



BREAKTHROUGH IN WAVE ENERGY HARVESTING

A Wave Energy Converter inspired by the human heart has shown step-change improvement in power capture using a new control technology “WaveSpring” invented at NTNU, Trondheim.

Stockholm, Sweden 13th March 2015 - A European sustainable technology consortium made up of the global power company Iberdrola Engineering, the Portuguese marine research centre WavEC Offshore Renewables and the Swedish technology developer CorPower Ocean is set to make public the test results from a new technology that may revolutionise the wave power sector.

The [HiWave Project](#), co-funded by KIC InnoEnergy and the Swedish Energy Agency, makes use of a new type of resonant Wave Energy Converter (WEC) based on the pumping principles of the human heart. Extensive tank testing at Ecole Centrale Nantes, has shown unprecedented efficiency rates in wave energy absorption, delivering five times higher energy density compared with previously developed technology.

“HiWave is a hugely exciting technological breakthrough in the wave power space, and we are thrilled to be supporting and funding such an innovative and state-of-the-art project,” says Diego Pavia, CEO, KIC InnoEnergy. “The implications of this are vast. HiWave has the power to decrease Europe’s energy bill, while significantly reducing our carbon footprint.”

Through a €6 million joint investment, the project consortium has joined forces with researchers from The Royal Institute of Technology of Stockholm and The Norwegian University of Science and Technology targeting half scale ocean deployment in 2016 and full scale demonstration by late 2017. The project aims to establish a new generation of wave power for off-grid and utility-scale energy generation, offering energy at a cost that can compete with conventional non-renewable energy resources.

“Ocean waves are a huge and untapped resource of clean energy. They possess an energy density several times greater than solar and higher predictability compared to wind. Wave power could potentially cover more than 10 per cent of the world’s energy demand. Assuming we can keep the same performance while scaling up the technology through the HiWave pilot we should be in a good position to tap into this market. The oceans offer a truly hostile environment and we still have a lot of work ahead of us, but the efficiency improvement shown with WaveSpring may be just what is needed to make wave power competitive,” says Patrik Möller, CEO, CorPower Ocean.

Resonant Wave Energy Converters have been researched since the 1970s. On March 18th the next generation technology from NTNU in Trondheim will be made public at an event in Stockholm, Sweden. See a full programme, and register for the event here: <http://www.kic-innoenergy.com/event/hiwave-project-grand-opening/>



Invitation to the Wave Power Seminar – In resonance with the waves

March 18th 2015, KTH campus, Stockholm, Sweden

Two recent milestones of the HiWave project will be disclosed: result from tank testing of the new phase control technology Wave Spring and a new test bench where the latest Power-Take-Off System is demonstrated in scale 1:3. A historical perspective on wave power will be given by one of the pioneers of modern wave energy research Prof J. Falnes (NTNU), while Prof A. Sarmiento (WavEC) will give an overview of the global opportunity, key challenges and current status of development in wave power.

Seminar Program

[Auditorium M3, Brinellvägen 64, KTH Campus, Stockholm](#)

14.00-14.20

Bo Normark – **KIC InnoEnergy**, Tobias Walla – **Energimyndigheten**

Patrik Möller – **CorPower Ocean**, Kjetil Mørkved - **NTNU**

Introduction to the efforts of improving wave power efficiency through the HiWave project.

14.20-15:00

Prof. Johannes Falnes – **NTNU**.

A historical perspective on wave power development – Resonant point absorbers. “To be a good absorber you need to be a good wave maker” & “Small is beautiful”. Size and power comparison between phase controlled and conventional devices.

15:00-15:30

Prof Antonio Sarmiento, **WavEC Offshore renewables**.

Wave power opportunity, key challenges & status of development. Scientific validation and numerical modelling of the HiWave Wave Energy Converter.

15:30-15.55

Björn Bolund, **Vattenfall**

Structured product verification of Wave Energy devices. Key lessons from previous projects. Do's and don'ts regarding prototype scales, performance readiness levels vs technology readiness levels.

15:55-16:15 – Coffee break



16:15-16:35

Patrik Möller, **CorPower Ocean**.

Introduction of the Wave Energy Converter technology demonstrated in HiWave. New solutions addressing challenges related to low velocity, reciprocating motion and the irregular nature of ocean waves.

16:35-17:10

Jørgen Hals Todalshaug, **NTNU**.

