

MARINE ENERGY IN ABERDEEN CITY AND SHIRE



AREG members have a unique combination of marine energy skills, gained through their current work on renewable energy projects around the globe and backed up by over four decades of offshore energy engineering for the international oil and gas exploration and production industry.

Our member companies are involved in the complete spectrum of marine renewables activities from design and engineering, project management, survey and installation, cargo and access logistics to emergency response and full service project management.

AREG hosts regular networking meetings to share marine energy information, contacts, market intelligence and project development briefings with its members.

Aberdeen - The Energy Capital of Europe

Over the last 900 years, Aberdeen's strong maritime heritage has influenced the development of its economy and encouraged extensive trade links to be established all over the world. Complementing this indigenous local expertise, over forty years of international offshore oil and gas exploration and production operations, based in the city, has provided a solid foundation of business innovation, R&D and engineering expertise.

Aberdeen City and Shire businesses have been involved in developing best practice solutions, world class QHSE processes and robust offshore applications and have become experts in managing complex engineering projects to the very tightest of timescales in the most challenging of environments.

With this depth of energy experience under their belts, businesses in 'The Energy Capital of Europe' are relishing the challenge of applying their well-honed

skills to new offshore engineering challenges in the renewable energy market. Aberdeen City and Shire's inherent expertise is particularly suited to wind, wave and tidal energy engineering.

These skills, combined with strong international business networks and two universities providing postgraduates with appropriate skill sets, means that the region is rightly leading the way in Scotland's and the UK's plans for renewable energy development.

The Scottish and UK Resource

- Scotland is uniquely placed to be a leader in the development of wave and tidal technology, having not only the skills to drive forward this new industry but being favoured with very significant wave and tidal resources. The scale of the resources available for exploitation clearly indicates the resultant scale of the industrial opportunity – more than 25% of Europe's wave energy resource and 10% of the tidal energy resource (Scottish Government). Looking beyond Europe, it is estimated that wave power alone has an estimated global potential in excess of the world's electricity consumption.
- Wave power has an estimated global potential of around 1-10 TW (World Offshore Renewable Energy Report 2004-2008, UK Renewables).
- The electricity capacity of the UK grid in 2009 was approximately 83 GW (National Grid).
- The UK has the best wave and tidal resource in Europe (RenewableUK).
- Potential for 14GW of wave and 7.5GW of tidal generation round Scottish coastlines resulting in up to 79.2TWh/yr round its coastlines (Scotland's Renewable Resource, The Scottish Executive in 2001).
- A significant proportion of this resource is clustered around the Pentland Firth, Orkney, Shetland and the west coast of Scotland.
- In the ocean between the Scottish mainland and the Orkney Islands, the concentration of fast flowing currents makes the Pentland Firth one of the top tidal energy zones in the world.
- In Orkney, the European Marine Energy Centre (EMEC) was set up to enable and encourage the testing of full-scale wave and tidal energy devices. The data provided from this testing enables developers to prove certainty to potential investors, publicise the success of their designs and maximise and refine their device development and next-steps progress.

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The Power of Partnership

Market growth is mirrored by the formation of alliances, networks and partnerships within the renewables supply chain. In Aberdeen City and Shire, a number of organisations are pooling their talents to strengthen their position and maximise available business opportunities. AREG is working hard to facilitate these networks, aiming to introduce its members to other like-minded businesses both here and overseas.

This support role is also underpinned by AREG's close ties with the public sector and other industry bodies including energy organisations such as RenewableUK, EWEC, Scottish Renewables, Subsea UK, North Scotland Industries Group, The Energy Institute, business development and international trade bodies such as UK Trade and Invest, Scottish Development International, Scottish Council for

Development and Industry, Scottish Enterprise, the Chamber of Commerce and a grouping of economic development interests from all the east coast Scottish councils. These links encourage knowledge sharing and allow cross promotion of initiatives and business opportunities to members as well as group strength in campaigning for change.

