Ken Street - Business Development Director

Orecon’s 1.5MW MRC
– a wave energy device for a 25 year commercial life
Orecon in Brief

• Established - 2002
• Venture capital investment - 2008
• Team of 10 based in Cornwall
• Device developer
• OWC technology
• Full scale deployment Portugal - Spring 2011
Steps to a commercial device

R&D
- Device type
- Tank Testing
- W2WM

PTO and Auxiliary Systems
- Equipment & Supplier selection
- System Testing

Survival
- Structural loads
- Coatings
- Moorings
- Standards - DNV

PTO
- Reliability
- Availability
- Maintainability

Performance
- Operation & Maintenance
- Scale
- Yield

Learning Rates
- Construction - (Capex)
- Performance – (Yield)

Stable Platform

Commercial Device
Competitive Cost of Power
Oscillating Water Column (OWC)
Equipment & Supplier selection

• Sub-contractors leaders in their field
  - DNV – Third party audit & certification
  - BPP-Tech – naval architecture
  - Tension Technology International – mooring design
  - Converteam – power system, control, grid integration
  - Dresser-Rand - turbines
HydroAir™ - Exclusive Agreement

- Shoreline
  - Breakwater
  - Cliff
- Deepwater
  - MRC
HydroAir™ - Variable Radius Turbine (VRT)

- Designed for OWCs
- Impulse
- Fixed geometry
- Only rotor moves
- High efficiency
- Wide operating band
- Slow speed
- Self starting
- No stall condition
HydroAir™ outperforms Wells

Efficiency

Flow Coefficient $\Phi$

Extended Operating Range

HydroAir™

Wells
PTO Testing

Complete PTO system – Wave to Grid testing at ¼ scale.

More than 400hrs of compliant power supplied into the national grid.
R&D Evolution

- 30 scale models
- 3500 runs
- 1050 tank hours

- Reduced mass
- Reduced cost
- Increased efficiency
- Increased yield
- Easier to build
- Easier to install

Orecon - Making wave energy work
Simplicity = Reliability

- Multi Resonant Chamber
- 1.5MW, 33kV, 50/60Hz
- Steel structure
- Tension moored
- All maintenance onboard
- 25 year design life
- Environmentally passive
- DNV certification
Basic Layout

Front Chambers

Rear Chamber

Machinery Space

Turbine/Generator

Orecon  Making wave energy work
Wave to Wire Model (W2WM)

- Compare performance
- Check effect of control changes
- System upgrades
- Fault finding
- What’s important and what’s not?
- Better yield predictions
- Reduce R&D costs

But........CALIBRATE - VERIFY and then do it again!

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Environmental

- Noise - turbine is low speed, low noise
- No biocides - silicone based marine coatings eliminates chemical leaching
- Entrapment - No risk to marine life
- Life time deployment - device is maintained on station for minimum disruption

MRC seen from 5 miles (8km)
Portugal – Orecon & Eneolica

2009
MOU signed

2010
MRC 1 construction

2011
MRC 1 install & test
1.5MW

2012
MRC 2&3 construction
MRC 2&3 install
4.5MW
Orecon Priorities

- Demonstrate survival
- Demonstrate reliability
- Trial deployment
- Final validation of W2WM
- Trial Operation & Maintenance routines
- Demonstrate at commercial scale
- Inform the design for units 2 & 3
- Inform future designs

Learn - Understand - Improve

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Finally ....

A wave energy device for 25 years operation

Is it feasible?

We believe the answer is YES.
Orecon Ltd
2 Dreason, Bodmin Road
Bodmin, Cornwall, PL30 4BG

+44 (0)1208 269374
contact@orecon.com
www.orecon.com
Road to DNV certification

- Concept review
- Preliminary design – stage 1
- Preliminary design – stage 2
- Detailed design
- Fabrication & Assembly
- Testing / Commissioning
- Offshore installation
- Operation & maintenance
- Array operation

- Statement of Feasibility
- Fitness for Service Statement
- Surveillance / Survey reports
- Prototype Readiness Statement
- Prototype Certificate
- Type Certificate (conditioned)
- Prototype Certificate

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Tank Testing - Survival & Performance