

AQUAMARINE
POWER



MAKING MARINE RENEWABLE ENERGY MAINSTREAM

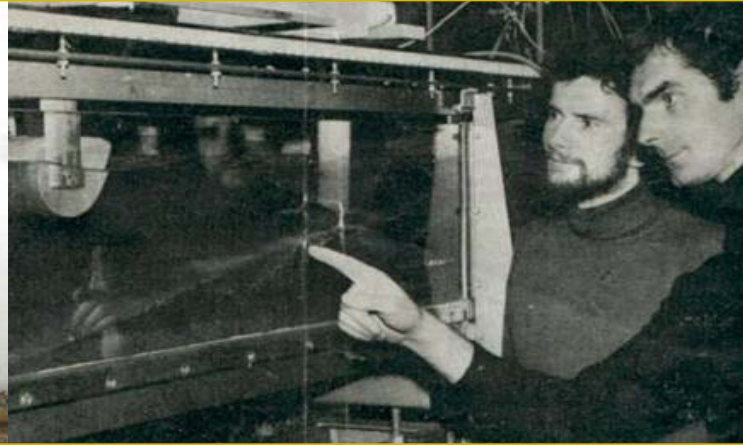
MARTIN McADAM, CEO, AQUAMARINE POWER



Aquamarine Power is a technology company that has developed a product called Oyster which produces electricity from ocean wave energy.

We are seeking joint venture partners and funding to deliver the next-generation Oyster.

INDUSTRY EXPERTISE



PROF. TREVOR WHITTAKER RESEARCH ADVISOR TO BOARD

- Professor of Coastal Engineering and Head of Wave Power Research Group, Queen's University, Belfast
- Experience of five wave power sea-trials to date including Islay 75kW plant
- Pioneered wave powered navigation buoys in 1984

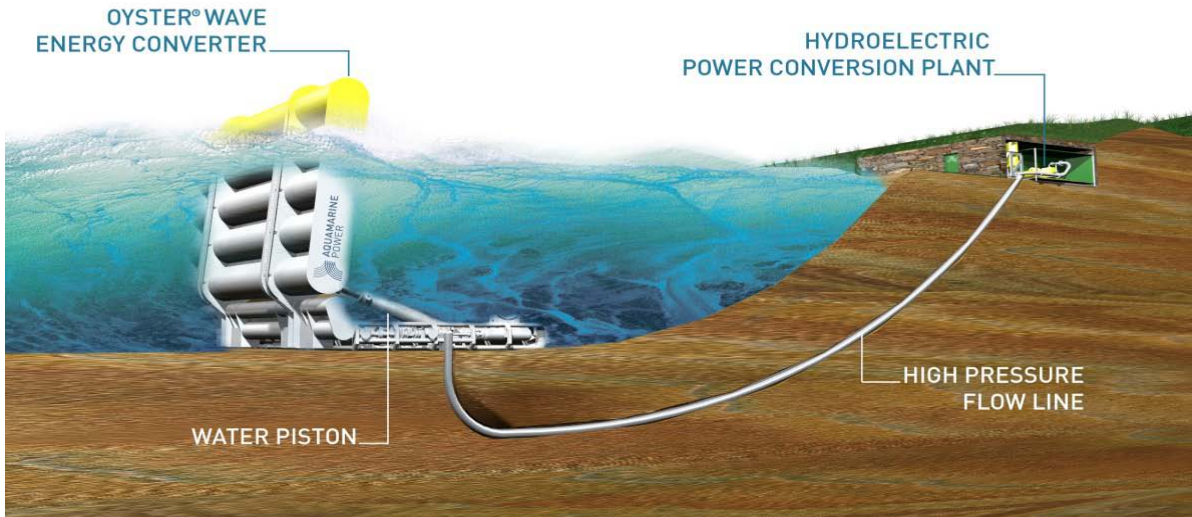
PROF. STEPHEN SALTER SPECIALIST TECHNICAL ADVISOR

- Professor of Engineering Design, University of Edinburgh
- Pioneer of wave energy since 1970s
- Developed Salter Duck, ground-breaking wave energy device, in 1970s

