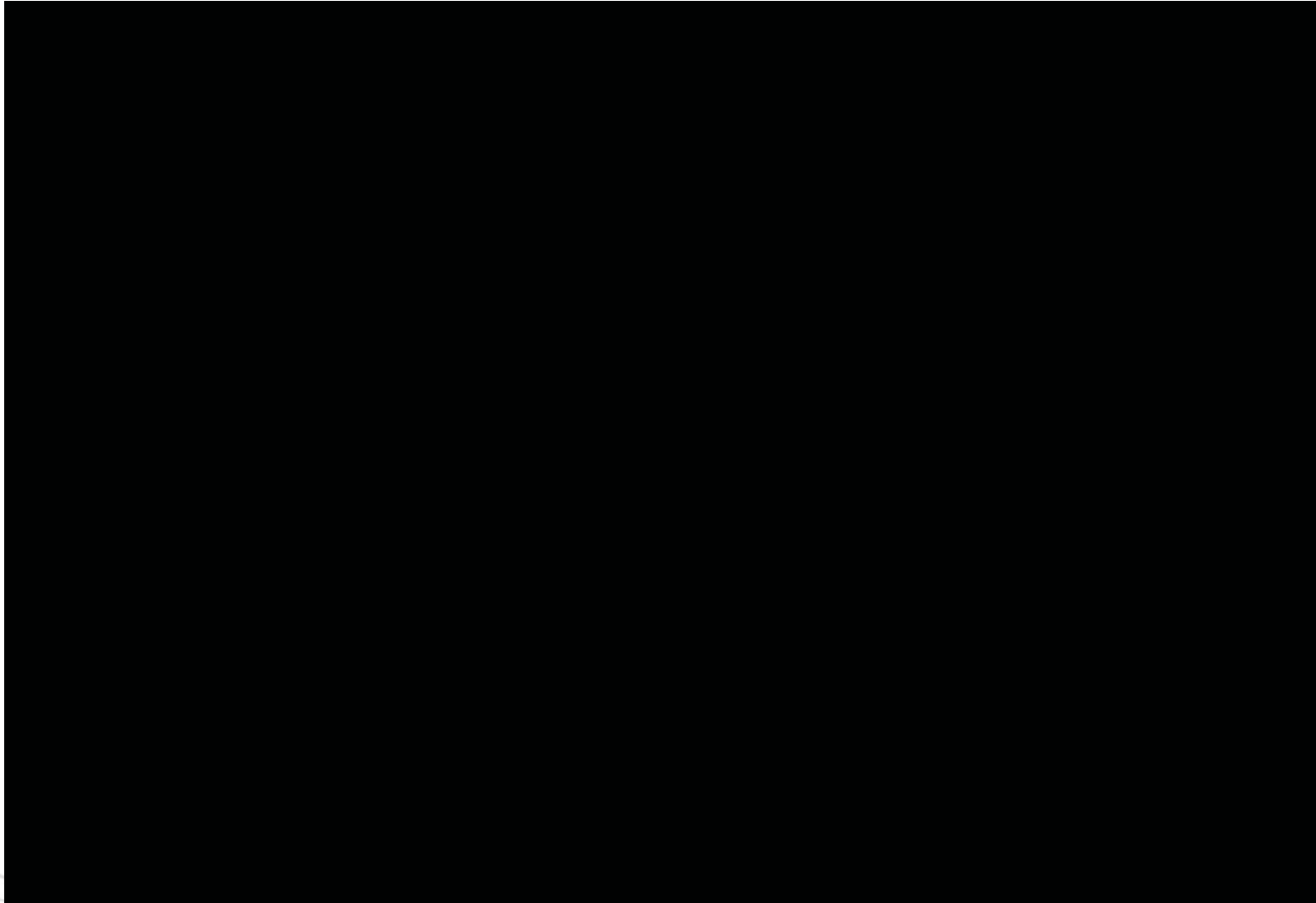
Energy in waves is extracted through a  
Oscillating Water Column (OWC)...



... and converted into electricity  
by using a turbine-generator set.



