



Wave & Tidal Energy

NETWORK

COMMUNICATION HUB FOR THE WAVE & TIDAL ENERGY INDUSTRY

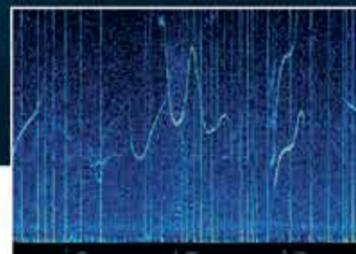
UNDERWATER NOISE

SPOTLIGHT ON...
IRELAND

Innovations



Marine Acoustic Solutions for the renewables industry



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LEAD BY THE INDUSTRY FOR THE INDUSTRY

WELCOME TO WAVE & TIDAL ENERGY NETWORK EDITION 4

As stated this publication is for the industry and it will be lead by the industry so we want you to continue to play your part in ensuring that this is the best vehicle of communication for all involved in the wave and tidal energy industry.

FOUNDING PARTNERS MEETING

Now into our 4th edition we welcome the continued support of our 'Founding Partners'.

A Founding Partners meeting took place at RenewableUK's Wave & Tidal Conference and Exhibition in Edinburgh at the EICC in late February 2015. Feedback was extremely positive and we thank all attendees for their advice, ideas and time – it is much appreciated.

EDITORIAL CONTRIBUTIONS

Please feel free to contribute to the next edition. The next edition will be our Autumn issue as the feedback we have received from the industry in general points towards a quarterly publication.

Your contributions will be vital to this success so please do not hesitate to get in touch.

SPOTLIGHT ON IRELAND

County Mayo sponsors and leads this substantial spotlight feature fondly described as the 'Heartbeat of the Wild Atlantic Way'.

Situated in the West of Ireland is at the heartbeat of the Wild Atlantic Way (WAW) tourist route which is (1500 miles) driving coastal route, stretching from Malin Head, County Donegal in the North West, to Kinsale, County Cork in the South running along Ireland's entire Western seaboard.

ATLANTIC POWER

The West Coast of Ireland has the potential to harness an astonishing 5000MW of renewable energy from their powerful world renowned wave resources. Detailed strategic environmental appraisal indicates that this 5000MW of raw renewable wave energy can be harnessed without generating any likely significant adverse effects on the environment.

FEATURES – GET INVOLVED

As the magazine grows so will the individual features on all sorts of areas within the industry.

These features will emanate from our discussions with leading experts during our visits to conferences and events, as well as our editorial team bringing up subject areas when looking at the industry as a whole.

Please feel free to contact us if there is any subject area which you think may be of interest to our readership and we will do the rest – there is never any charge for genuine editorial.

You will find our 'Forthcoming Features' tab on our website in the magazine section.

MAGAZINE AND WEBSITE INTERACTION – QR CODES

As with our sister publication Wind Energy Network we have pink and green flashes indicating more information online.

QR codes have been substituted in the printed version which means that you can scan the code with your smart phone and it will direct you to the featured company or organisation micropage/additional information held within our website, so that you can learn much more in all sorts of formats.

These have already become very popular as it links the printed magazine in a very interactive way – a great marketing tool for our decision making readership to find out about products and services following the reading of an interesting article.



Duncan McGilvray
Editor
Wave & Tidal Energy Network

[Click to view more info](#)

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Our cover image is credited to Phil Johnston – it features Bottlenose Dolphins taken at Fiordland, New Zealand on behalf of Sieche Limited who have sponsored our Underwater Noise feature.

The articles within the feature should shed some light on the reasoning and complexity of this very interesting subject area.

SPOTLIGHT ON IRELAND

We revisit Ireland, a leader in Wave & Tidal technology.

INNOVATIONS

Any new industry requires the energy, enthusiasm and foresight of the engineers and designers who work within it – the articles within this sizeable feature do not disappoint.

FOUNDING PARTNERS

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**Duncan McGilvray - Editor
Wave & Tidal Energy Network**

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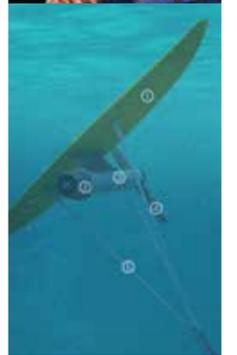
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OUR FOUNDING PARTNERS:





Reproducing Nature's Laboratory at Large-Scale

On the outskirts of the small market town of Wallingford lies Howbery Park, a vibrant and grassy campus owned by HR Wallingford Group and the headquarters of HR Wallingford Ltd. The company has been sited on the park since 1952 when it started life as a government agency, Hydraulics Research Station, before becoming privatised in the 1980s as part of the government initiative to move the business into the private sector. The company changed its name to HR Wallingford Ltd as a nod to its roots and continued to diversify and grow into the independent international consultancy that is today.

HR Wallingford are involved in marine and freshwater projects worldwide and has satellite offices across the globe to support its growing client base. Work, however is carried out in Wallingford, where lines of communication between technical groups and on-site facilities can remain short and efficient to provide a technical suite of services to the client in the most timely fashion.

The company remains at the forefront of technological advancements within industry through both its pool of technical specialists and its unrelenting investment into a self-funded program of research and development. With many staff retaining active roles of PhD supervisors, visiting professors as well as members of various working groups and councils, HR Wallingford is in a unique position to co-fund and invest in areas of innovative research to bridge challenging knowledge gaps realised by their clients.

R&D PROJECTS AT THE CUTTING EDGE...

The in house acoustic modelling tool, **HAMMER**, is compliant with the most recent guidance on underwater sound measurement and modelling and has been peer reviewed, validated and benchmarked against collected data and other models using standard methods.

HR Wallingford developed **SMARTide** (Simulated Marine Array Resource Testing), a unique suite of two dimensional (2D) hydrodynamic models of the UK's continental shelf including the North-West European coastline. The model was commissioned and funded by the Energy Technologies Institute (ETI) with the purpose of creating a valuable tool in site selection as it assesses the interactions between tidal energy systems (tidal range and tidal stream) at high resolution.

A European Research Council funded grant (**URBANWAVES**) joint with University College London will use HR Wallingford's world leading pneumatic Tsunami Simulator later this year to investigate tsunami loading on single and multiple buildings among other phenomena. This will allow a wider range of tsunami hazards to be investigated as well as exploring more fundamental behaviour within a larger facility than previously possible.

WORLD CLASS FACILITIES....

Although investment into facilities is an ongoing concept for the company, its physical modelling hall and navigation centre was catapulted into the limelight in October 2014 with a grand opening by Lord Heseltine. The UK Ship Simulation Centre was purpose built to house HR Wallingford's suite of four real-time simulators. At the same time the physical modelling hall was expanded to accommodate the next generation of physical modelling facilities – the 75 m long, 8 m wide Fast Flow Facility.

The progress of the tidal energy industry has driven the requirement for physical modelling at large scales due to the increased costs and risks associated with cable and foundation protection. As such the key area of interest in physical modelling was to be able to include sediment into the mix of wave and current interaction in order to combat potentially the most technically challenging issue of foundation and cable protection in highly dynamic environments.

....AND NOW TO THE NEW FLUME

An insight to the Fast Flow Facility in Fast Forward....click on the QR Code/video link at the end of this article to see the 6 month development captured in 3 minutes.

Professor Richard Whitehouse is a Technical Director at HR Wallingford and highly acclaimed expert in his field of sediment dynamics, having published over 30 papers with over 60 authors and receiving almost 500 citations. The new facility is the brainchild of Richard and his team. *"We realised the need to create a facility large enough to accommodate models at a scale which closer represents the conditions present in the natural environment. Our aim was simple: rule out more simplifications from physical modelling and reduce scale effects so that the models we test perform more like they would in the field, providing greater confidence in the feasibility of projects to developers and investors alike."*

In essence, Richard wanted to 'Reproduce Nature's Laboratory at Large-Scale'.

FAST FLOW FACTS...

(CLICK ON THE QR CODE/LINK)

The Fast Flow Facility provides the opportunity to explore structural interactions in a controlled environment at a larger scale and in more detail than has previously been possible. This facility builds upon 70 years of modelling experience with 15 years' experience in the offshore wind sector to provide practical solutions for complex challenges to facilitate more effective asset management. It is anticipated that the use of large-scale physical modelling facilities will significantly reduce the costs associated with marine renewable development through the optimisation of foundation design and scour protection.

The continuous sediment movement in the sea is reproduced within the Fast Flow Facility, an essential element for the successful modelling of seabed processes and wave-current-sediment interaction, while the deep sediment pit provides the capability to simulate deep foundations and buried assets, such as subsea cabling.

PROJECTS UNDERWAY...

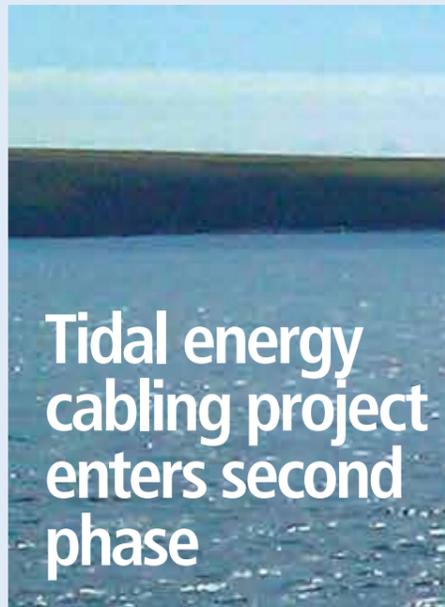
Renewables Business Development Manager, Samantha Dawson provided an insight to the projects underway: *"To date, we have used the Fast Flow Facility on a range of projects – both commercial and research. It provides us with a controlled environment where we can evaluate new and innovative scour protection systems for cables and help developers investigate novel foundation performance for large offshore developments."*

HR Wallingford

[Click to view more info](#)

= [Click to view video](#)





Tidal energy cabling project enters second phase

Scottish Enterprise has awarded contracts to Aquatera and Jee as part of the next phase of a world-leading project to develop innovative low-cost cabling solutions for Scotland's growing tidal energy industry.

In response to feedback from the industry, Scottish Enterprise's Tidal Array Cabling Solution Project was developed to look at innovative ways of installing electrical cables on the sea bed for tidal energy arrays. The seabed at tidal energy sites is often severely scoured, with large expanses of bare rock, making the conventional offshore practice of burying cables unsuitable.

PARTNERSHIP

As part of this next phase, the two companies will work in partnership to demonstrate two array cabling solutions in Orkney later this year, with a number of other Scottish companies due to be contracted to supply fabrication, materials and offshore services.