SUPPORT

- The main instrument to support the development of all types of renewables in the UK are Renewable Obligation Certificates (ROCs). Scotland has its own ROC system, offering enhanced certificates to wave and tidal electricity generators. The system operates by placing an obligation on UK suppliers of electricity to source an increasing proportion of their electricity from renewable sources. A ROC is a certificate issued to an accredited generator for eligible renewable electricity generated within the UK and supplied to customers by their licensed electricity supplier. One ROC is issued for each megawatt hour (MWh) of eligible renewable output generated.
- ROC support is banded, which means that technologies which are furthest from commercial viability are given the most support. In Scotland, wave generators can achieve 5 ROCs and tidal 3 (both technologies only attract 2 ROCs in England) compared to offshore wind at 1.5 ROCs.
- ROC support offers certainty to developers and investors, and has led to Scotland and the UK being considered as the prime development area for marine renewables.
- The Marine Renewables Proving Fund (MRPF), the Marine Renewables Deployment Fund (MRDF) and the Marine Energy Accelerator are initiatives from the Carbon Trust. The Carbon Trust is a key agency working to administer funding provided by DECC to encourage marine renewables development. The MRPF handed out £22m to two wave and four tidal energy developers in February 2010.
- The Scottish Government has taken a leading stance in the development of marine renewables with such initiatives as the Saltire prize, WATES (Wave and Tidal Energy Support scheme) and WATERS (Wave and Tidal Energy: Research, Development and Demonstration Support fund). Scottish Enterprise will manage and administer the WATERS fund on behalf of and in partnership with the Scottish Government and Highlands and Islands Enterprise.
- The Saltire prize will award £10 million to the team that can demonstrate, in Scottish waters, a commercially viable wave or tidal stream energy technology that achieves the greatest volume of electrical output over the set minimum hurdle of 100 GWh over a continuous two year period.
- The Crown Estate awarded seabed leases to ten wave and tidal projects in March 2010. 1.2 GW is targeted to be produced from 600MW of wave projects and 600MW tidal. 5,000 jobs in Scotland are predicted from this first phase of development.
- Seven more areas on the west coast of Scotland will be opened up to development later in 2010.

Local Capabilities, Global Solutions

AREG's member organisations are involved in the full range of marine energy supply chain delivery encompassing project management, research and development, design, engineering, deployment, maintenance and monitoring.

At these early stages of development, many are commercially unable to publicise details of their specific project involvements, but we look forward to hearing many news announcements of significantly high profile and high value contracts for the world leading developments planned by these Aberdeen City and Shire businesses.

Here are just a few examples of what is happening in the region:

Projects

GREEN OCEAN ENERGY AND WAVE TREADER

An innovative and forward looking company utilising skills honed in the offshore oil and gas industry, Green Ocean Energy was formed in 2005 to meet the needs of the emerging marine energy market. The company is dedicated to developing wave energy devices and their Wave Treader machine is designed to deploy onto offshore wind turbine towers, thus negating the need for stand-alone mooring systems.

Wave Treader is a unique wave energy device which attaches to the transition piece of an offshore wind turbine. Combining Wave Treader with an offshore wind farm shares the offshore cable infrastructure and also increases the energy yield from the sea area that is licensed. Wave Treader also assists in power smoothing in the offshore wind farm and offers improved personnel access to the turbine, both of which are major benefits to the site developers. The device can be attached to various types of foundations such as monopiles or jacket structures.

The device is a derivative machine from Ocean Treader which is a free floating wave device, which will be deployed in arrays moored to the sea bed. A full scale Wave Treader prototype is under construction, and will be deployed in Scottish waters in 2011. The device will be commercially available in time for deployment on the Scottish Territorial waters or UK Round 3 offshore wind farm sites.

For further information please call 01224 651 051 or visit www.greenoceanenergy.com