# How it Works - Resonance



# Three Units Demonstrated

**MK1**  
Full scale evaluation unit  
(fixed to seabed)



**MK2**  
1/3-scale research unit  
(floating)



**MK3**  
Pre-commercial scale unit  
(floating)

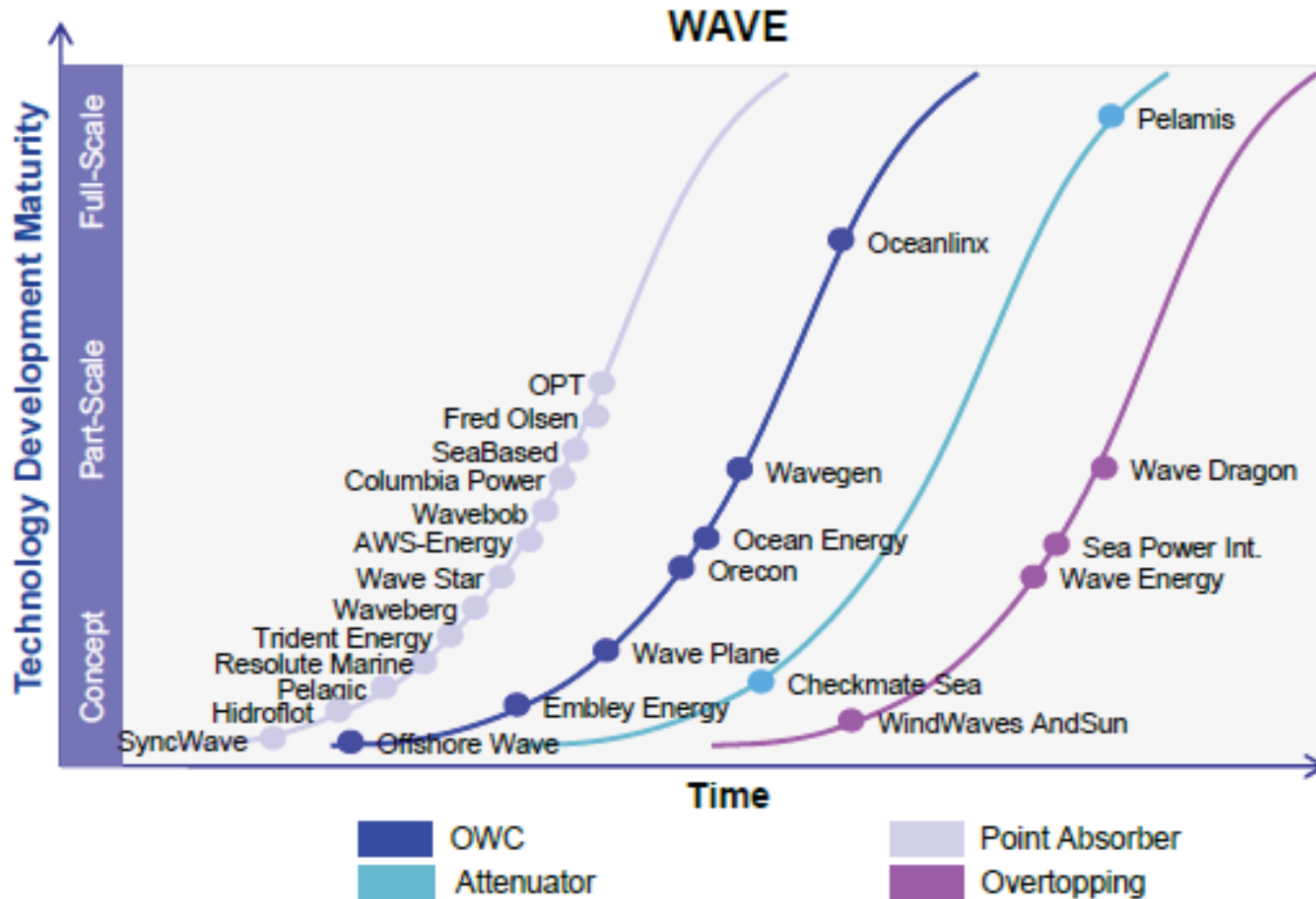


2005 - 2009

2007-2008

2009-2010

# Wave Technology Maturity Curve



Source: Emerging Energy Research, USA, 2009

COMMERCIAL IN CONFIDENCE