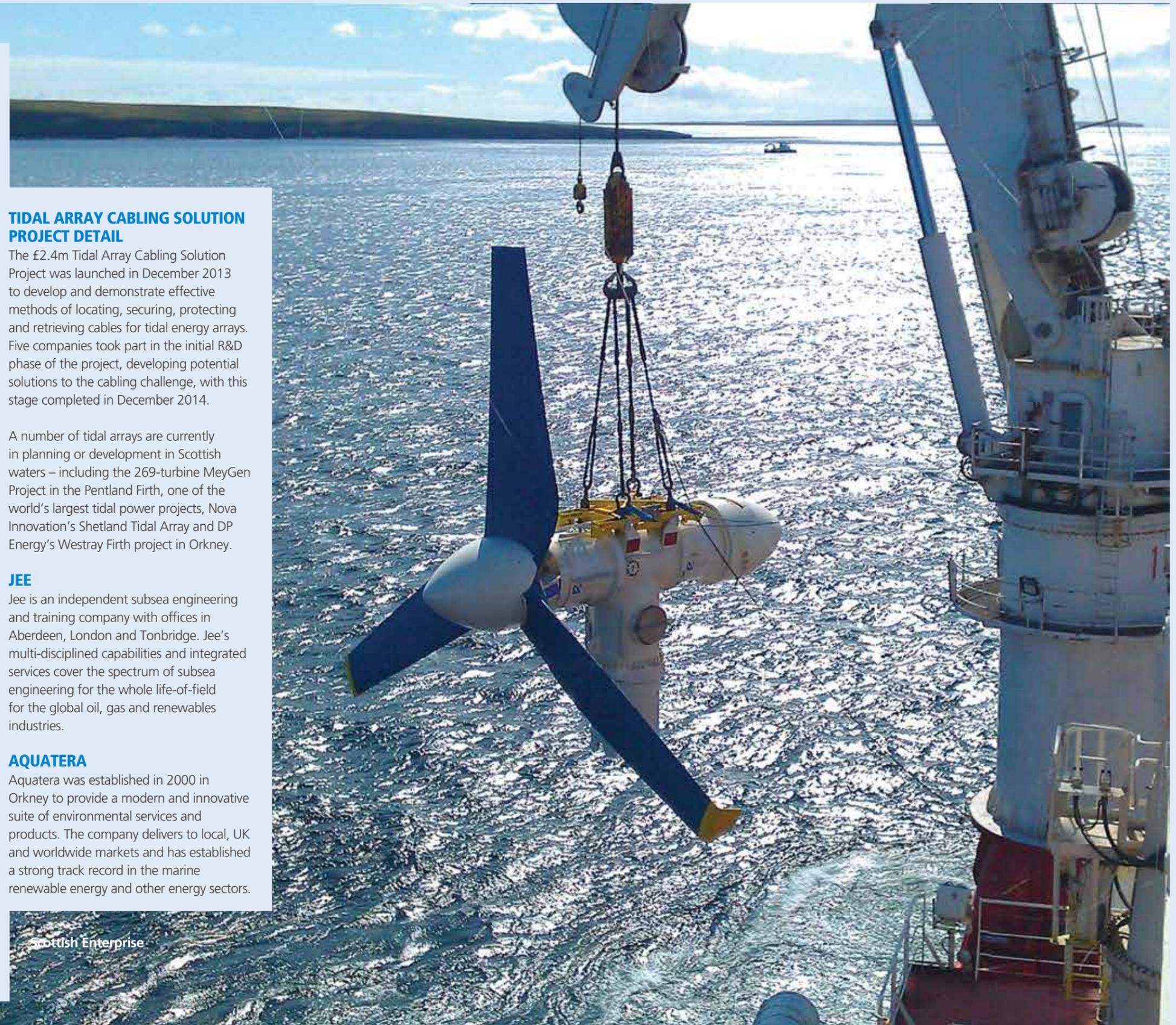


Neil Ferguson, Energy & Clean Technologies Senior Executive at Scottish Enterprise said: *"Finding safe and low-cost solutions in this field is a key requirement for the successful deployment and operation of the initial demonstration tidal arrays around Scotland. At the same time developing this new technology will be fundamental to the reduction of marine energy project costs over the longer term and enabling the successful commercialisation of the industry. The demonstration phase of this project is a key next step in achieving that and we look forward to working with both companies over the next few months."*

Jonathan McGregor, Head of Engineering at Jee, said: *"Our highly skilled team are delighted to be demonstrating the solution we have developed for this challenging tidal energy project. With decades of experience in providing innovative subsea engineering services to the expanding renewables industry, combined with Aquatera's expertise in installation, we are well placed to provide the best results for this pioneering tidal energy development."*

Ian Johnstone of Aquatera added: *"Aquatera is very pleased to be selected for this important project. We have pulled together a high quality team to develop innovative cabling solutions. The key components of our solution are cost reduction and flexibility which are vital for the industry to fully develop the tidal resource we have around our shores."*

"The process to get to this stage has involved some intense workshops and problem solving as well as detailed financial analysis. Over the coming months we will construct our chosen design and trial it in Orkney waters using the local supply chain. We are confident that we can prove our option can deliver the project objectives to the benefit of the whole industry."



TIDAL ARRAY CABLING SOLUTION PROJECT DETAIL

The £2.4m Tidal Array Cabling Solution Project was launched in December 2013 to develop and demonstrate effective methods of locating, securing, protecting and retrieving cables for tidal energy arrays. Five companies took part in the initial R&D phase of the project, developing potential solutions to the cabling challenge, with this stage completed in December 2014.

A number of tidal arrays are currently in planning or development in Scottish waters – including the 269-turbine MeyGen Project in the Pentland Firth, one of the world's largest tidal power projects, Nova Innovation's Shetland Tidal Array and DP Energy's Westray Firth project in Orkney.

JEE

Jee is an independent subsea engineering and training company with offices in Aberdeen, London and Tonbridge. Jee's multi-disciplined capabilities and integrated services cover the spectrum of subsea engineering for the whole life-of-field for the global oil, gas and renewables industries.

AQUATERA

Aquatera was established in 2000 in Orkney to provide a modern and innovative suite of environmental services and products. The company delivers to local, UK and worldwide markets and has established a strong track record in the marine renewable energy and other energy sectors.

Scottish Enterprise

New deal with world's biggest tidal turbine

Safety seal manufacturer Roxtec has provided its waterproof sealing solution to the largest and most powerful tidal turbine in the world.

Manchester based Roxtec UK Managing Director Graham O'Hare said the deal with Orkney based Scotrenewables Tidal Power Limited (SRTP) involved Roxtec supplying the new SR2000 2MW floating turbine which is 65m long, 3m diameter and weighs 550 tons.

2015 LAUNCH

Once launched later in 2015, the SR2000 will undergo an intensive demonstration programme at the European Marine Energy Centre (EMEC), following which it will be offered to the global tidal industry as a technology with the lowest cost of energy in the sector. It is being built and tested at Harland and Wolff in Belfast and Scotrenewables headquarters.

LEADING THE WAY

Graham O'Hare said Roxtec, which exports to 70 countries was delighted to be at the forefront of developing new technology for such an innovative project in the progressive tidal power industry. He said the company's super strong watertight seals have been installed to protect the turbine's vital control systems from flooding and water ingress over a 20-year period.

BUILD SPECIFICATION

"The turbine was built in Orkney at the Harland and Wolff shipyard in Belfast and Roxtec provided support at both locations throughout the project," Graham explained.

"We have sealed a high volume of multiple electrical control and instrumentation cables of various sizes on the turbine through every bulkhead between sections. Importantly we could offer the highest standards of certified waterproof bulkhead seals. The cabling in the turbine is extensive and runs its entire length through ten compartments inside the floating hull and also cable sealing within the generator nacelles and over an exposed section linked to topside power, control and communication equipment."

"Going forward our seals are designed to be flexible with easy maintenance access and spare capacity for upgrades. This is important because the project is still in test phase and changes may be required. But our sealing solutions have been designed so changes can be carried out easily at low cost. This is in stark contrast to many traditional seals which can be onerous, costly and time-consuming to maintain and upgrade."



Roxtec MD Graham O'Hare

INDUSTRY EXPERIENCE

"Drawing on our many years' experience in the marine and renewables sector we have been able to provide support throughout the process from planning to installation to ongoing maintenance."

COMPUTER SOFTWARE

Graham said during the planning phase Scotrenewables designers were able to deploy Roxtec's innovative Transit Designer computer software.



Turbine design and construction

"Our software is a highly effective tool for engineers wanting to save time," he said. "It is the most advanced of its kind on the market and enabled their team to produce detailed drawings, quickly and simply, of cable and pipe locations which makes the installation process faster."

Graham continued that the company is keen to win more work in the tidal sector building on its formidable track record in the renewable sector worldwide.

INDUSTRY LEADERS

"Roxtec was chosen for this project because we are industry leaders in sealing solutions for the renewables sector, where we have been used in over 40 offshore windfarms in Europe," he said. "Customers

have confidence in our meticulous engineering and testing of sealing products which are the best in the world at helping protect people and assets from a range of hazards. We have a fantastic product and service to offer the tidal power and wider renewables industry."

CPD (CONTINUING PROFESSIONAL DEVELOPMENT)

The company is also able to pass on its expertise via its new CPD accredited seminars programme which examines sealing cables and pipes, covering legislation, industry standards and best practice.

Roxtec UK

Serving the world of Hydrography & Oceanography

Tide Gauges

Telemetry

Optical Sensors

Wave Recorders

CTD & Multiparameter

Current Meters

Ocean Engineering

Echo Sounders & Bathymetry

Sound Velocity

in our element

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World's first floating tidal platform ready for electricity generation

Recently the first BlueTEC Tidal Energy platform was formally named by the Mayor of Texel, The Netherlands.

The floating platform, which holds tidal turbines below the sea surface, will soon be positioned near the island of Texel – supplying clean electricity to the Dutch grid. This first BlueTEC will serve as a demonstration platform targeted at remote locations world-wide, such as islands in Indonesia, Philippines and the Pacific. It is also the start of further development of higher capacity tidal energy platforms, to be deployed in large farms.

MILESTONE

"We are very pleased that we have reached this exciting milestone for our first floating tidal demonstration platform," said Bluewater's Head of New Energy Allard van Hoeken at the naming ceremony. Mr. Van Hoeken adds: *"It is wonderful to see the Texel tidal energy project come to reality. Today's ceremony puts us a step closer to our goal of putting an all-in-one tidal energy platform on the market and delivering clean, local and endless energy to the world."*

INSTALLATION AND CONNECTION

The platform will be installed offshore the island of Texel and connected to the Dutch electricity grid – starting its electricity production before Summer. It is meant to stay there producing electricity for several years, allowing multiple turbines to be tried out.

This platform is targeted at a worldwide market, it can be shipped as containers and installed anywhere in the world, to provide clean electricity in remote areas and small islands, replacing expensive and polluting diesel generators. An important advantage of tidal energy is its predictability and consistency, bringing stability to local electricity grids.

INSPECTION AND MAINTENANCE

As all vulnerable electronic equipment is safely housed inside the unit, with easy access from the surface since it floats, inspection for maintenance and repair purposes is a straightforward matter. This makes it a truly unique product. It is also the first time that a complete, integrated tidal system is offered to the market.

COLLABORATIVE EFFORTS

The project draws on the specialist skills and experience of an impressive list of partners, many of them having their core business in the offshore oil & gas industry. *"This project is realised thanks to the close co-operation between all involved. Everyone has demonstrated huge enthusiasm – it is fantastic to be a part of that,"* concluded Mr. Van Hoeken.

MODULAR BENEFITS

The platform is a development of Damen's modular barge system – a flexible product that can be put into effect in the construction of a wide range of vessels from dredgers and jetties to ferries and pontoons.

Damen used three standard container-sized modules to construct the Texel platform. The efficiency of containerised transportation combined with uncomplicated assembly means that the platform can be transported and installed anywhere in the world.

Damen Group



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bluewater
artist impression

Permanent magnet generator chosen for Atlantis tidal turbine

Earlier this year Atlantis confirmed an order with The Switch for an integrated PM medium-speed generator that resulted from a successfully completed pre-design project carried out in 2014. The Switch generator will be used in its newest AR1500 turbine, which will be one of the world's highest yield tidal generation devices. It is designed to withstand the extreme environmental conditions expected in Scotland and Canada. The turbine is scheduled for delivery to the MeyGen project in Q1 2016.

SIGNIFICANT ROLE

The Switch also had a significant role to play in the design of the gearbox and generator mating interface. *"By integrating the generator and gearbox as a pre-tested module, we are reducing assembly risk, reducing cost and improving reliability through the reduction in the number of bearings and assembly stages required prior to full commissioning of the nacelle,"* says Drew Blaxland, ARL Chief Technology Officer.