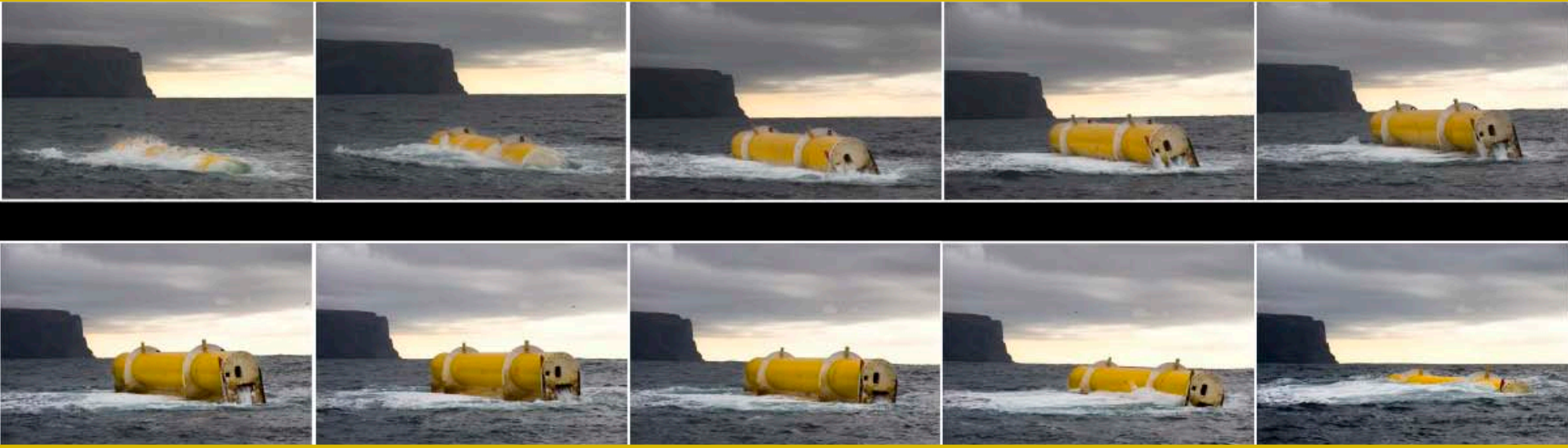
ALLAN THOMSON COMPANY FOUNDER & NON-EXECUTIVE DIRECTOR

- Leading developer of wave power technology in UK
- Founded first ever wave energy company
- Developed Limpet, commercial-scale 500kW device in 1999

OYSTER TECHNOLOGY



- Large mechanical 'flap' moves back and forth with motion of waves
- Two hydraulic pistons pump high pressure water via pipeline to shore
- Conventional hydro-electric generator located onshore
- Secured to seabed at depths of 8 – 16m
- Located nearshore, typically 500 – 800m from shoreline
- Suitable for installation on any type of seabed



SIMPLE AND ROBUST

- > MINIMAL UNDERWATER MOVING PARTS
- > ENHANCED SURVIVABILITY DUE TO NEARSHORE LOCATION
- > RELIABLE, PROVEN HYDRO-ELECTRIC TURBINE
- > ONSHORE GENERATION EQUIPMENT ACCESSIBLE 24/7
- > LOW COST OPERATION

LOW COST MANUFACTURE

- > FAVOURABLE WEIGHT TO POWER RATIO COMPARED TO ALTERNATIVES INCLUDING OFFSHORE WIND
- > SIMPLICITY OF DESIGN
- > MULTIPLE UNITS POWER ONE ONSHORE GENERATOR
- > ECONOMIES OF SCALE

HIGH EFFICIENCY

- > HIGH CAPTURE FACTOR
- > OPTIMISED POWER OUTPUT IN MOST COMMONLY OCCURRING SEA STATES
- > EASY TO SCALE UP
- > MINIMISED SYSTEM LOSSES
- > LOW COST OF POWER

OYSTER PROJECT MILESTONES



- **Oyster 1 Project** – 315kW demonstrator successfully installed and grid-connected at European Marine Energy Centre (EMEC) in Orkney, October 2009
- **Oyster 2 Project** – 2.4MW project - on schedule for 2011
- **Oyster 3 Project** – 10MW development on track– commissioning 2013 -14
- **Lease for first 200MW wave farm site** – announced March 2010