# Product development

2002

2005

2008

2010

2011

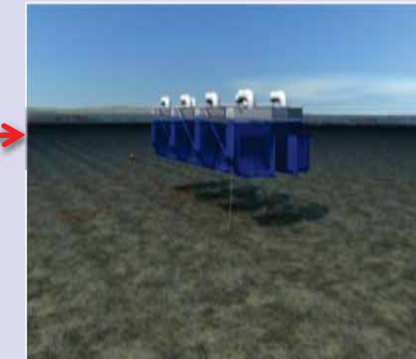
airWAVE



greenWAVE



blueWAVE

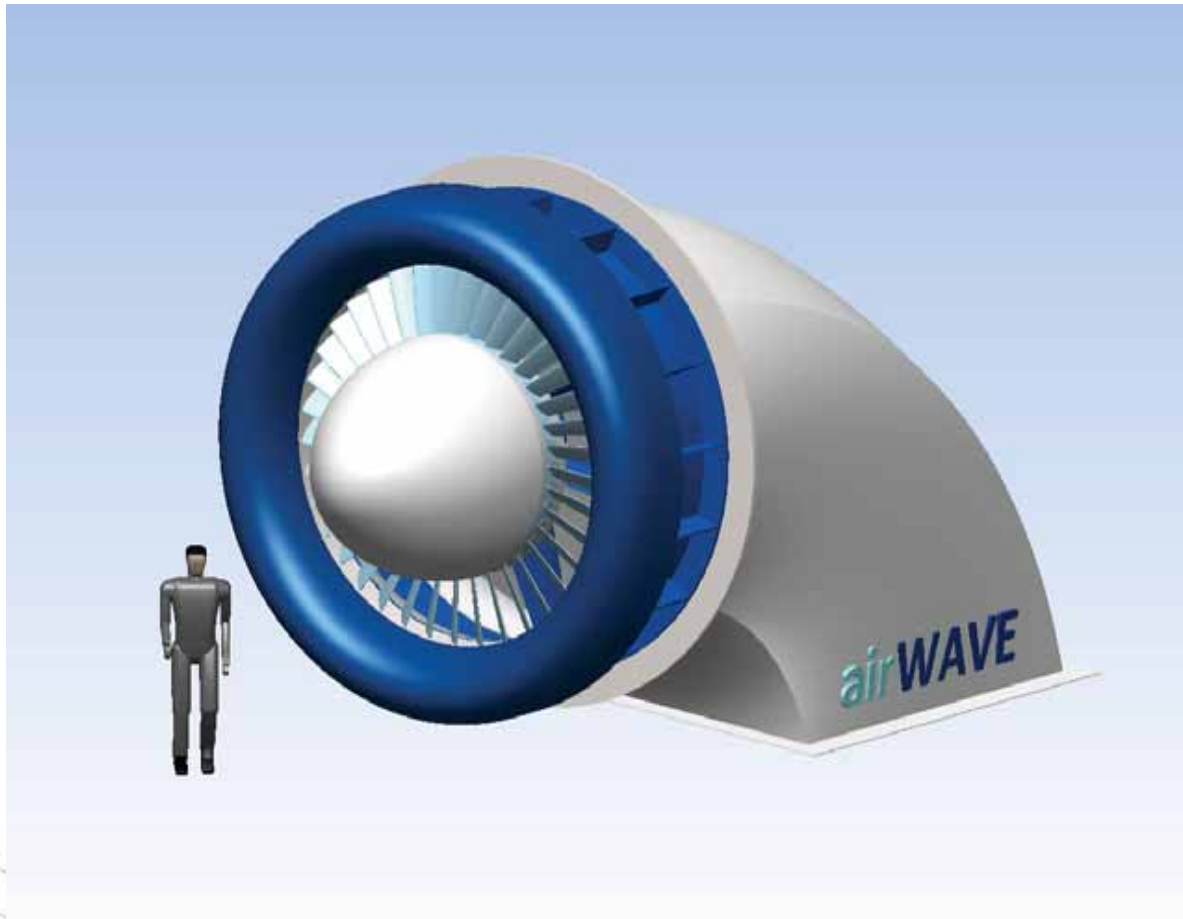


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# Products

## 'airWAVE'



- Max output 3 MW
- High efficiency
- Self actuating
- Bidirectional
- Composite material
- High endurance
- Low maintenance