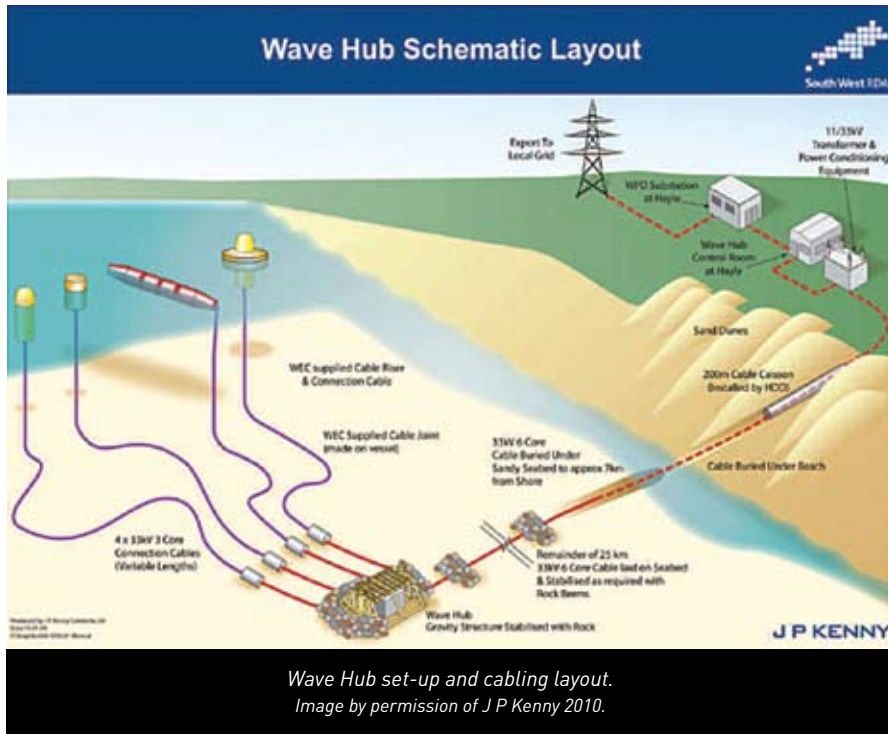
First Minister Alex Salmond visits the Green Ocean Energy team, where the team took the opportunity to explain how this unique technology works, and the benefits that it will bring to marine renewables in Scotland.

Copyright Green Ocean Energy Ltd.



The potential deployment of Wave Treader designed to increase the output of an offshore wind farm.

Copyright Green Ocean Energy Ltd.



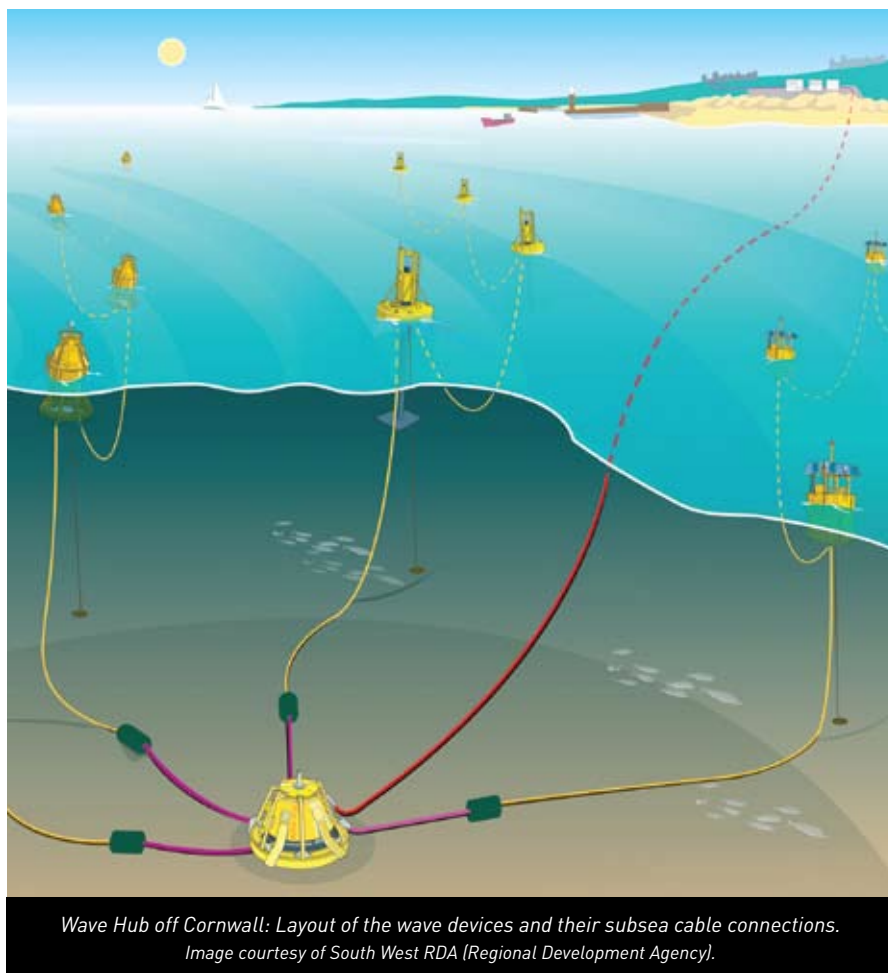
J P KENNY AND WAVE HUB

J P Kenny has been awarded the contract for the management of the Wave Hub project in Cornwall. A £30m project funded by the UK government, South West Regional Development Agency and the EU, this will be the world's largest wave energy device testing site. With an initial capacity of up to 20MW, pre-commercial testing of wave energy devices will be possible on an unprecedented scale.