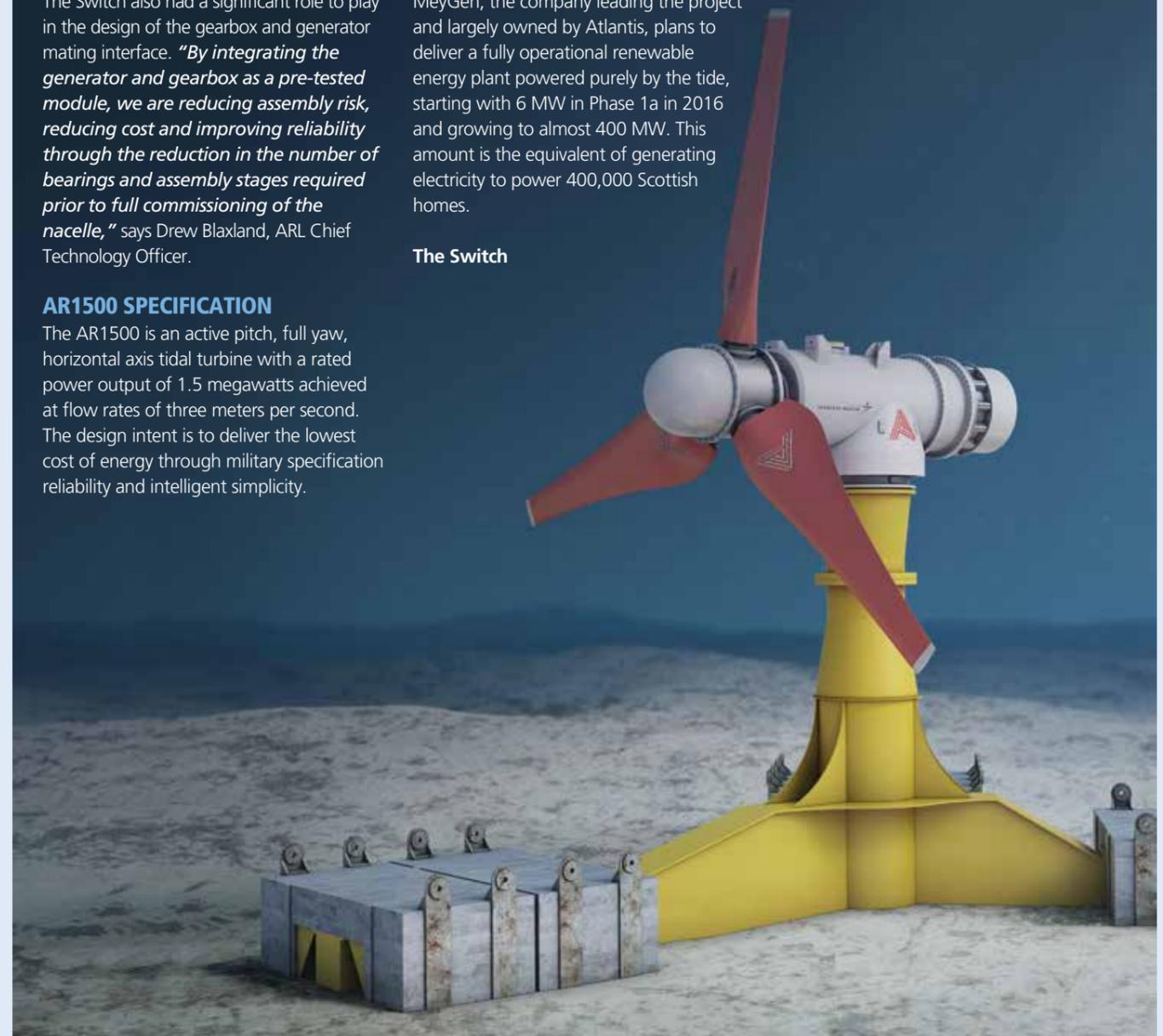
AR1500 SPECIFICATION

The AR1500 is an active pitch, full yaw, horizontal axis tidal turbine with a rated power output of 1.5 megawatts achieved at flow rates of three meters per second. The design intent is to deliver the lowest cost of energy through military specification reliability and intelligent simplicity.

AIMS AND AMBITIONS

MeyGen, the company leading the project and largely owned by Atlantis, plans to deliver a fully operational renewable energy plant powered purely by the tide, starting with 6 MW in Phase 1a in 2016 and growing to almost 400 MW. This amount is the equivalent of generating electricity to power 400,000 Scottish homes.

The Switch



JBA Consulting

We are engineers, scientists and designers, managing weather and environmental risks and opportunities for our clients. We are independent and employee-owned since 1995. This allows us the freedom to focus on innovation and our commitment to exceptional client service.

We work across a range of sectors, including renewable energy, sustainable development, government and regulatory, third sector, transport and infrastructure, utilities and insurance. We do this from 14 offices in the UK, Ireland and Asia using 350+ specialists.

DRIVEN

We are passionate about responding to current environmental challenges and opportunities; and promoting sustainable development. We do this 'the JBA Way' which is to work to a simple set of principles...

- Work collaboratively
- Embrace challenge
- Innovate, every day
- Create cutting edge solutions
- Be a partner of choice
- Work smarter



WORKING COLLABORATIVELY

Find out more about our research partnerships

OUR FAMILY

We started business in 1995 with the intention of creating a specialist consultancy with an inter-disciplinary approach to our offering. Sixteen years later, we restructured to form a new group of companies, the JBA Group. This allowed us to add to the breadth of our services while focusing even more keenly on our specialist skills and expertise.

Today, we look forward to celebrating our 20th anniversary in 2015 and to a bright future ahead. The JBA family includes...

EMBRACING CHALLENGES

Read how we are adapting to climate change



$$F_{i+1/2, j}^* = \frac{1}{2} [F(U_{i+1, j}^n) + F(U_{i, j}^n)]$$



PRIORITISING INNOVATION

Explore our Research and Development Projects

- JBA Consulting - the original consulting business
- JBA Risk Management - a specialist company for assessing and managing risk in the insurance sector
- JBA Energy - a renewable energy portfolio
- The JBA Trust - a registered charity lying outside the JBA Group, specifically created to further research and education in our areas of business

CREATING CUTTING EDGE SOLUTIONS

See how we are making the most of emerging technology

INNOVATE, EVERY DAY

Innovation is at our core. We define ourselves by our drive to do things differently, better and more efficiently. This year we won an Institute of Civil Engineers (ICE) innovation award for AssetCoast, developed in cooperation with Network Rail.

AssetCoast is an integrated asset inspection, investment prioritisation and metocean forecasting and incident management tool. It is now used by Network Rail to manage all coastal and estuarine assets in Wales. We are currently developing a new system for the South West; a region badly affected by the 2013/14 winter storms.

In 2012, we were finalists in the UK's longest running and most prestigious engineering prize, the MacRobert Award, which celebrates outstanding innovation and commercial success. This nod was in recognition of JFLOW, the first hydrodynamic flood model to use graphics processing unit (GPU) technology to improve speed and efficiency. We now use this software to produce detailed flood models at national and global scales.

REMAINING A PARTNER OF CHOICE

Meet our engineers, consultants, designers and scientists

WORK COLLABORATIVELY

Our growing success in the marine energy sector is also founded on innovation. In 2013/14 we won grants from Scottish Enterprise and InnovateUK to develop ForeCoast Marine, a sophisticated metocean planning and forecasting tool for marine energy develops (as featured in this edition).

A recurring theme of our R&D is collaboration with universities and industry, bringing together ideas, research and commercial application. ForeCoast Marine is no different to this, representing highly collaborative work involving ScottishPower Renewables, the Met Office, the European Marine Energy Centre (EMEC), the University of Edinburgh, the National Oceanography Centre and 350 Strategy.

UNDERSTANDING CLIENT NEEDS

Visit our knowledge hub to see how we are working smarter

To further develop our links with universities, we recently welcomed two students from the Industrial Doctorate Centre for Offshore Energy (IDCORE) programme. This four year course is run by the Universities of Edinburgh, Exeter and Strathclyde and comprises of intensive training at the University of Edinburgh followed by a three year industrial placement. Edward Kay and Ben Hudson will be placed with us for the next three years, conducting cutting edge research into how to reduce the levelised cost of energy using sophisticated metocean and naval architecture planning systems.

WORK SMARTER

Our success would not be possible without the dedication and hard work of our staff. Their technical expertise, combined with a collaborative approach and overall 'can do' spirit are what help make JBA a great company to do business with.



We are delighted to have recently been appointed by Tidal Lagoon Power to undertake EIA and flood risk assessment work in relation to Cardiff Tidal Lagoon and we are supporting China Harbour Engineering Company to address the environmental requirements and conditions associated with Swansea Tidal Lagoon. We are also working with EMEC to develop a ForeCoast Marine Mission Planner for their operations on Orkney, as well as Mission Planners for two large wind farms in UK and European waters.

EXCITING TIMES AHEAD

"It is an exciting time for JBA in the marine energy sector. The growth of this sector combined with our appetite for the development and application of innovative and technically challenging solutions has generated growth in new business areas, on a range of stimulating, high profile projects. Our recent appointments to the Swansea Bay and Cardiff Tidal Lagoon projects and our ongoing work with EMEC, in particular, represent an exciting new chapter for the company and our partnerships."

Many of our staff are leaders in their field. They benefit from extensive experience, professional accreditation and charterhip with organisations such as ICE, IMarEST and CIWEM. We commit to supporting all staff in their careers through individual development and training plans.

Our staff have specialist skills in: metocean planning and forecasting; environmental impact and habitat regulations assessments; flood risk management and engineering; ecosystems services and scheme appraisal; landscape assessment and design and; software development.

BE A PARTNER OF CHOICE

We have a long history of framework appointments, including the Environment Agency, the Scottish Environment Protection Agency, Yorkshire Water and council frameworks. We are currently appointed by Natural Resources Wales to undertake independent expert input in relation to marine and coastal casework, much of which is marine energy related.

JBA Consulting

Click to view more info





MONITORING UNDERWATER SOUND

Underwater sound has become an important issue. Noise created by maritime industry projects, such as wave and tidal developments, may have a negative impact on marine-life. The effects of underwater sound range from behavioural changes to permanent auditory damage.

Human divers may also be susceptible. As a result, environmental regulators worldwide have shown increasing interest in the monitoring, measurement and mitigation of aquatic sound. Particular attention has been paid to marine mammals, which have evolved to rely on the use of sound for communication and navigation. Increasing concern though is centring on the effects on fish and also marine invertebrates.

High quality monitoring of underwater sound is crucial for accurately assessing impacts on the environment. Modelling work can then extrapolate the 'soundscape' of the marine environment. But it is vital to have a full and robust data set from the field and crucially, expertise is required to fully understand and interpret the results.

Image Credit Roy Wyatt

Such information is now a key component of a quality environmental impact assessment (EIA) which then informs the most appropriate mitigation to be used in construction and/or operations.

Acoustic expertise is also frequently required during the operational phase of the project, with passive acoustic monitoring (PAM) deployed to detect and localise marine mammals. It can then ensure that the immediate vicinity around the sound source is clear of whales, dolphins or other cetaceans.

BASICS OF UNDERWATER SOUND

Sound pressure waves alternately compress and decompress water molecules as the wave travels through the sea. The basic components of a sound wave are frequency, wavelength and amplitude. Both sound in water and sound in air share these basic components of being a wave but comparing between the two mediums is fraught with difficulty, particularly when it comes to reporting sound intensity levels and sound's movement through the medium.

As a pressure wave, sound can be converted into an electrical signal so most hydrophones are based on a piezoelectric transducer that generates electricity when subjected to this pressure change.

MONITORING

Monitoring of this underwater sound signal can be done in real-time, such as for marine mammal mitigation or the data might be logged for later analysis, such as for baseline monitoring. Methods vary greatly to suit the requirement from the very simple to the highly sophisticated.

Towed hydrophones, commonly deployed from a vessel have the advantages of following a survey transect for baseline monitoring of marine mammals, but engine noise is likely to be a problem. Static acoustic buoys are flexible platforms and can be moored in position longer term and address the issue of 'self-noise', but flow noise may remain a problem. Drift buoys offer a more dynamic approach: they are built to be deployed in environments of strong flow – such as tidal currents – and provide a wealth of data, both spatial and temporal.

Pods programmed to log specific detections (such as porpoise clicks) are cheap and convenient for baseline surveys but limited in scope and may also suffer poor recovery rates. More advanced seabed-mounted data loggers extend possibilities here, including use in deep waters. Finally, unmanned surface vehicles (USVs) bring a range of exciting possibilities and their use as a platform for sub-sea acoustic monitoring looks set to grow.



MITIGATION

PAM may be deployed during the construction phase of a project. In these instances, standard JNCC guidelines are likely to apply where an operator must listen for 30 minutes before initiation of a noisy operation – to ensure no animal is detected within a 500 metre mitigation zone.

Many wave and tidal devices carry the potential risk of collision with large animals such as dolphins. This concern has led to an innovative solution at the tidal turbine currently being installed in the Ramsey Sound. A hydrophone system is mounted on the device structure to listen for marine mammals. The signal is then cabled ashore to be monitored by operators in real time. If a species of concern is detected within close proximity of the device – it may be required to shut down.

MEASUREMENT AND MODELLING

Noise measurement during industrial operations is on the increase in other sectors and around the world, particularly for pile-driving. In Germany, for instance, sound levels are required to be kept below a minimum threshold to prevent environmental impact. In turn, to reduce the output, noise abatement techniques, such as bubble curtains, may be deployed. To effect all this, accurate noise measurement in near real-time is required.

More commonly, modelling is used as a tool to predict the intensity and spread of sound – and the level of possible impact. Methods vary, but ideally extensive measured data is used from which modelling carefully extrapolates. This then provides a representation of the marine sound-scape.

Models consider the interaction between many environmental complexities. Information is required on endless dynamic variables including; the bathymetry, the sediment stratigraphy, the conductivity, temperature, depth and flow of the water. All of which influence how the sound is absorbed, reflected and refracted within the water column.

CONCLUSION

Underwater sound is a complex issue. It is also an important one with potential impacts on marine-life widely recognised as significant. Expertise in underwater acoustics is increasingly in demand, be it for equipment, academic knowledge or PAM operators in the field. General understanding is also now rising amongst developers, regulators and practitioners in the wave and tidal industry.

Seiche

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Innovative underwater noise mapping tool

ABPmer, a specialist in marine data and management, has been contracted by the Marine Management Organisation (MMO) to create a GIS tool that generates data to map the distribution of man-made continuous underwater noise in the south marine plan areas.

The outputs of the tool will improve the MMO's understanding of underwater noise. They may also inform marine planning and decision making processes.

