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Technology Feature: The Wave Energy Converter

About Us

GreenTechEurope.com (GTE) is a production of London Research International (LRI), a global research and consulting firm with expertise in the energy, environment, and chemical sectors. GTE is a video-based technology platform showcasing innovative technologies from Europe.

The GTE Newsletter

Our interview-based newsletter features innovative energy technologies and businesses from around the world.

Announcements

GreenTechEurope.com has been uploading footage shot over the summer at the Sustainability Live and Global Offshore Wind exhibitions. Go and check out what makes the companies we interviewed and their technologies unique.



Featuring: Offshore Wave Energy Ltd (OWEL)

In the latest edition of our newsletter, LRI interviewed Ned Minns, Chief Technical Officer at OWEL. Their Wave Energy Converter (WEC) is among the leading technologies in the UK's burgeoning marine energy sector. A demonstration scale project is due in 2013 that will pave the way for utility scale installations of up to 3MW. OWEL - a subsidiary of the renewable energy consultancy ITP - are actively seeking financial investment to help the WEC progress from R&D to full commercialisation.

The genuine prospect of utility-scale marine energy

Who are OWEL?

OWEL is a marine energy technology developer. In the early 2000s its founder Professor John Kemp approached the challenge of harnessing wave energy with the aim of making a simple machine with few moving parts that was easily scalable. These principles have endured to produce the present incarnation of the WEC, which will demonstrate commercial scale marine energy in 2013 and utility scale installations in 2016.

The Technology

An OWEL WEC comprises a floating horizontal duct supported by buoyancy tanks. The duct in each unit is open at one end, and the mooring system of the platform takes account of wind and tides to ensure that this open end is presented to the incoming waves. The duct has parallel side-walls and angled roof- and bottom-walls. The air in the trough behind an incoming wave is trapped as the following wave seals against the top of the duct. This air is then compressed by the angled side-plates and delivered to the air-take-off. This air take-off feeds the compressed air to a turbine which drives a generator to produce electricity.

At the end of each duct, behind the air-take-off, is a baffle system which disperses any remnant energy in spent waves so that they do not reflect back along the duct to interfere with following waves.

Timeline

- 2002-3** – Proof of concept research is completed with tests predicting that the WEC would successfully convert wave energy.
- 2005-06** – Testing shows conclusive evidence that commercial scale installations could be achieved. R&D then moves onto the optimization of the technology through to **2010**.
- 2013** – First marine demonstration project will be launched, just slightly smaller than a commercial scale installation.
- 2016** – Full-scale utility installations and the development of wave parks that feed into the national grid are expected.

Competitive Edge

What makes the WEC different?

The design of the OWEL WEC is characterised by simplicity and scalability.

Most other marine energy technologies have the potential to produce individual installations with capacities in the range of hundreds of kilowatts, but the OWEL WEC can expect to produce individual installations of 2-3MW. This offers the potential for project developers to build genuinely utility scale marine parks.

Of the other existing marine energy designs, attenuators (long thin machines) and point absorbers (floating buoys) will not have as much headroom for increasing their capacity as they become fully commercialised.

Many other machines have more complicated hydraulic and electrical components – and whilst the engineering is ingenious – the level of complexity may increase the technologies' O&M costs and potentially affect reliability.

By and large, the OWEL WEC is made of off-the-shelf components, and should not face significant challenges during its construction, installation and O&M due to its simple design.

The OWEL WEC also avoids the obstacles faced by near-shore machines which, despite possessing a simple design, will require extensive engagement with the multitude of near-shore stakeholders e.g. locals and tourists, the fishing industry, the MOD and dredging companies, to develop its projects. In addition, there are a limited number of near-shore sites with appropriate resources which makes near-shore machines a niche application in wave energy.

The WEC Marine Demonstrator

The demonstrator has been designed to be moored offshore in highly energetic, deep water locations.

It has few moving parts and none in contact with the water. Its robust design, simple construction and minimal machinery will help keep the cost of power low and minimise maintenance. A single OWEL unit will be deployed at the Cornish Wave Hub facility in early 2013. This marine demonstrator will primarily be used to prove that the concept works at large scale in an ocean environment.

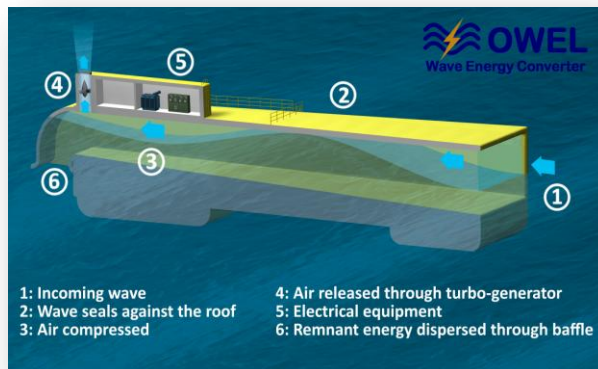


Image courtesy of OWEL

This design will be a smaller version of a suite of commercial machines that will be developed for future deployment. The device demonstrator will be developed by a national consortium of organisations that, between them, bring together the wealth of experience needed to successfully deliver a project of this nature; OWEL, IT Power, Ramboll, Narec, NPL, DNV, A&P Shipbuilders, Mojo Maritime, University of Plymouth and PRIMaRE.