JP Kenny are responsible for supporting all aspects of the project development cycle from conceptual design to operational support. Like other Aberdeen based businesses, the company has an established track record in the oil and gas industry but recognises the specific requirements of offshore renewables.

The organisation's key capabilities enable them to provide comprehensive services across all aspects of a marine renewables project life-cycle - from the earliest conceptual studies, through to the optimisation of architecture, detailed design and operations and maintenance to ensure delivery of a fully integrated project.

For further information please call 01224 347 300 or visit www.jpkenney.com



JDR CABLE SYSTEMS LTD AND WAVE HUB

JDR Cables provides custom designed and manufactured subsea power cables, umbilical systems and specialised marine cables and was awarded a contract by the South West RDA (Regional Development Agency) for the supply of subsea power cables for the UK's ground-breaking Wave Hub project.

The Wave Hub system's berthing area offers four discreet segments, each with the potential for single wave energy converter operator occupation, linking their individual device arrays to the system by means of a cable riser connected to one of four 33kV, three phase Wave Hub Tails tied back to the Wave Hub Chamber.

JDR will install 25km of 33kV three-phase power cables which will provide the link between the Wave

Hub and the onshore control room. Wave energy converters are connected back to the Wave Hub by four additional 300m three phase power cables and dry mate connector sets. All cables include fibre optics and will be subject to rigorous integration testing. JDR will also supply the Wave Hub assembly consisting of subsea terminations and a complete subsea protection structure. The first wave energy devices are expected to be deployed in 2011.

Custom-engineered by JDR, this project draws on a wealth of experience in the design and manufacture of subsea cables and umbilical systems to deliver a solution that will meet the demanding requirements of this innovative application.

For further information please call 01224 224 362 or visit www.jdrcables.com

HYDRO GROUP

Hydro Group is fulfilling a £½ million contract for JDR Cables, to supply high-voltage connectors for Wave Hub, the marine renewable infrastructure project situated 16 kilometres off the coast of Cornwall, which is connected to the National Grid via a subsea cable.

After assessing the new technology required for the emerging marine renewables industry and undertaking considerable R&D work, the Group developed a 12 kV dry mate connector to ensure the electrical output from the energy converters

is transferred to the seabed hub. The Group has developed these specialist assemblies that not only carry the electrical output from the energy converters, but they also combine optical fibre technology. The company sees marine renewables as a key focus both in the UK and internationally, and this contract win at Wave Hub, which is the largest wave and tidal energy project in the U.K., signals market confidence in its subsea technology expertise.

For further information please call 01224 822 996 or visit www.hydrogroup.plc.uk

VATTENFALL, PELAMIS AND THE AEGIR PROJECT

Vattenfall are the fifth largest utility company in Europe and a well known Swedish name in renewables, with particular interest in renewable heat and wind power. They are a joint partner with AREG in the European Offshore Wind Deployment Centre project in Aberdeen.

In partnership with Pelamis Wave Power, Vattenfall is also exploring wave power development opportunities in Scottish waters and plan to deploy the Pelamis P2 machine off the Shetland Islands. This venture, named 'Aegir' is keen to identify and confirm an initial potential site to install a multi-

machined array of up to 20MW, with the option to increase up to 1GW. This project is just one in Vattenfall's Ocean Energy Programme, which aims to meet the demands of their customers and support their strategic policy of clean electricity. Vattenfall are a good example of a major international utility identifying the collective benefits of an experienced local supply chain and skills base and proximity to excellent wave regimes and testing facilities.

For further information please call 01434 611 300 or visit www.vattenfall.co.uk



NEPTUNE DEEPTECH

In the construction of the Pelamis P1 device, Neptune Deeptech built the full scale Joint Rig for first phase onshore testing, followed by three power modules for the full scale prototype, launched in 2004. The successful proving of the technology led to another nine power modules being manufactured for the deployment at Agucadoura, Portugal. The Pelamis device, now advanced to a P2 machine, continues to utilise Neptune Deeptech's fabrication capabilities, in a diversification from their traditional oil and gas activities.