GROWING RECOGNITION

Elena San Martin, EIA and Underwater Noise Specialist at ABPmer said: "We are excited to be developing such an innovative tool for the MMO. The marine environment experiences noise from both natural and man-made sources. Over the past decade,

there has been a growing recognition of the potential harm of man-made underwater noise.

"Although challenging to develop, the maps will assist in the creation of sustainable development policies in the south marine plan areas."

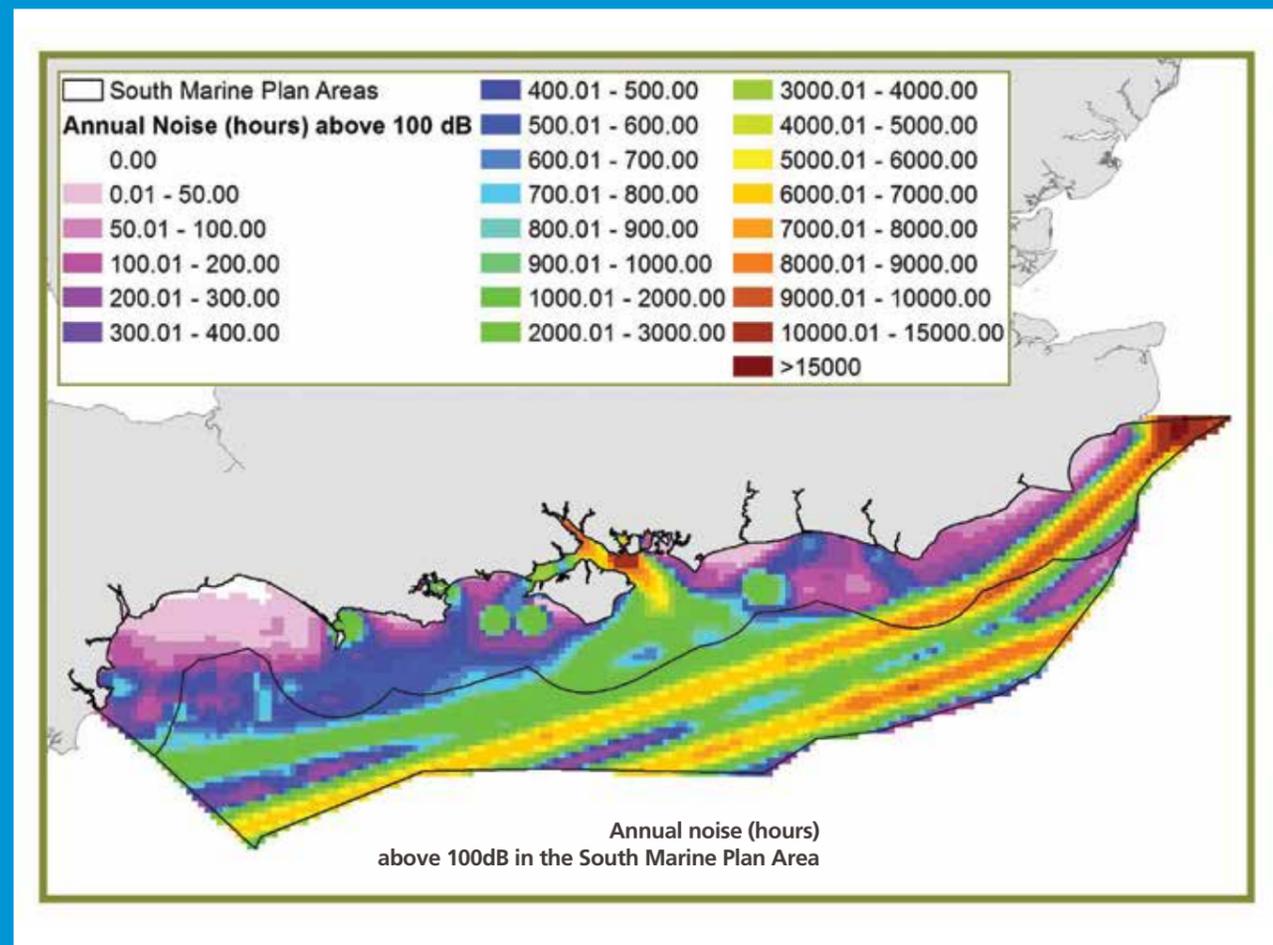
PAST DEVELOPMENTS

ABPmer is a recognised authority in marine planning and has developed a number of related tools. Past developments include

scoping a strategic co-existence assessment tool and a data processing tool to decode and display Automatic Identification System (AIS) data to understand shipping activity.

ABPmer

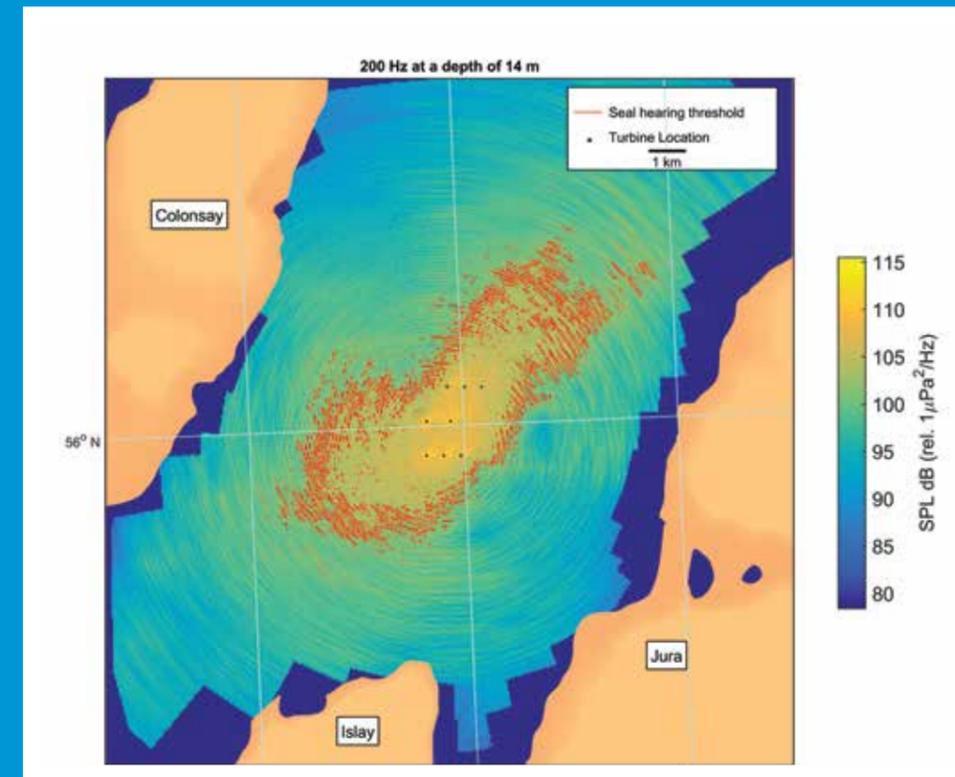
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Predicting the environmental noise impact of operational marine energy devices

Operational noise from tidal turbine provides a vital early warning to marine animals that helps them avoid potentially fatal collision with the turbine's moving parts.

loads during the design of the HS1000 tidal turbine currently deployed at EMEC. For marine equipment to harness and also survive the enormous power of the ocean it is vital that a design is mechanically robust and reliable.



PREDICTING ACOUSTIC SIGNATURES AND CUMULATIVE NOISE

The work on tidal turbine design and acoustic output from wind turbines is now being used to assist marine developers to predict the acoustic signatures and cumulative noise generated by arrays of marine renewable devices.

The company provides developers with 3D acoustical maps of device noise output taking into account individual device designs and the sea floor bathymetry interactions. These acoustic maps can be compared to acoustic data recorded by partners, such as SRSI and to hearing threshold curves of

The designs of tidal turbines are rapidly evolving and it is often impossible to measure the acoustic output of the devices before they are placed into environments where they interact with marine animals.

WEST ISLAY TIDAL ENERGY PARK

Xi Engineering Consultants are combining their acoustic models of operational tidal turbines with ambient noise measurements to predict the range at which marine animals can hear tidal turbine arrays and avoid them.

The company's work recently formed part of the environment impact assessment of the West Islay Tidal Energy Park submitted to Marine Scotland by DP Energy.

EXPERIENCE

Xi have been working on acoustic and vibration problems in onshore wind turbines for over a decade and this work has received the Engineering Excellence award at the 2014 Scottish Green Energy Awards.

They began working in the tidal energy sector five years ago analysing fatigue

marine species such as harbour seals to help access collision risk.

CRUCIAL ROLE

Analyses of these acoustic maps allow developers to submit robust environmental impact assessments with the inclusion of predictions with regard to local marine life populations. This insight can play a crucial role into the design phase to optimise any potential array whilst ensuring environmental noise is not of an issue from a regulatory perspective.

Xi Engineering Consultants

Underwater noise monitoring and the MSFD

Whilst the Government pushes to increase the use of renewable energy sources, planned offshore developments are now subject to more stringent environmental regulations, which seek to safeguard the Good Environmental Status (GES) of our seas.

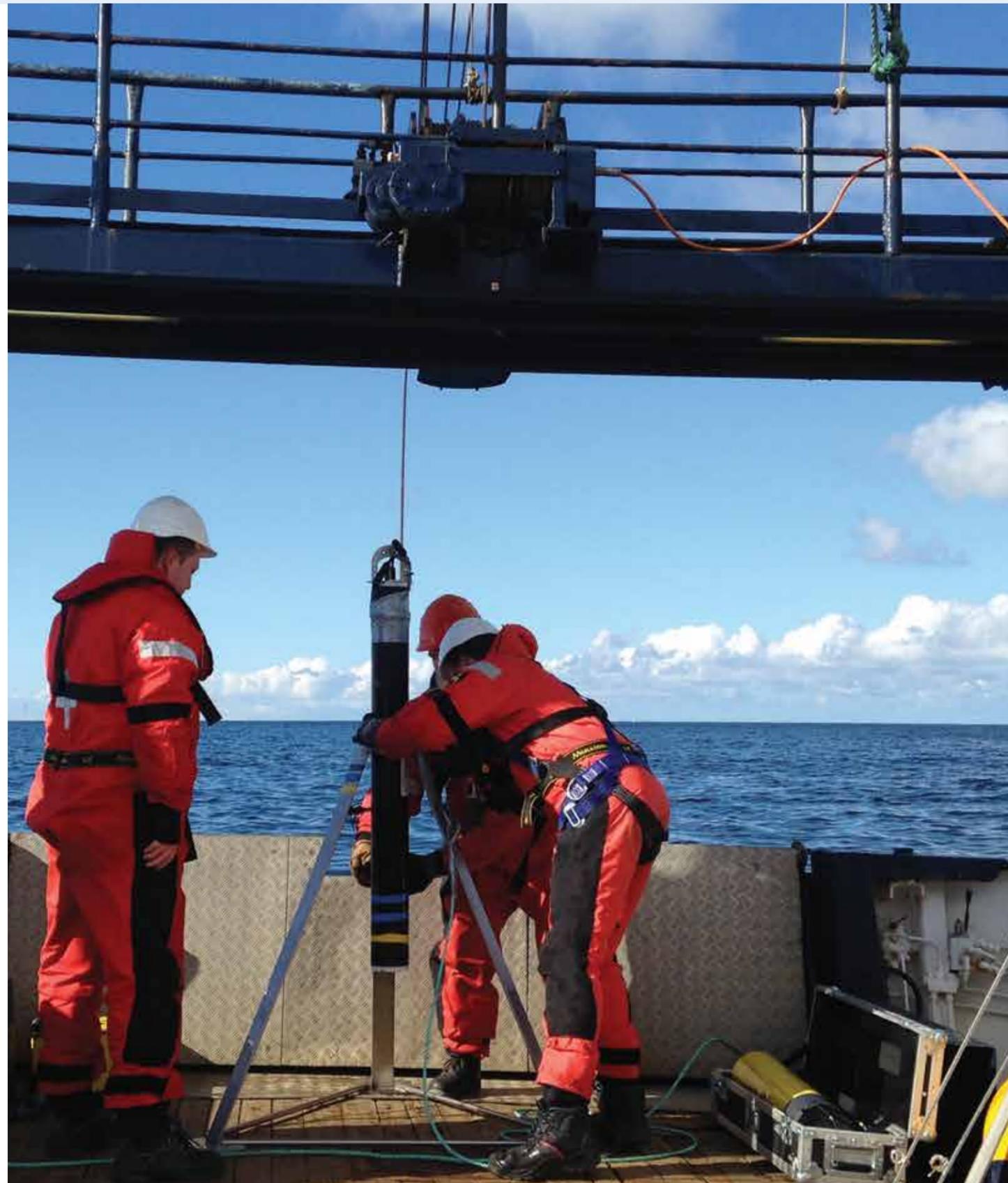
The EU Marine Strategy Framework Directive (MSFD) requires member states to achieve GES by 2020, so as to maintain biodiversity in their seas. The MSFD lays out eleven criteria to determine GES and assess the current condition of our seas and sets targets for each criteria (CEFAS 2012). The UK has transposed the MSFD into domestic law through the Marine Strategy Regulations 2010.