The overall goal of the project is to produce a costed and DNV accredited design for a 1st generation commercial product by the end of 2013. From 2016 OWEL plans to sell this as a commercial product that will feature a number of ducts combined to form a single, 2-3MW platform.

Markets and Regions

The WEC's demonstration project will be located off the South West coast of the UK, at Cornwall's offshore marine energy research centre - Wave Hub. As the technology becomes commercially scaled,

Chile are all blessed with marine energy resources to provide attractive returns on investment, even in the absence of policy support.

In Search of Investment

At present, OWEL are actively searching for an investment partner to assist in the next stage of the WEC's journey to market.

Marine Demonstrator Project Specification

- Single duct
- Rated power - 350Kw
- Overall length – 42m
- Inlet width – 17m
- Draft – 8m
- Mass – 650 tonnes

The project will demonstrate

- Large scale performance
- Construction methods
- Marine deployment and operation
- Grid connection
- Commercial viability

OWEL have a range of figures in mind:

Minimum: £2.5m – With this level of support, the company itself and the demonstration project would be fully funded for several years.

Ned Minns envisages the marine sites in the North of Scotland - leased to developers by the Crown Estate – will be the location of the first projects. The UK's South west coast will also be an attractive location, despite the relatively calmer marine environment offering less potential wave energy. Beyond the domestic market, Ned suggests that the West coast of Ireland, Portugal and



Image courtesy of OWEL

Maximum £5m -This level of investment will facilitate the building of the management team to accelerate the route-to-market and the development of commercial partnerships in advance of full-scale commercial deployments.

Business model

In the UK, Policy support in the form of Renewable Obligations Certificates (ROCs) will help bridge the gap between commercial scale marine demonstration projects and utility size installations. The Renewables Obligation currently offers 5 ROCs (valued at £45 each) per MWh of marine energy generated,

but as evidenced in the solar industry, these levels can be subject to change.

It is therefore very reassuring to hear that OWEL's long-term revenue forecasts are based on conservative levels of policy support for marine energy. At the stage of small-array developments (6-12 MW) from 2016 onwards the device efficiencies will ensure a very attractive rate of return with a support level of 3 ROCs. The present OWEL business plan assumes 3 ROCs at 2017, after which the level of policy support for marine energy is undefined. Accordingly, neither ROC's, nor any other support is included in the revenue projections beyond 2022.

These show the WEC to continue as a financially attractive investment option, with a cost of energy less than £150 per MWh by 2020 – comparable to the cost of present day offshore wind.

Project Management

Ned Minns suggests that OWEL is primarily seeking to license the technology to project developers as opposed to developing projects itself. The company does however have capabilities in project management, partially drawn from their parent company's (IT Power) expertise, and so would be able to contribute to project development if required.

Work with OWEL

Contact Points

Technical,
Ned Minns – Chief
Technical Officer
nminns@owel.co.uk
Tel: 0117 214 0518

**Finance and Investor
Relations,**
Chris Rich – Chief
Commercial Officer
crich@owel.co.uk
Tel: 07768233727

Cornwall Office
Tamaris House
Lezant
Launceston
Cornwall
PL15 9PP
United Kingdom
Tel: 01579 370058

Bristol Office
St Brandon's House
29 Great George St
Bristol
BS1 5QT
United Kingdom

The Wave Energy Converter in Summary

- **Economic Extraction of Wave Energy**
The WEC will generate electricity on a competitive basis
- **Straightforward Design**
Industry standard construction techniques will reduce cost and improve reliability
- **Robust and scalable design gives**
Survivability in the marine environment and utility scale (multi-MW) power production.
- **Unique and patented technology**
Protected in all likely deployment territories around the world.
- **Environmentally beneficial**
It is fundamental to the ethos of OWEL that the machine is benign to flora and fauna. In addition the carbon offset from the green electricity produced will be positively beneficial to the global environment.

For more information visit
OWEL's website:
<http://www.owel.co.uk/>



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Related Upcoming Events – Wave and Tidal Energy

- [International Tidal Energy Summit 2012](#)

28-29th November 2013 | London

The 6th International Tidal Energy Summit (#ITES2012) is the commercial networking forum for industry stakeholders, device developers, service providers and manufacturers.

- [Renewable UK 2012](#)

30th October – 1st November 2012 | Glasgow

At Renewable UK 2012 you will share ideas, network, and do business with leading companies in Renewable Energy.

- [Renewable UK Wave & Tidal 2013](#)

27-28th February 2013 | London

Each year Renewable UK's events provide the UK wave & tidal energy industry with the opportunity to present the latest in research and development, technological innovations, policy, public opinion and any other aspect of the industry which may be topical.

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OR

Let us know about the next exhibition you plan to attend.

If we're in attendance, we can visit your booth for an interview.

We are attending the Renewable UK 2012 Exhibition in Glasgow next month.

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London
Research
International



Elizabeth House, First Floor, Block 2
39 York Road
London, SE1 7NQ
Tel: +44(0)20 7378 7300 Fax: +44(0)20 7183 1899
<http://www.londonresearchinternational.com/>