For further information
please call 01569 767 888 or
visit www.neptunems.com



These images show fabrication of the joint rig for the Pelamis wave energy device by Neptune Deeptech at their Stonehaven facility. The joint rig is a full scale joint module for onshore testing purposes. Images by permission of Neptune Deeptech and Les Black Photographer Ltd 2010.

BALMORAL OFFSHORE ENGINEERING (BOE)

With a long standing reputation for reliability and quality in the oil and gas industry, BOE recognised emerging opportunities in renewables a number of years ago. The company specialises in polymer engineering, manufacturing a wide range of equipment, from turbine nacelle covers to subsea cable protection. They also manufacture a range of fibre-reinforced products (FRP) which have the advantage of being tough, corrosion resistant, lightweight and virtually maintenance free –

ideal for moulding complex shapes and achieving high quality repeatability on surface finish and tolerances. A wide range of elastomer products, state-of-the-art manufacturing capability and a recently upgraded subsea test centre are all designed for BOE to assist and service the development of the renewable energy market into the future.

For further information please call 01224 859 000 or visit www.balmoral-group.com

BMT GROUP LTD

BMT Group is a multidisciplinary network of environmental and engineering consultancies. Through this network BMT Group provides an extensive range of specialist services across a diverse range of market sectors both in the UK and internationally. The drafting of standards on reliability, maintainability and survivability of marine energy converters was just one project undertaken for the marine energy market by BMT recently.

With a long standing track record, BMT delivers significant, integrated environmental services and solutions in the UK and internationally in terrestrial and marine environments. Their clients range from renewable energy developers to oil and gas operators with projects ranging from full scale Environmental Impact Assessments to individual technical studies.

For further information please call 01224 414 200 or visit www.bmtcordah.com



*BMT staff visiting the Pulse tidal technology demonstrator in the Humber as part of a supportability assessment.
Image by permission of BMT 2010*

DRAKA AND EMEC

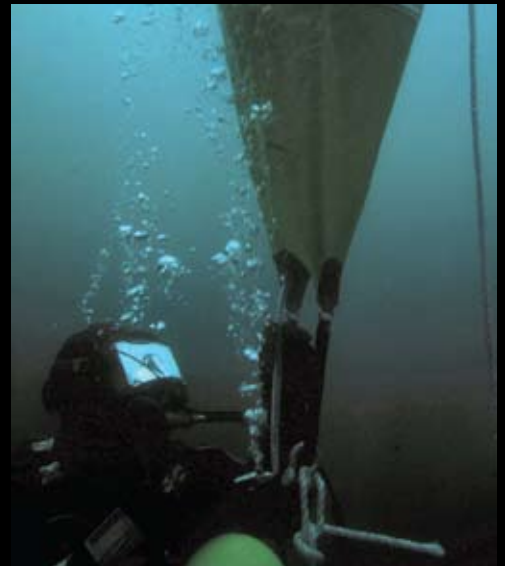
With a background in engineering for the oil and gas and subsea markets, Draka Offshore was an early adopter of renewable energy opportunities and now delivers cabling solutions to the complete offshore marine energy market. A division of Norwegian owned Draka Holding N.V, the company's offshore operations in the UK are located in Aberdeen and were recently awarded a contract to deliver approximately 11,000 meters of 20kV submarine power cables and accessories for the European

Marine Energy Centre's (EMEC) tidal and wave energy test sites in Orkney. The wave and tidal sites are designed to test a range of machines down to a depth of 50 meters and up to 2 kilometers from shore. The cables will be used to extend the EMEC test sites to create three new grid-connected berths, two at the tidal test site and another at the wave test site.

For further information please call 01224 244 807 or visit www.drakamog.com



EMEC's Billia Croo wave energy site in Orkney: Yellow lines show where 11kV subsea cables lie descending to 50m depth, 1.2km from shore at locations 0.5km apart.



Diver working at EMEC



Open Hydro's open-centre 10m turbine that was installed in the Bay of Fundy, Canada, and successive generations of its device continue to be trialled at EMEC.



EMEC cabling assembly through the Draka factory. The picture shows the laying up operation of three power cores with additional fillers to circularise the cable. Image by permission of Draka 2010.