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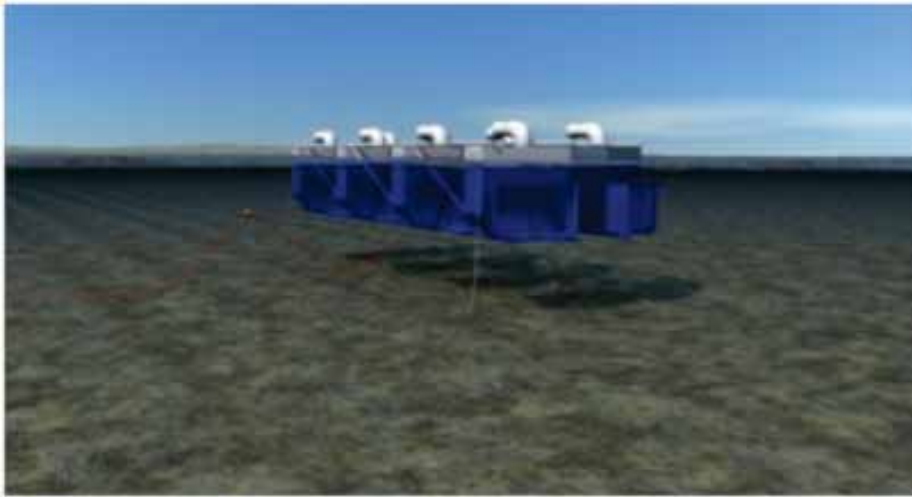
# Products



**greenWAVE**

<b>Water depth (m)</b>	<b>10-15m</b>
<b>Material</b>	<b>Concrete</b>
<b>Mass (tonnes)</b>	<b>2500</b>
<b>Application</b>	<b>Near shore power/ Desalination</b>
<b>Rated Power (kW)</b>	<b>1MW</b>
<b>Certification</b>	<b>DNV</b>