MAIN CAUSE FOR CONCERN

One of the main causes of concern is the introduction of noise into the marine environment (Descriptor 11 of the MSFD), given that numerous marine species including dolphins and porpoises rely on sound as their principal means of communication and navigation in this environment.

Underwater noise emissions associated with different renewable energy devices present different challenges depending on the technology chosen. The key concern for meeting the GES in relation to offshore wind is during the installation process when high levels of noise are generated by piling.

On the other hand, concern regarding the impact of wave and tidal devices on marine mammals is greater during the operational phase. In this case, the lack of underwater noise that may be generated by the devices may lead to increased risk of collision of marine mammals that are unaware of the threat. If the developments are too quiet there is a risk that they may not be easily detected by marine mammals, who may end up going through a tidal turbine to chase a fish shoal, with lethal consequences.



ACOUSTIC DETERRENT DEVICES (ADDs)

For this reason, installation of renewable devices and their operation are often accompanied by the deployment of acoustic deterrent devices (ADDs) to keep marine mammals outside of an established mitigation zone area. However, whilst these devices are useful for preventing lethal effects, they inherently introduce noise into the marine environment.

Research is currently looking at developing 'smart' acoustic deterrents that emit alarm signals only when a marine mammal is detected nearby the renewable device to minimise the noise pollution generated by ADDs.

COST REDUCTIONS

The marine renewables sector across Europe is under extreme pressure from the relevant government bodies to reduce the cost of energy, which in turn means that production costs need to be minimised. However, monitoring noise levels and introducing mitigation measures to reduce noise emissions, where necessary, can substantially increase project costs.

Using passive acoustic monitoring is one way in which these costs can be decreased but the targets that individual governments establish regarding this descriptor of the MSFD may still impact the overall strategy for renewable developments in that particular state.

Baker Consultants

Joint initiative to improve marine component reliability

Three of the UK's leading technology innovation, research and testing centres are working together on a joint project to test and analyse components in wave and tidal devices, to better understand issues around component reliability, improve performance and ultimately reduce the cost of marine energy.

The Offshore Renewable Energy (ORE) Catapult is working with the European Marine Energy Centre (EMEC) and the University of Strathclyde's Advanced Forming Research Centre (ARFC), part of the High Value Manufacturing (HVM) Catapult, to build a database identifying the common failure mechanisms of components.

REPORT DETAIL

EMEC will undertake a 'forensic analysis' of a variety of components that have failed to some degree across a range of wave and tidal energy devices, with AFRC providing support around component testing.

The resulting report will be made available to support the sector in engineering design choices around components and materials.

COST REDUCTION

The UK's wave and tidal industry is strategically important to the UK economy and could be worth around £76bn cumulatively by 2050. However, in the highly energetic marine environment, component failure contributes to high industry costs, which must be reduced if the industry is to move towards commercialisation and compete effectively with other sources of energy supply.

EMEC's Fall of Warness Tidal Energy Test Site (Image supplied by Aquatera)

COLLABORATION AGREEMENT

This project is the first under a new Collaboration Agreement between ORE Catapult and EMEC. ORE Catapult's Elaine Buck was seconded to EMEC in August 2014 to identify common areas in which the two organisations could pool their resources and work together on a series of practical projects designed to support the wave and tidal industry in the UK and abroad.

ORE Catapult's Strategy & Commercialisation Director Dr Stephen Wyatt said: "Through our collaboration with EMEC, we are able to provide a much more joined up approach to supporting the UK's wave and tidal sector, pooling our common expertise and test and demonstration assets to tackle some of the key technology innovation challenges facing the sector today.

"This particular project also gives us the opportunity to work cross-Catapult with our colleagues at AFRC, part of the HVM Catapult and other experts in the field who will help us get to the root cause of common industry failures."

Dr Jennifer Norris, EMEC's Research Director, added: "At the moment, some of the components being used in marine energy converters are being tested for the first time - at least for the purpose of generating electricity from marine energy - in challenging high energy real sea conditions. Many of the marine energy developers have experienced issues with component failures on their devices. Using off-the-shelf components can, of course,

be the most efficient option when those components can cope with the challenges associated with marine energy capture, but sometimes these components - which have often been designed for use in different environments - cannot cope.

"The developers testing with us at EMEC collectively have the most experience in the world of the challenges, successes and failures of marine energy deployment and operation. By gathering failed components from a range of devices and looking at them in more detail at a variety of Technology Readiness Level (TRL) stages, this project will assist technology developers in the selection of appropriate components thereby improving efficiency and ultimately lowering the cost of energy.

"EMEC's unique position will ensure that essential lessons learned from the early-stage deployments are shared with the rest of the sector, whilst protecting the intellectual property of the developers themselves, enabling the industry to progress more efficiently to commercialisation."

WORKSHOP

Moving forward EMEC and AFRC are hosting a workshop, focusing on component testing. The workshop will target renewables developers, manufacturers and the supply chain for component production and will cover a number of aspects of component testing including material selection and metallurgy, manufacturing methods and opportunities for conducting component evaluation.

CYCLE CHALLENGE

Three members of ORE Catapult's senior management team have just completed the 215 mile Earth Wind and Tyre cycle challenge to mark Global Wind Day, raising £2519.06 for charity.

The intrepid trio, comprising Operations Director Tony Quinn, Finance Director Andrew Walls and Strategy & Commercialisation Director Steve Wyatt, who was in the winning pack, began their two-day journey in Durham and cycled through seven of the country's most spectacular wind farms, climbing over 4,000 metres on their way to Edinburgh. They smashed their original fundraising target of £1,500 for the charity Renewable World, which works to tackle energy poverty in the developing world and helps energy-poor communities to access life changing power.

WORTHWHILE CAUSE

Tony Quinn said: "When Christian Egal from EDF Energy Renewables first told me about his brainchild after a couple of glasses of red, I took temporary leave of my senses and 'agreed' to cycle over 200 miles to raise money for a cause that is very close to my heart, recruiting a couple of colleagues along the way.



Tony Quinn (left) and Andrew Walls preparing to depart from our National Renewable Energy Centre in Blyth on their epic adventure.

RENEWABLE WORLD SUPPORT

Steve Wyatt said. "It was great to see so many colleagues from across our industry taking part in the cycle as well as raising awareness and supporting the great work of Renewable World. Judging by the smiles on people's faces when they arrived in Edinburgh I'm sure we'll all be back next year."

ORE Catapult

Earth, Wind and Tyre was dreamed up by our team early this year as a way to bring together our supporters in the renewables industry. We themed it around wind energy and designed the route to pass ten of the UK's iconic wind farms. We are delighted to say it went really well and we raised £50,000 for our work to alleviate poverty.

[Click to view more info](#)

"Many of the communities Renewable World work with have been severely affected by the largest earthquake to hit South East Asia in 80 years, with Nepal having special significance for me. I've visited twice and love the country and its people. It is nice to think that turning the pedals a few times might contribute in some small way to rebuilding and renewing Nepal."

REWARDING EXPERIENCE

Andrew Walls added: "I am already a keen cyclist and couldn't resist the challenge, especially for such a worthy cause. It was a very well organised event by EDF Energy Renewables and Renewable World and a hugely rewarding experience for us all. I fully intend to participate in future, similar events that strengthen relationships across our industry."

GUIDING YOU Through uncertain seas

THE PROBLEM

Working in the marine environment is risky and expensive. Operational planning typically fails to fully account for the impact of metocean conditions. When uninformed decisions are made, significant commercial and Health & Safety risks may result. Overcoming these challenges is critical to lowering the cost of marine energy.

THE SOLUTION

In order to help overcome this significant industry hurdle, JBA Consulting has secured funding from Scottish Enterprise and InnovateUK to develop a sophisticated metocean planning tool for those involved in marine energy projects. ForeCoast Marine can guide and optimise both long and short term operational strategies to reduce costs, minimise H&S risks and demonstrate best practice to financiers and insurers.

PROJECT TEAM

To ensure that ForeCoast Marine is developed in a targeted, innovative and industrially relevant manner, the project team comprises world leaders in offshore renewable energy – ScottishPower Renewables, the Met Office, the National Oceanography Centre, the European Marine Energy Centre, the University of Edinburgh and 350 Strategy.

OPTIMISER AND THE MISSION PLANNER

The planning tool comprises two components – the Optimiser and the Mission Planner...

1 OPTIMISER – a long term strategic decision support tool which considers the impact of metocean conditions over the lifetime of the project.

- Combines hindcast metocean data and advanced Monte Carlo approaches to simulate the impact of different O&M strategies on project financial performance over its lifetime

• Is a highly innovative way to develop and optimise strategies and provide guidance on key project decisions such as...

- Site and port selection
- Device repair strategy
- Vessel selection and chartering strategy
- Metocean risk mitigation strategies

2 MISSION PLANNER – a short term planning tool which allows the user to determine the optimal time for their mission, by considering the metocean conditions over the coming hours, days and weeks.

- Uses ensemble forecast data and innovative algorithms to compute the viability of complex, uncertain missions with a few clicks of a button
- Optimises the timing and sequencing of missions to reduce downtime, vessel costs and H&S risks
- Tracks missions through their duration and issues warnings should a mission be jeopardised by a change in the weather
- Includes a pioneering Gamer Mode, where you can practice all missions in a safe, simulated, environment before you try them for real

CONTINUED...





REAL WORLD APPLICATIONS

To begin with, ForeCoast Marine has been applied to a major tidal array which is under development in UK waters. It is anticipated that the tool will be applied to EMEC's international wave and tidal test facility in Orkney, as well as to several offshore wind facilities in UK and European waters in the coming months.

Although the focus of the development work has been on the application to the marine renewables sector, the generic nature of the software's framework ensures that it can be applied to any marine operation which requires a comprehensive understanding of metocean conditions and their potential impact on activities.

INNOVATION LESSONS LEARNED

Key lessons have been learned through the development of ForeCoast Marine...

- **Understand your market** – when developing a new product, it is essential to understand the needs of your potential clients. Connecting with policy makers, technology and project developers and investors is a good start.
- **Build on core skills** – when entering a new market, build on your core skills to enter the market in a strong position with minimal risks.
- **Innovate** – as newcomers to the marine renewables sector, innovation was essential in order to gain a place at the table. Focusing on developing improved techniques to meet the needs of the market and surpass the competition.
- **Be tenacious** – diversification into new markets requires significant drive, along with the dedication of staff to see it through. The process takes time and commitment, but can reap significant rewards.



- **Network and collaborate** – collaboration allows gaps in knowledge to be bridged, and boosts your company profile through the association with established and respected organisations.
- **Take a long term view** – it is essential to look at the long-term viability of products and services that you develop. We determined that the metocean planning tool can be applied to all stages of marine renewable projects – from planning, all the way through to decommissioning.
- **Utilise third party funding.** The costs and risks of entering a new market can be minimised by utilising third party funding where possible. Potential private sector clients may see significant benefits of your proposed product, but the early stage development (i.e. feasibility) might not fit with the companies' risk profiles. Funding from InnovateUK and Scottish Enterprise has been instrumental in reducing this early stage development risk and has allowed the company to progress rapidly along the product development process.

Mark Lawless
JBA Consulting

Click to view more info



Tidal energy available anywhere and less expensive than offshore wind!

Renewable Devices Marine has revolutionised the generation of clean offshore energy with the development of the Capricorn Marine Turbine.

A WORLD FIRST
This unique tidal stream turbine has allowed the company to make available, for the first time anywhere in the world, a technology which offers reliable tidal electricity generation at a cost lower than offshore wind.

The technology can generate electricity from average tidal areas found all around the UK and worldwide, rather than in a select few hard to access environmentally sensitive, high flow sites. This breakthrough will allow tidal energy to become the primary renewable energy contributor by 2025.

All a little unnecessary when the machines themselves can be designed and manufactured with a great deal less inherent complexity and deployed in sites which have lower speed flows and so lower forces on the turbines.

ACHIEVABLE REALISTIC ENERGY COST
The innovative design of the Capricorn Marine Turbine means that a cost of under £128/MWh is achievable. This is due to the turbines ability to operate invisibly in



OVER-ENGINEERED AND EXPENSIVE DEVICES
The rush for 'high tech' solutions in the marine energy industry however has led to the development of very expensive and complicated devices. In addition to this, almost all developers have to date sought to extract energy from the highest flow sites available, such as the Pentland Firth.

These two factors have led to the development of over-engineered and expensive devices being deployed in the most hazardous and demanding marine environments.