BARRIERS TO DEVELOPMENT

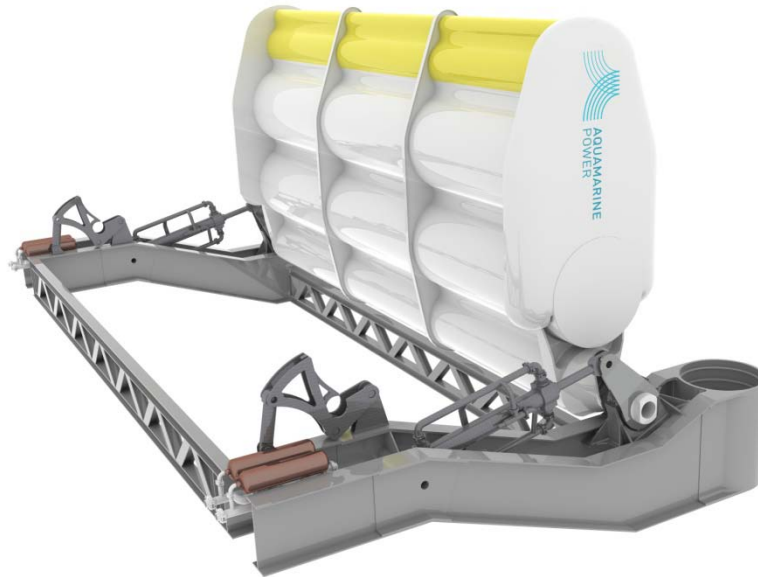
1) Grid infrastructure

4) 'Market-push' capital grants

2) Site permitting
process

5) 'Market-pull' price incentives

3) Other marine
users

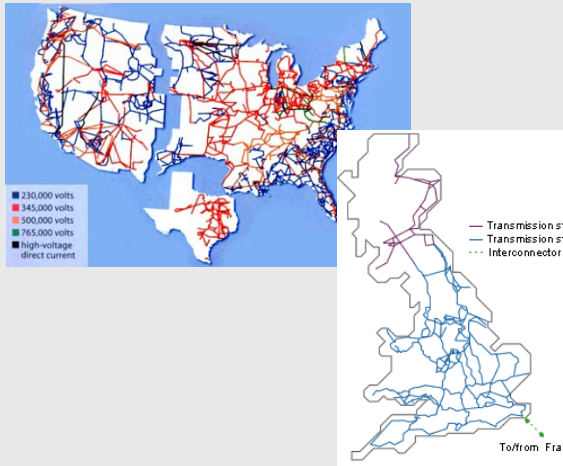


6) Equity
investment

7) Supply chain

SITE DEVELOPMENT

1) Grid Infrastructure



European grid requires major investment to exploit best wave resource in North West region, as with offshore wind.

Strong existing coastal electrical grid in USA; some localised reinforcement may be required

2) Site Permitting Process

Need to define clear standards for assessing environmental impacts and develop a consistent framework for site permitting across states within Europe & U.S.A.

Site development, resource assessment and environmental monitoring is a very high cost for early stage developments.

RECOMMENDATION:

- Federal and state bodies (e.g. NMRECs, NOAA & US Navy) could invest in the development of shared information databases and development protocols which can be accessed by developers in order to reduce permitting costs.
- Regulators must recognise low potential impact of early-stage projects and use 'Adaptive Management' techniques to reduce site development costs to reasonable levels

3) Other Marine Users

Interest groups may object to new developments, prolonging the site development process and resulting in increased costs to developers.

RECOMMENDATION:

- Early, open and honest consultation with other marine users often prevents misunderstanding and is critical to success
- Federal and state bodies can support education and outreach efforts to promote wave energy benefits with key stakeholders: fishermen, surfers, coastal residents.



FINANCIAL INCENTIVES

4) Capital Grants

Even early stage demo projects are highly capital intensive (£10m+).

Capital grants are key to sharing technology risk and getting 'steel into the water' in the early years.

RECOMMENDATION:

- Prioritise projects with leading developers who have strongest near-term commercialisation potential
- Continuous programme of funding to progress technologies through TRL levels
- DOE MHK FOA & Carbon Trust MRPf programmes are a very positive development.
- Work closely with industry associations to influence policy at state and Federal levels.



5) Market Incentives

Early stage commercial projects require a market mechanism which provides a premium price for electricity produced, to mitigate technology risk and reach maturity through scale.

RECOMMENDATION:

- Tax credits require a tax appetite.
- Renewable Portfolio Standards do not provide targeted support for particular technologies.
- Renewable Energy Certificates are one useful mechanism; 'Banded ROC' scheme in Scotland is an efficient way to provide targeted support for wave energy development
- Long-term Feed-in Tariff regime e.g. Ireland and Portugal provides highest level of investor certainty

INVESTORS & SUPPLY CHAIN

6) Investors

'Best' investors have a long term strategic perspective.

RECOMMENDATION:

- Targeted PR and marketing to develop awareness of the market opportunity in the investment community.
- Develop utility Joint Ventures, industrial alliances and technology partnerships.



7) Supply chain

New MHK industry must be able to build on existing capabilities of supply chain partners from the marine, oil & gas and defence sectors.

Many suppliers lack awareness of the marine energy market opportunity.

Suppliers cannot commit investment to large manufacturing plant until technology is fully proven

RECOMMENDATION:

Federal and state economic development agencies have a role to play in:

- Brokering partnerships to create a high quality supply chain.
- Raising awareness of the market opportunity with suppliers.

OREGON IRON WORKS, INC.





AQUAMARINE
POWER

MAKING MARINE RENEWABLE ENERGY MAINSTREAM

inspire

Innovation

We value and reward innovation. When people tell us it cannot be done we ask why not!

INTEGRITY NURTURE SAFETY PARTNERSHIP INNOVATION RESPECT ENTHUSIASM



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