# Products



**blueWAVE**

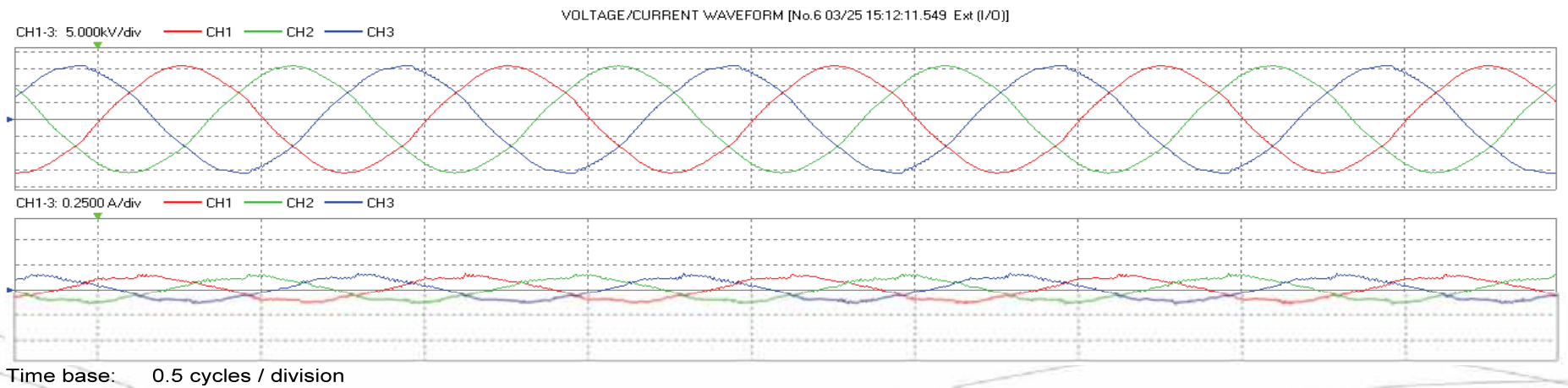
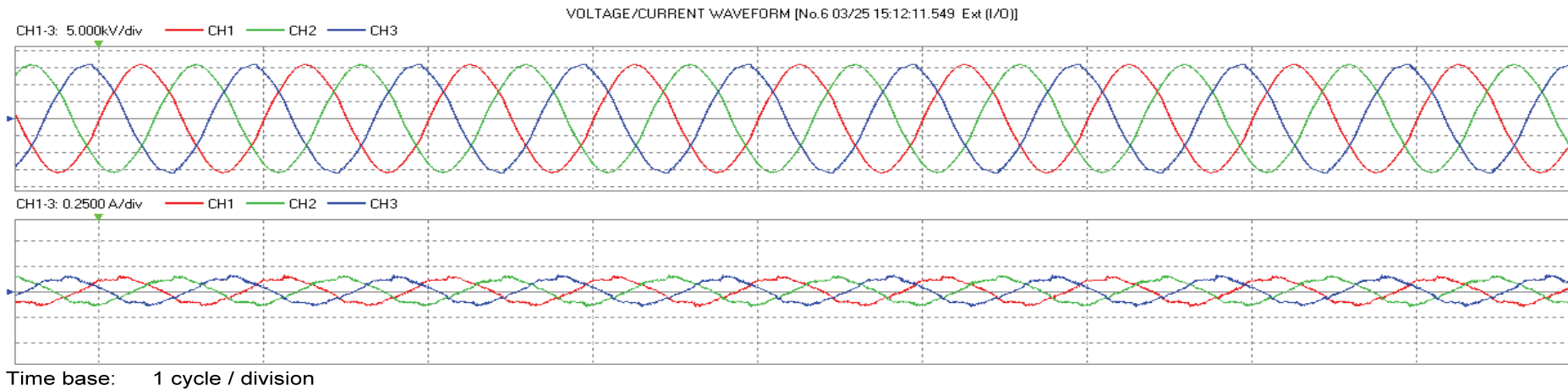
<b>Water depth (m)</b>	<b>40-80m</b>
<b>Material</b>	<b>Steel</b>
<b>Mass (tonnes)</b>	<b>2000</b>
<b>Application</b>	<b>Off shore power/ Desalination</b>
<b>Rated Power (kW)</b>	<b>2.5MW</b>
<b>Certification</b>	<b>DNV</b>