DESIGN PHILOSOPHY
This is the cornerstone of the design philosophy for the Capricorn Marine Turbine range – 50 kW and 1.25 MW, twin rotor devices optimised for simple deployment and efficient energy extraction across a range of tidal flows.

The UK's Energy Technology Institute show the existing cost of energy from tidal generation to be approximately £300/MWh. By comparison, offshore wind currently costs approximately £133/MWh.

easily accessible low flow areas that are not environmentally sensitive and are close to the populations that need the energy.

The Capricorn Marine Turbine can generate clean and reliable tidal energy at half the cost of current tidal generation and less expensive than electricity from offshore wind turbines.

Dr David Anderson
Renewable Devices Marine Ltd



Helping Improve Tidal Turbine Powertrain Reliability

Reliability is one of the most crucial determinants of the commercial case for tidal farm developments. While site selection provides the basic potential in terms of tidal resource, the ability to convert that potential into revenue, for energy sold into the power grid, is critical.



Unexpected maintenance costs must be avoided, so as the tidal stream sector moves forward with multiple turbine arrays, it becomes ever more important that tidal stream turbine suppliers make the right choices of drivetrain architecture, innovation and product development processes.

CONSORTIUM

Given this need, the Offshore Renewable Energy (ORE) Catapult is leading a consortium including Ricardo and DNV GL, to aid tidal developers in improving the reliability of tidal turbine powertrains, by reducing risk through the design phase process and aiding design optimisation through reliability simulation.

TIPTORS (TIDAL POWER TAKE-OFF RELIABILITY SIMULATION)

The TIPTORS programme has a three-phased approach, with the first phase already underway. It centres around two core parallel streams...

- 1 Developing a Design for Reliability (DfR) methodology – to aid design processes and a simulation tool that will be continually updated using input data from component testing, real-sea test sites, commercial deployments
- 2 Utilising ORE Catapult's own 3MW Nautilus drivetrain test-rig in Blyth

INNOVATIVE APPROACH

This innovative approach to aiding tidal technology developers will see deliverables including...

- A DfR methodology for tidal stream power take-off systems, using best practice approaches from other industries to help reduce risk at the design and testing stages
- A simulation tool for evaluating the reliability of tidal stream power take-offs, improved designs and innovations

- Pilot projects during Phase 2 that directly involves tidal turbine developers and the supply chain to test and validate the DfR methodology and tools
- Develop an advanced, standardised condition monitoring system that meets the specific requirements for tidal turbines installed as part of Phase 2, for the benefit of tidal turbine developers and collection of data on failure modes, frequency and load cases
- Production of a DNV GL Recommend Practice, which will be recognised by industry and utilised to support the certification of devices and obtaining lower cost finance and insurance

PARTNERSHIPS

We know from the experiences of other industries that making meaningful improvements in reliability is made possible through cross industry partnerships.

Through these partnerships, knowledge, resources and motivation can be leveraged to make step change improvements. From an early stage the programme plans to deliver benefits to the industry. The deliverables including DfR methodology, recommended practice and simulation tool, will be shared via the ORE Catapult.

COMMITTED SUPPORT

Already, some of the leading tidal developers have committed to providing support. They know that fully understanding the key areas of reliability can help further optimise systems, helping to bring down the cost of energy and grow the industry.

Ricardo

DNV GL

Pioneering tidal energy development

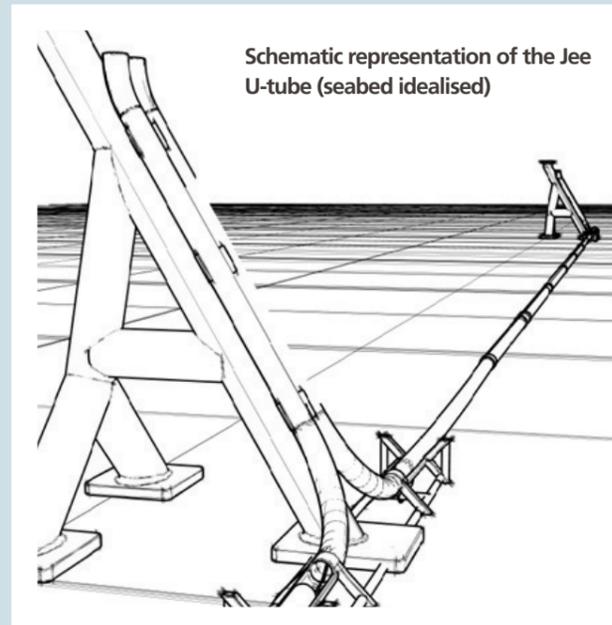
Leading independent multi-discipline subsea engineering and training firm, Jee Ltd develops innovative subsea electrical array cable solution for tidal energy installations.

CABLING SOLUTION PROJECT

The £2.4m tidal array cabling solution project was launched in December 2013 and tasked companies to develop and demonstrate effective methods for locating, securing, protecting and retrieving electrical array cables for tidal energy installations. In September 2014, Jee was awarded a phase one contract with Scottish Enterprise to conduct the pioneering study for the marine energy industry in Scotland.

FULL CONTROL

The U-tube system provides the marine contractor with full control of the cable installation, which can be stopped and reversed if necessary offering a high level of flexibility. It also provides a wider weather window for the cable installation, which allowed Jee to overcome one of the biggest challenges of the project.



Schematic representation of the Jee U-tube (seabed idealised)

PHASE TWO – U-TUBE SOLUTION

The company has subsequently been awarded phase two of the contract, which will see the firm undertake the demonstration of their innovative U-tube solution in Scottish tidal waters this year.

The U-tube protection system features a pipe fixed to a J-tube which is secured to the turbine foundations at each end of the pipe. The cable is then pulled vertically into one of the J-tubes and through the pipe using a pre-installed messenger and winch line. Once the cable is pulled in, connections are made to the turbine nacelles using wet-mate connections.

FINDING INNOVATIVE SOLUTIONS

Neil Ferguson, Energy and Clean Technologies Senior Executive at Scottish Enterprise, commented: "Finding safe and low-cost solutions in this field is a key requirement for the successful deployment and operation of the initial demonstration tidal arrays around Scotland. At the same time developing this new technology will be fundamental to the reduction of marine energy project costs over the longer term and enabling the successful commercialisation of the industry. The demonstration phase of this project is a key next step in achieving that."

Jonathan McGregor, Head of Engineering at Jee, said: "We were one of five companies initially selected to develop innovative solutions for this exciting renewables project and one of only two contractors selected by Scottish Enterprise to deliver the practical demonstration of the proposed solution."

"The highly skilled Jee team are delighted to be demonstrating the solution we have developed for this challenging tidal energy project. With decades of experience in providing innovative subsea engineering services to the expanding renewables industry, we are well placed to provide the best results for this pioneering tidal energy development."

COLLABORATION

The company will be designing, manufacturing and delivering the U-tube in collaboration with the other contractor, Aquatera Ltd who are responsible for installation using their novel cable installation methods.

CHALLENGE

Joe Gransden, Lead Engineer at Jee, explained: "Fast currents, narrow offshore working windows and rocky seabeds found at typical tidal energy sites make through-life management of cable operations and maintenance a key challenge for the industry. Jee's U-tube concept addresses this challenge and provides full cable protection, ultimately resulting in increased reliability and a reduction in through-life costs."

Jee Ltd

HBM WAVES TO SUCCESS WITH TIDAL POWER PLANT

HBM – a market leader in the field of test and measurement – has been successfully awarded the contract to install strain gauges inside Deep Green, the latest tidal power plant from Minesto, which is the largest marine energy company in the Nordics.

KEY ROLE

As part of the rigorous development work undertaken by Minesto, HBM was able to play a key role in verifying how the plant behaved in the water and how it measured the forces to which it was exposed.

Although relatively protected inside the power plant, the most important issue was to ensure that the moist environment in no way compromised the measurement result but thanks to HBM's installation and sizing technology for offshore environments, this was successfully achieved.

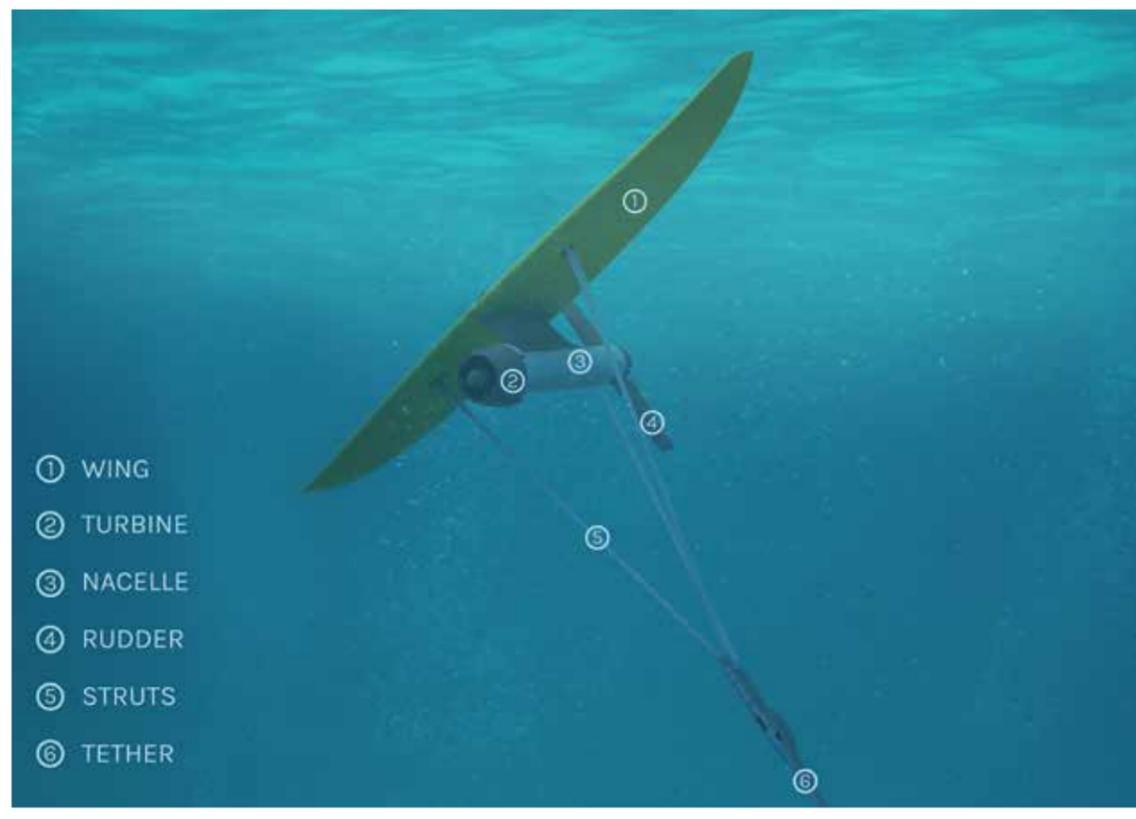
SUCCESSFUL CHALLENGE

The restricted space inside the prototype presented another challenge in terms of installation. HBM addressed through gluing the strain gauges directly onto the plant components before they were assembled in Minesto's laboratory.