Introduction to the new WAVE SPRING phase control technology.

Gunnar Steinn Ásgeirsson, **CorPower Ocean**.

Tank testing and numerical benchmarking results, presentation of key metrics.

17:10-17:30

Stefan Svensson, **CorPower Ocean**, Stefan Björklund, **KTH** & Hans Hansson, **SwePart Transmission**

Cascade gear technology – a new solution for robust conversion of linear-to-rotating motion

17:30-17:45

Antoni Martinez, **KIC InnoEnergy Iberia**. A KIC InnoEnergy view on ocean energy. Programs for industrial innovation projects connecting academia, startups and industry.

Grand Opening – Wave Power Test Bench at KTH

[KTH Machine Department, Brinellvägen 83, Stockholm](#)

18:00-20:00

Wave Energy Converters are tested in scale 1:3 using a hardware-in-the-loop test rig at the Royal Institute of Technology in Stockholm. The test rig uses a custom designed electromechanical drive system supplying the Power-Take-Off (PTO) with simulated wave loading. The PTO is used to verify and debug all functions and operational modes on-land before the next scale 1:2 HiWave system will be deployed offshore in 2016. The system will be introduced followed by demonstration of the bench in operation, supplying the PTO with mechanical loads that are converted into electricity on the Swedish grid.

Press Contact

Valentino Giudice
KIC InnoEnergy Sweden
Marketing & Communication Officer
valentino.giudice@kic-innoenergy.com
+46 (0) 760 656 633

Rosie Williams
Aspectus PR London
Account Manager
rosie.williams@aspectuspr.com
+44 (0) 20 7092 8127



The WaveSpring Technology

The new phase control method called WaveSpring has been invented at NTNU in Trondheim by J. Hals Todalshaug and tested in collaboration with the HiWave project. It is a negative spring module that inherently widens the response bandwidth of point absorbers without the need for real-time wave information or prediction algorithms. The negative spring module acts directly on the linear mechanism of the buoy. This avoids the losses associated with transmitting large reciprocating energy flows through the PTO system, a challenge that has limited the practical use of phase control methods known as reactive control. Compared to other phase control methods such as latching, the WaveSpring principle offers similar amplification of power capture, but requires less than half the machinery force and therefore enables a smaller and less costly PTO. The device motion is continuous, avoiding the fatigue and wear challenges associated with more abrupt motion resulting from latching control. Combined with tribological advantages this enables improved reliability and component lifetime. Since no real-time information on the incident waves is required for making the buoy resonant, the number of sensors and active control loops can be reduced, making the system less complex which is expected to improve robustness.

KIC InnoEnergy is the European company for innovation, business creation and education in sustainable energy. We are a world class alliance of top European players. The Consortium consists of 27 shareholders and additional 100+ partners – companies, research institutes, universities and business schools covering the whole energy mix. We are organised around six offices: France, Benelux, Germany, Iberia, Poland and Sweden. Our mission is to foster innovation through the integration of education, research and business creation. Our vision is to become the leading engine of innovation in the field of sustainable energy. <http://www.kic-innoenergy.com/>

CorPower Ocean is an innovative Swedish developer of resonant Wave Energy Converters inspired by the pumping principles of the human heart. Phase control technology significantly amplifies power capture, enabling five times higher energy density compared to a conventional passive Wave Energy Converters. Survivability in storms is achieved by detuning the phase control, making the devices more transparent to incoming energy, similar to pitching down the blades of a wind turbine. The company was founded in 2009 by Dr Stig Lundbäck, after he had spent about 30 years of his life designing various kinds of high efficiency pumping systems. www.corpowerocean.com

Iberdrola Engineering is a leading energy infrastructure company specializing on turnkey projects in the field of generation, nuclear, smart grid and renewable energy. The IBERDROLA Group is a pioneer in marine energy harnessing, with multiple projects in wave and tidal power, and offshore wind power where it is already carrying out projects totalling over 8,000 megawatts(MW). www.iberdrolaingenieria.com



WavEC Offshore Renewables is a Portuguese non-profit research organization offering due-diligence, strategic studies, performance monitoring, environmental and technology assessments to clients within the field of marine renewables. WavEC has developed extensive expertise in fields such as numerical modelling, techno-economic assessment and market research through its involvement in numerous offshore energy projects over the last ten years.

www.wavec.org