# blueWAVE

## DNV Independent Review of full scale yield calculation



# Port Kembla Wave Generator (Mk III) - voltage & current waveform snapshot



# Some Pertinent Points

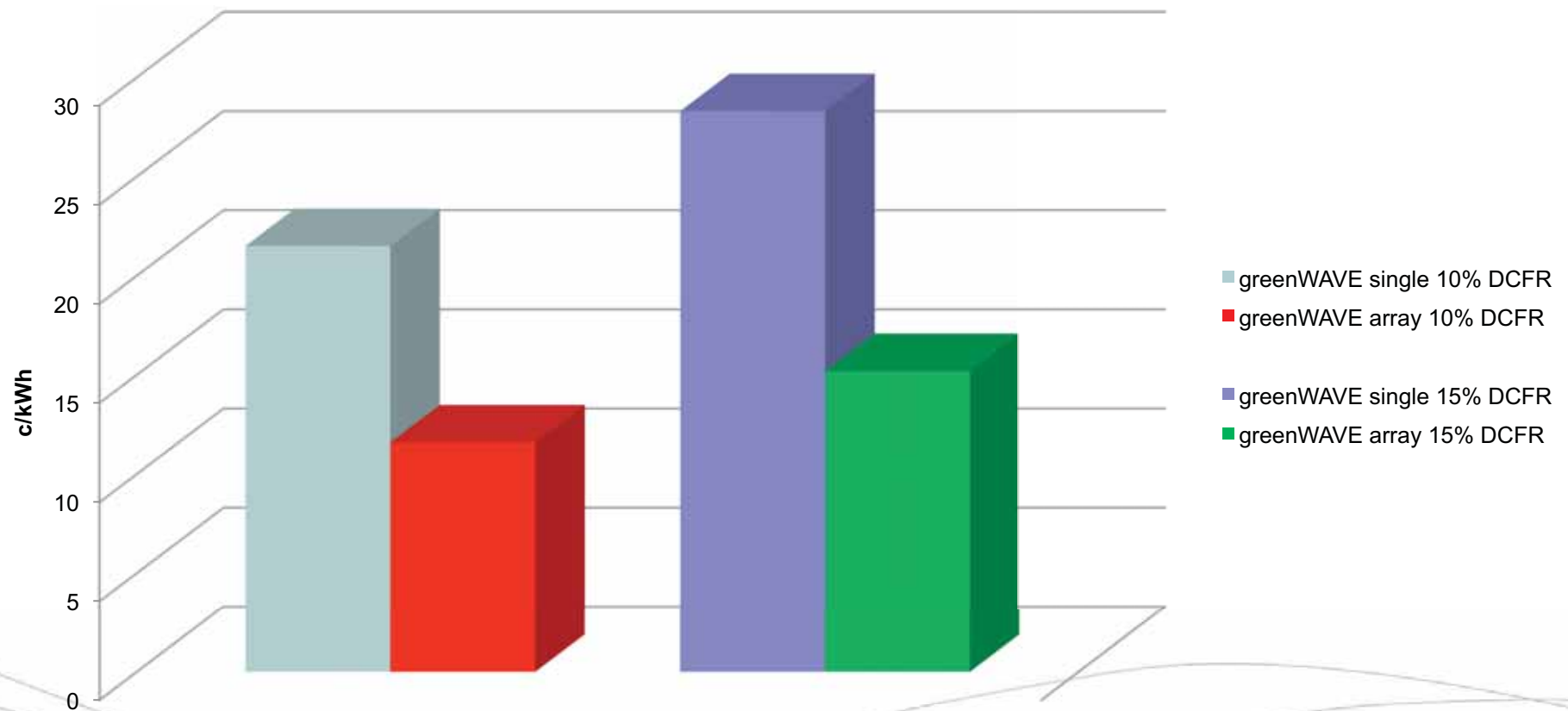
- Products designed to withstand 21 metre wave heights
- Low noise levels – verified by Lloyds Register at 74 dB (1 m)
- No moving parts under the water
- No emission or contaminants
- Three units installed in the open ocean
  - Capacity of up to 2.5 MW
  - Desalination capability



# Cost of Energy

(including full capex and excluding any subsidies)