Arne Quappen, Project Manager at Minesto, explains: *"We have received very good support from HBM. Strain gauges are not part of our core business, so it's important to get the expertise in measurement technology. HBM has experience from offshore installations and has better tools than we would have access to. In the end, it is both easier and cheaper to use professional help, to ensure the installation is solid and able to provide reliable measurement results."*

COMMITMENT

In the UK, there are an increasing number of Offshore Renewable Energy Installations (OREI's) including wind farms and wave and tidal energy devices. This forms part of the government's commitment to reducing its Carbon footprint and tackling climate control. In line with these developments, HBM is able to offer a range of strain

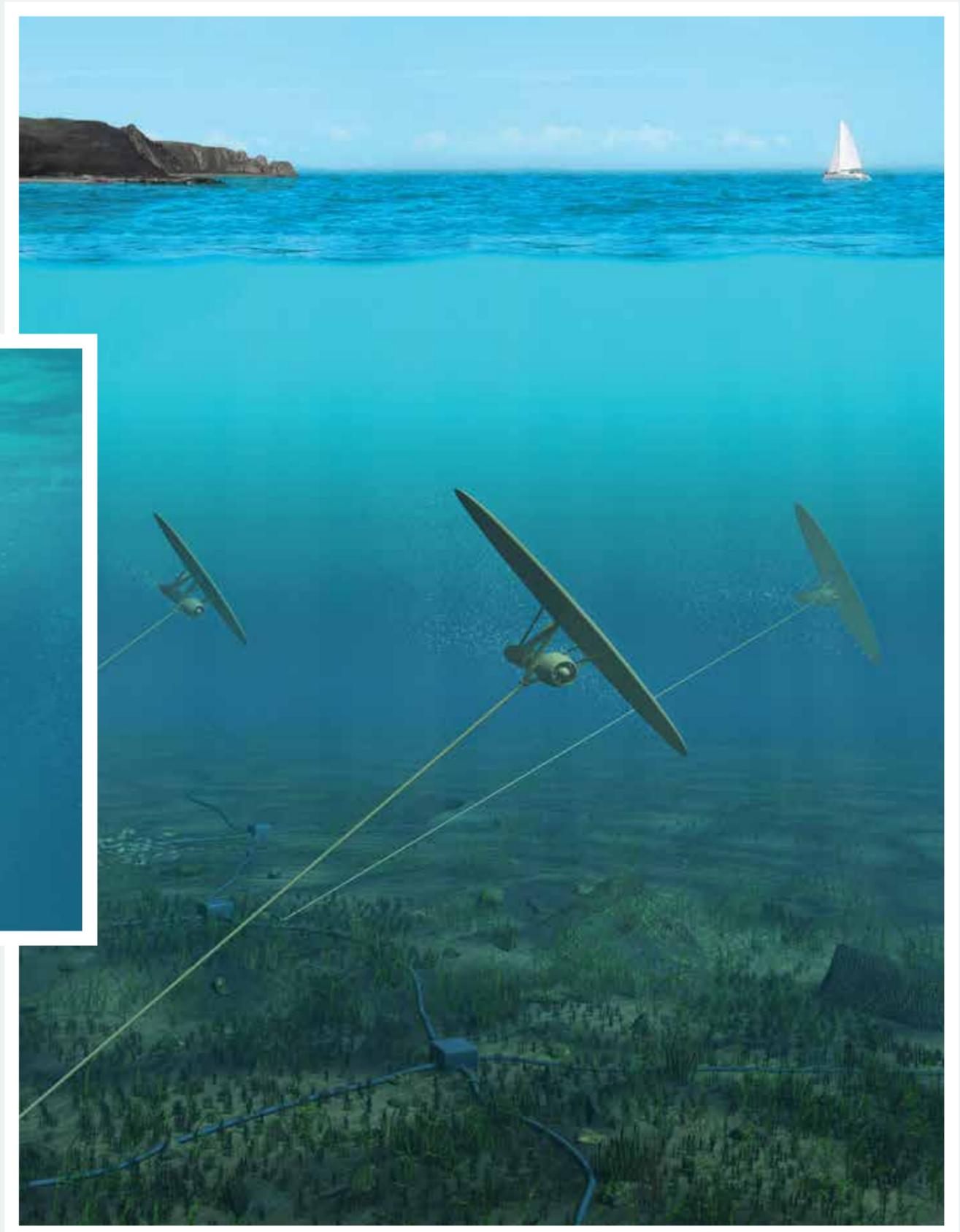


MORE COST EFFECTIVE

Deep Green is a relatively small power plant designed to extract marine energy even at slow water currents, which makes it more cost effective than previous techniques. Designed to move under the water in a figure eight pattern, Deep Green reaches a speed that is ten times higher than the currents in the surrounding water. Deep Green is currently undergoing long-term ocean trials in quarter scale in Strangford Lough, Northern Ireland.

gauges for a wide range of different applications in the fields of experimental stress analysis, strain measurement and component testing, to provide accurate measurements which are critical to ensure a project is on the right track.

HBM



County Mayo – Heartbeat of the Wild Atlantic Way

County Mayo in the West of Ireland is the heartbeat of the Wild Atlantic Way (WAW) tourist route. The WAW is a 2500km (1500 miles) driving coastal route, stretching from Malin Head, County Donegal in the North West, to Kinsale, County Cork in the south running along Ireland's entire western seaboard.

COASTAL HERITAGE

Mayo is home to some of Europe's most breath-taking natural attractions such as Downpatrick Head in Ballycastle, Keem Strand on Achill Island and Clew Bay off Westport. The coastal heritage and historical economic dependency on this vast expansive sea coast is reflected in the official Mayo crest illustrating shipping and waves.

However historical though, it is the latter emblem (waves) that is set to become one of the cornerstones for future economic growth of Co. Mayo through the harnessing of waves for generating renewable energy that is fit not only as an indigenous energy supply but one that is also fit for exportation.

ATLANTIC POWER

The West Coast of Ireland has the potential to harness an astonishing 5000MW of renewable energy from their powerful world renowned wave resources. Detailed strategic environmental appraisal indicates that this 5000MW of raw renewable wave energy can be harnessed without generating any likely significant adverse effects on the environment.

In addition this world class resource has an average wave climate that is consistently over 50 kW/m. In such climates, it can be expected that there will be occasional waves of much larger magnitude during storms and steep waves of over 20M in height are not uncommon off the west coast of Co. Mayo. To promote this valuable resource Mayo County Council has partnered with the Irish Wave Energy Development Association.

PARTNERSHIP/COLLABORATION

Mayo County Council is harnessing and developing many of the economic opportunities associated with renewable energy. With a strong and commercially based Renewable Energy Strategy (2014-2020) the Local Authority is amongst the lead drivers of this industry nationally. The Local Authority has garnered a strong reputation in supporting innovative research and development.

In this context Mayo County Council (MCC) has recently partnered with the Irish Wave Energy Developers Association (IWEDA). Under this partnership it is proposed to develop a 1:15 prototype wave energy test at Blacksod Bay, Belmullet Co. Mayo known as "Blacksod Wave Energy Test Site" (BWET). The Irish Wave Energy Development Association is a collaboration of eleven early stage Irish wave energy device developers. The clear objective of IWEDA is to develop a viable wave industry off the west coast of Ireland which has huge economic benefits for the country.

BWET MAYO (BLACKSOD BAY WAVE ENERGY TEST SITE)

The test site to be developed in partnership between MCC and IWEDA will be located in realistic seaway testing conditions in a fully consented area of seabed accessible to industry for rehearsal, deployment and recovery techniques at 1:15 scale prototype Wave Energy Convertors.

The main features proposed in the test site will include...

- A fully consented test site
- 3 berths
- Water depth 7 to 12m lower water springs
- Work boat and divers available locally for deployment and recovery
- Wave rider buoy with data transmission ashore
- 500m from pier with slip way and crane
- Office space in Belmullet Co. Mayo to receive data

WHY CHOOSE MAYO?

From start-ups to major multinational companies, Mayo is already the location of choice for more than 4,000 businesses.

This is because it combines a pro-business environment with a 'can-do' attitude. It also offers strong business supports and networks, a highly-skilled work force and a clean, green location with good natural resources and ready access to international markets.

Natural beauty, world-class visitor attractions, culture and historic charm – it's all part of a package that makes Mayo not just a popular destination for visitors, but for business investment too.

Mayo has a population of 130,000, while 40% of its people are less than 25 years of age. The county has a campus of Galway Mayo Institute of Technology in Castlebar and a leading innovation and business centre focusing on research and development. Timing is everything with business and Mayo is the chosen destination as a landing point for the international high-speed subsea fibre-optic cable connecting US - Europe (America Europe Connect).

LOCATION

Its location on Ireland's most westerly shore makes Mayo centrally-located for businesses with global aspirations. The accessibility is second to none with Ireland West Airport located centrally in the County (50 mins timeflight from London) and a rail/road network connecting us to ports, harbours and markets around the country Mayo is one of Ireland's most beautiful counties, regularly topping polls as one the best places in Ireland not just to visit but in which to live.

Joanne Grehan
Head of Economic Development
Enterprise and Investment Unit
Mayo County Council

[Click to view more info](#)

Courtesy of Michael Mclaughlin Studios Westport on behalf of the Enterprise & Investment unit

Marine Renewable Energy Ireland (MaREI) Centre

A UNIQUE AND NOVEL BUSINESS MODEL PROVIDING INNOVATIVE SOLUTIONS THAT REDUCE THE TIME TO MARKET, AND REDUCE COSTS TO A COMPETITIVE LEVEL.

MaREI Research Programme:

Research Programme comprises:

Platform Projects = Scientific Research

Spoke Projects = Industry Targeted

Platform Projects

- P1 – Wave Energy Device Design Innovation and Optimisation
- P2 – Marine Electro-gas
- P3 – Marine Renewable Energy Informatics Tools
- P4 – Cost Reduction for Marine Renewable Energy

Spoke Projects

- S1 – Marine Renewable Energy Devices
- S2 – Novel Materials for MRE Systems
- S3 – Power Take-off and Energy Storage for MRE
- S4 – Operations Support Engineering
- S5 – MRE Decision Support and Data Management



MaREI is a cluster of key academic and industrial partners dedicated to solving the main scientific, technical and socio-economic challenges related to marine renewable energy. The nucleus of MaREI originates from well-established Marine Renewable Energy (MRE) related research entities distributed throughout Ireland.

INTERNATIONALLY RECOGNISED EXPERTS

The Centre comprises internationally recognised experts in MRE and associated and complementary fields capable of providing the underpinning research necessary for Ireland to achieve a commercially successful MRE industry.

As such, a primary focus for MaREI is the development of strategic long-term relationships with industrial partners achieved by providing them with access to world-class researchers and test-bed infrastructure and subsequent co-production of knowledge.

INDUSTRY-CENTRED APPROACH

This industry-centred approach provides a focal point to enable over 45 companies to participate in the development of a vertically-integrated supply chain. The Centre promotes and enhances cross-fertilisation of ideas between industry and academia in the MRE sector.

This generates new ideas or perspectives and provides an innovative environment that yields intellectual property, leading to start-up companies and jobs.

RESEARCH PROGRAMME

The research programme is organised into four Platform Themes (P1-4) conducting scientific research that underpins MRE sector development and five Spokes (S1-5) that contain targeted projects pertinent to the industry partners:

The potential exists to add additional industry partners through both a Rolling Spoke Call which is currently open on an ongoing basis and through a Fixed Spoke Call which takes the form of an open competition for a planned amount of funding.

MaREI



Embracing Ireland's Ocean Wealth

Maritime Festival will showcase and celebrate Ireland's Oceans – the Our Ocean Wealth conference will attract over 600 industry representatives

One tenth of Ireland's national territory is land while nine-tenths of it is sea. In this context, Ireland's national territory is three times the size of Germany's. The seabed extends to almost one million square kilometres, making it one of the largest European jurisdictions. Sea-based transport accounts for 99 per cent of exports by volume and 95 per cent of exports by value. Fishing activity alone is a €1 billion industry.

GOVERNMENT RECOGNITION

The current government has recognised Ireland's enormous marine potential and has set out a 'roadmap' on how to realise this potential in a document entitled "Harnessing Our Ocean Wealth" first published in 2012 and referred to as "an integrated marine plan".

The express objectives of this integrated marine plan for the state is to double to €6.4 billion a year in turnover from the ocean by 2020 and to double the contribution of the maritime economy to 2.4 per cent of GDP by 2030. Ireland's blue economy generated 1.2 per cent of GDP in 2007 - €2.4 billion, support 1 per cent of the workforce.

CORK HARBOUR

Nowhere is the focus of this marine plan more evident than in Cork Harbour, the second largest natural harbour in the world and home to an ambitious collaboration between academia, industry and government which plans to deliver at least one-third of the national marine targets.

OUR OCEAN WEALTH CONFERENCE

Our annual Ocean Wealth conference is hosted at Ringaskiddy, Cork Harbour. The conference attracts representatives of the marine industry from all over the world, including investors, entrepreneurs and industry organisations who will convene

at the site of the new €15 million Beaufort building to hear from an exciting line up of industry experts, TED Talks and lectures.

With over 600 attendees last year, the Our Ocean Wealth conference is expected to attract a significant marine-related audience.