MOTT MACDONALD

Mott MacDonald are an international firm with five Scottish offices, including Aberdeen. They have been the consultant engineers on a number of high profile renewable energy projects including technical reviews of devices by developers such as AWS Ocean Energy Ltd, Pelamis Wave Power and for Aurora Environment for the Siadar Wave Energy Project off the Island of Lewis. Covering the whole project cycle for offshore renewables, the Mott MacDonald team combines engineers, planners, financial analysts and safety specialists as well as environmental specialists.

For further information please call 01224 641 348 or visit www.mottmac.com

SEAROUTE PORT SERVICES LTD

Cargo handling and shipping for the marine energy industry is a crucial part of the logistical supply chain, assisting to maximise efficiency and reduce downtime. Searoute Port Services has identified the requirements for the movement and handling of break-bulk or containerised equipment for the marine energy market and is already heavily involved

in this sector worldwide. The company is keen to support the industry and is positioning themselves as readily available to handle specialised requirements for single item freight and non-typical loads.

For further information please call 01224 581 777 or visit www.searouteportservices.co.uk



All images show Searoute Port Services handling wind turbine components at Cambeltown.
Images by permission from Searoute Port Services

News and Regional Resources

THE CENTRE FOR RESEARCH INTO RENEWABLE ENERGY

The Centre for Research into Renewable Energy is a joint initiative between the University of Aberdeen and the Robert Gordon University and supported by Aberdeen City Council. The initiative is designed to strengthen the research capacity of the two universities in renewable energy technologies and is led by Professor Hicham Indriss who holds the Joint Chair in Energy Futures.

The initiative is building on existing marine energy expertise at the Robert Gordon University, particularly their Sea Snail device, and bio-energy and wave energy expertise at the University of Aberdeen. Both universities currently conduct research into fuel cell technologies and have excellent links with local industry. By integrating these research strengths and building a critical mass of researchers, Aberdeen is underpinning the skill sets required for a growing renewable energy industry.

RELOCATION OF RENEWABLES OPERATIONS

Technip has recently announced its intention to headquarter its renewable operations in the city, in addition to the staff already working here on hydrocarbon projects. The awakening of many companies to the opportunities in renewable energy has been assisted by AREG's programme of lobbying, promotion and events, with dedicated workshops on

the skills transfer and work required to make the transition a successful one. Fugro recognises the current and future importance of offshore renewable energy developments to its businesses and that the Aberdeen-based Fugro companies are already active in the sector, with plans to increase their activity as the sector's demands for its services increase.

SEGEC

SEGEC aims to support Scottish engagement in European activity by influencing policy, identifying opportunities and accessing funding for large scale infrastructure projects. Sponsored by the Scottish Government, Scottish Enterprise, Highlands and Islands Enterprise, Scottish Power and Scottish and Southern Energy, and part funded by the ERDF, SEGEC will play a catalytic role in accelerating the development, demonstration and deployment of new energy technologies. Currently SEGEC are supporting AREG by facilitating the consenting process for the European Offshore Wind Deployment Centre – SEGEC supported AREG in their successful bid for €40 million European Funding for this project.

SCOTTISH ENTERPRISE ENERGY AND LOW CARBON TECHNOLOGIES TEAM

The Scottish Enterprise Energy Team (SE) is a specially created division within Scottish Enterprise tasked with advancing Scotland's energy sectors. The SE Energy team continues to play a pivotal role in the ongoing development of the energy sector by helping companies seek out and grow markets at home and overseas.

Comprising a team of experienced energy industry professionals, the SE Energy Team brings a wealth of knowledge to bear on the issues confronting companies in all sectors of the power generation, oil and gas, and renewable energy industries.

The Energy Team operates on two levels – representing the broad interests of the Scottish energy and power sector on a national and international stage, whilst also aiming to broker contacts for and give profile to individual companies within the industry as appropriate depending on the nature of the project under consideration.

Scottish Enterprise are also administering the new £12 million WATERS fund on behalf of and in partnership with the Scottish Government and Highlands and Islands Enterprise to aid wave and tidal projects to progress. The fund will support the testing of new wave and tidal prototypes in the seas around Scotland, as well as assist in the development of new technologies, up to the prototype stage, especially those which increase the effectiveness of installation, operation and maintenance of wave and tidal energy devices.

Key support organisations and sources of assistance:

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