Cost of Energy

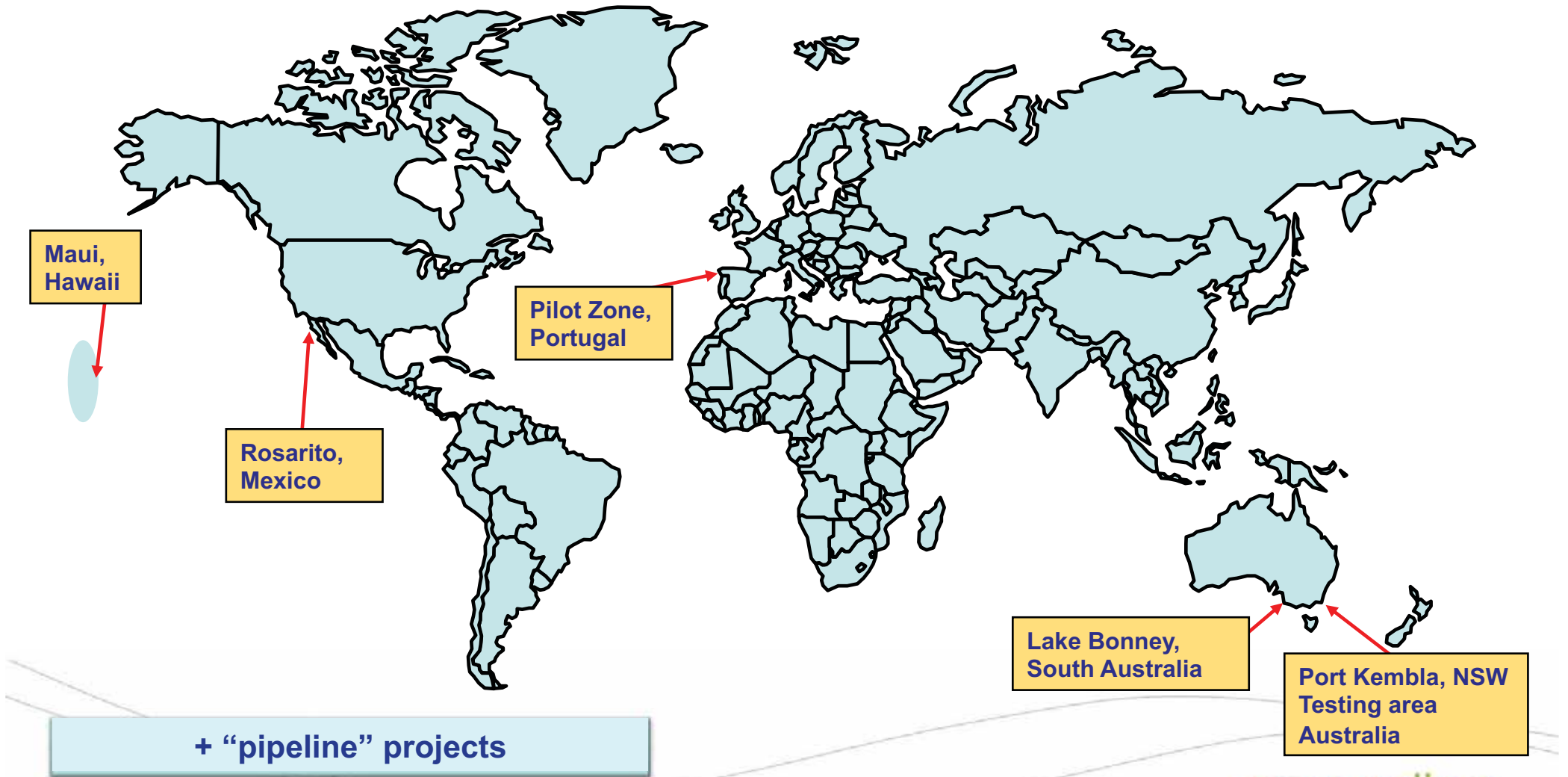


# Awards and Accolades

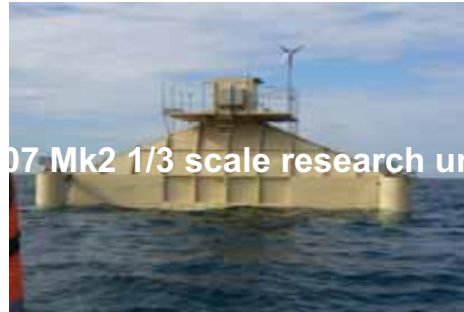
- 2005: Ranked by the Electric Power Research Institute (EPRI) as the lowest cost producer of electricity from waves
- 2006: St Louis, USA – The International Academy of Science names the Energetech technology as one of the Ten Most Outstanding Technologies in the World (this award spanned technologies of all forms, not just energy technologies).
- 2009: Shenzhen, China – The United Nations Industrial Development Organization (UNIDO) ranks Oceanlinx third in its annual list of the Top Ten Renewable Energy Investment Opportunities in the World.
- 2010: Sydney, Australia – The Annual EcoGen Conference names Oceanlinx's latest wave energy device the Most Outstanding Clean Energy Technology Innovation of 2010.



# OLX Current Opportunities



# Thank you



07 Mk2 1/3 scale research un



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