MARITIME FESTIVAL

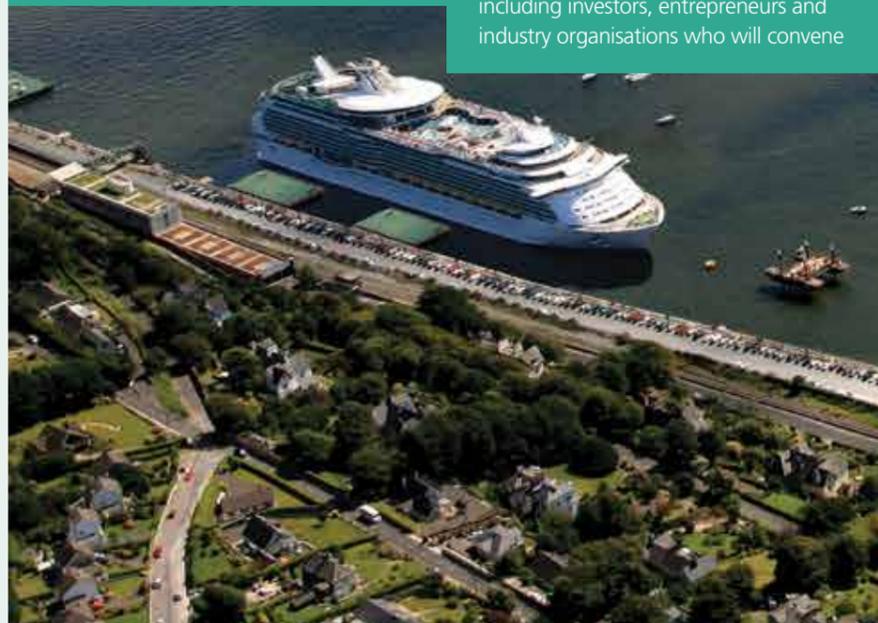
As well as the Our Ocean Wealth conference, a public Maritime Festival will draw thousands to the Region to experience the fruits of the sea with a seafood festival, to see RNLI and Naval Service rescue demonstrations, a sail-by of stunning pleasure craft and yachts in the harbour, lectures and exhibits on marine life in the harbour and all manner of sea-faring fun and entertainment for the family.

Government of Ireland

Image Courtesy of Laura Mellett



Minister Simon Coveney



Galway Bay to become world-class test site for ocean energy

In a major enhancement of the Galway Bay Ocean Energy Test Site, a four kilometre power and data cable will be installed on the seabed connecting the test site to the shore in Spiddal, Co. Galway.

DEVELOPMENT

This is part of a programme to develop the Galway Bay Ocean Energy Test site which will include the installation of sensors and environmental monitoring equipment on the seabed at the cable end this summer and later, a floating 'sea station' to provide additional power to and dissipate power from ocean energy converters on the site and provide high-speed data transmission for real-time monitoring.

OPPORTUNITIES

"Ireland has one of the best offshore renewable energy resources in the world and the opportunities to harness the power of the ocean are immense," according to Peter Heffernan, CEO Marine Institute.

"The new facilities at the Galway Bay Ocean Energy Test site will give companies and researchers working to capture and convert the immense power of the ocean a unique opportunity to test and validate innovate technology and get unlimited real-time data on their performance in the ocean."

PROJECT DETAIL

The cable will be floated ashore from the Celtic Explorer research vessel marking a major milestone in the development of this important national research and development infrastructure.

A variety of instrument nodes and sensor packages will be installed at the Galway Bay Ocean Energy Test Site. They are designed to contribute to marine sectors including environmental monitoring, shipping, security and education.

Extensive historical wave and weather data is also available for this site since 2008 and can be made available to potential device developers.

UNIQUE ENERGY TEST SITE

The new research infrastructure will make Galway Bay a unique, world-class ocean energy test site and will promote the creation of an indigenous cluster of research and industrial technology development and testing capabilities and support the commercialisation of environmental technologies and marine renewable energy.

The project, funded by Science Foundation Ireland, is a collaboration between the Sustainable Energy Authority of Ireland, the Marine Institute, the Marine Renewable Energy Ireland (MaREI) and SmartBay Ireland.

Marine Institute



World Firsts for Wave & Tidal Power

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Frank Fortune: Wave and Tidal Development Director, Renewable Energy
 T: +44 (0) 131 561 2295 E: frank.fortune@rhdhv.com

CONSENTED

royalhaskoningdhv.com

Supporting Offshore Renewable Development in Ireland

The Sustainable Energy Authority of Ireland (SEAI) is Ireland's national energy agency, with a mission to play a leading role in transforming Ireland into a society based on sustainable energy structures, technologies and practices.

Since 2009 SEAI has been actively involved in developing appropriate structures in which the offshore renewable energy sector can develop and thrive. In particular SEAI has concentrated efforts in supporting appropriate policy development, as well as developing test site structures and grant support.

OFFSHORE RENEWABLE ENERGY DEVELOPMENT PLAN (OREDP)

From a policy perspective SEAI is actively involved in implementing Ireland's OREDP which was published in 2014 by the Department of Communications, Energy and Natural Resources.

The three high level goals of the OREDP are...

- 1 Harness the market opportunities presented by offshore renewable energy to achieve economic development, growth and jobs
- 2 Increase awareness of the value, opportunities and societal benefits of developing offshore renewable energy
- 3 Ensure offshore renewable energy developments do not adversely impact our rich marine environment and its living and non-living resources

The OREDP reiterates the focus on stimulating industry-led projects for the development and deployment of ocean energy devices and systems through the support of SEAI's Prototype Development Fund. Details of the fund can be read in the accompanying article 'The Sustainable Energy Authority of Ireland Prototype Development Fund'.

KEY ROLE

SEAI also has a key role in the development of test sites for the industry in Ireland and works closely with the Marine Institute and UCC to develop and manage test sites which allow testing of technology from TRL 1-9.

In addition through a partnership with Marine Institute, SEAI finances the management of the Galway Bay Test site which can test devices up to quarter scale. The Galway Bay Test Site is managed by Smartbay Ireland and will see extensive development this year with the installation of a power and fibre cables and a 'Sea-station'.

TEST SITE

SEAI is also working to develop a full scale test site off Belmullet in Co Mayo and is in final stages of negotiations on the foreshore lease for the test site. SEAI is working closely with Mayo County Council to update port facilities in the area which will provide access to the test site and work is expected on a substation for the test site before the end of 2015.

Ireland's Ocean Energy Portal, launched in 2014, is a comprehensive source of information on the supports available in Ireland for the development of the marine renewable energy sector.

Patricia Comiskey
Programme Managers
SEAI

The Sustainable Energy Authority of Ireland Prototype Development Fund

The Sustainable Energy Authority of Ireland Prototype Development Fund aims to accelerate and enhance support for the research, development, testing and deployment of wave and tidal energy devices.

INDUSTRY-LED PROJECTS

The emphasis is on industry-led projects and covers a broad scope, including the following indicative types of activities...

- Projects to develop and test wave and tidal energy capture devices, systems and sites
- Independent monitoring of projects/technologies
- Industry-led R&D aimed at the integration of ocean energy into the electricity market and the national electricity grid
- Data monitoring, forecasting, communications and control of ocean energy systems

PROGRAMME DETAIL

The programme was launched in 2008 and to date 53 projects have been supported with grant funding. Many of these projects have investigated the potential of novel technologies through small scale physical testing, such as those developed by Jospa, a Cork-based company.

Jospa's principal activity is the development of wave energy converter concepts, but have also through their testing programme facilitated the development of the GKinetic tidal turbine through several iterations of numerical modelling and testing at the Ifremer flume in France. The company is now working towards the demonstration of a 1:10 scale device.

CROSS-CUTTING TECHNOLOGIES

The Prototype Development Fund also has a focus on enabling cross-cutting technologies that have a wide benefit to the ocean energy sector. For example, Omey Labs have received funding to design modular, low-cost wave flumes and towing carriages suitable for teaching, research and early stage device testing.

The polymer tethers being developed by Technology from Ideas are intended to provide mooring solutions that will reduce the peak loads experienced by wave energy devices, as well as to ocean observation and aquaculture systems. The company demonstrated their system on a large metocean buoy at the Galway Bay quarter scale test site with the support of SEAI in 2014.

IRELAND'S FACILITIES

It is notable that projects supported through the programme have encompassed significant usage of Ireland's excellent suite of test facilities, particularly around the experimental development of small scale physical models in the wave basins at the National Ocean Test Facility at University College Cork and sea trials in Galway Bay.

A new call for proposals through the Prototype Development Fund was announced in February 2015, with increased levels of support, up to 80% in some cases, available for projects that display a high level of collaboration and dissemination.

Dr. Brendan Cahill
Programme Manager
SEAI



Image Credit Eugene McKeown Biospherics

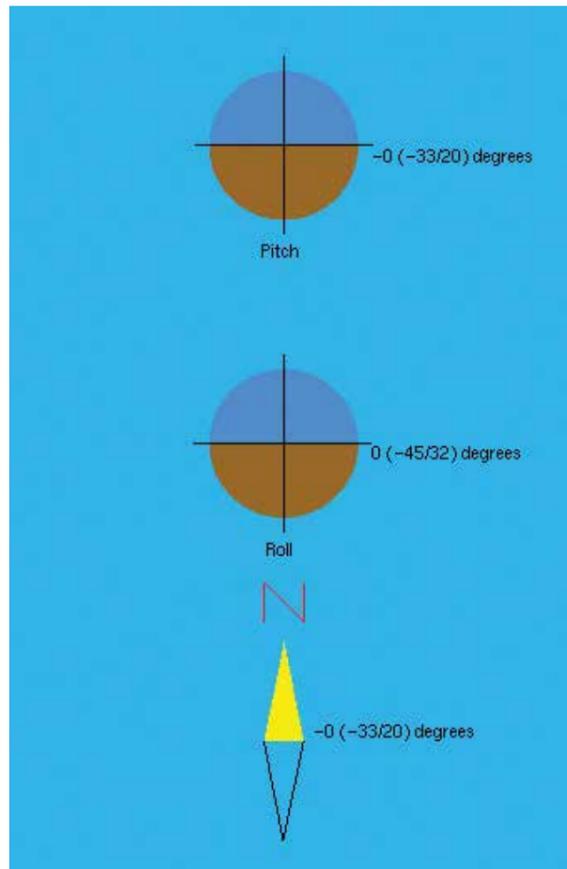
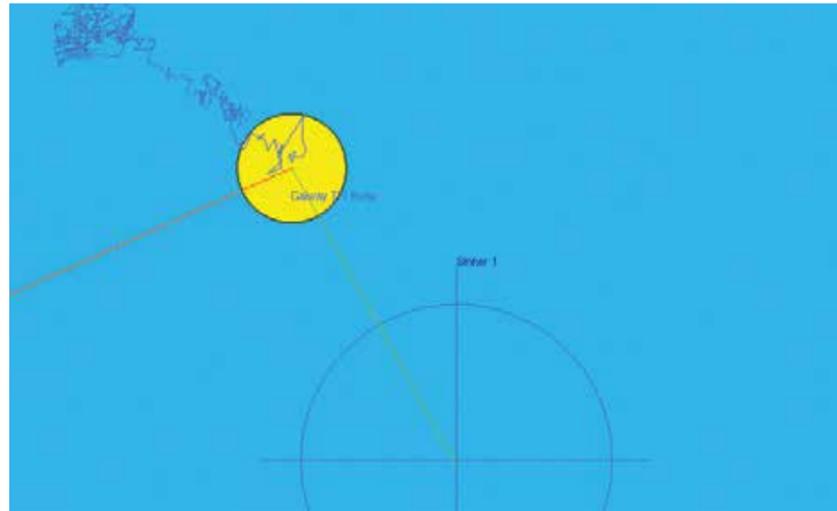
Galway Bay marine test and validation facility

SmartBay Ireland has developed a bespoke data acquisition system to collect and disseminate data from a range of maritime assets. The data delivery system streams near real-time marine sensor data to onshore servers and includes the provision of catch-up data during communications downtime and is delivered over a network capable of operating at speeds up to 54Mbps.

The data, captured by the SmartBay developed 'Sea of Things' system parses, disseminates and visualises data online via the SmartBay Data Portal. To date this portal has delivered more than 150GBb of MetOcean, water quality, force and motion sensor data to SmartBay users via their desktops or mobile devices.

REMOTE SENSOR POD

The team is currently developing a 'Sea of Things' remote sensor pod that is primarily designed to interface with sensors located in different parts of a wave energy device and send data back over a differential twisted pair transmission line. Speeds of up to 2.5Mbps located up to 4km away from the main acquisition system are possible. While intended to be physically connected, there is also built in WiFi and 3G services for alternative wireless data links and even greater speeds.



Screen shots of SmartBay's device visualisation application

INTEGRATION

Clients sensors may be integrated using RS232, 4-20mA current loop, or through Analog to Digital converters though high density marine connectors. In addition, there are a number of built in sensors including: tilt compensating compass, accelerometer, gyro, temperature and thermocouple sensors.



An example of SmartBay data visualisation

The pod is configured with a 256 GByte micro SD card for standalone, or failover data logging and a high precision 10Hz update GPS module for tracking. The design utilises the low power mbed micro controller architecture allowing for rapid plug and play sensor integration. The remote sensor pod is enclosed in a package with a footprint slightly larger than a deck of cards.

VISUALISATION

SmartBay has also developed an application to allow the visualisation of data from instruments mounted on floating devices. Buoy pitch, roll and yaw are presented in a head up display similar to an aircraft's artificial horizon.

Wind strengths and directions are presented in a wind rose more suited to directional data. Visualisation is also enhanced with the provision of min/max ranges reached by sensors. With the use of the remote Sensor pod 2D or 3D visualisation can show real-time articulation of multiple components within a wave energy device.

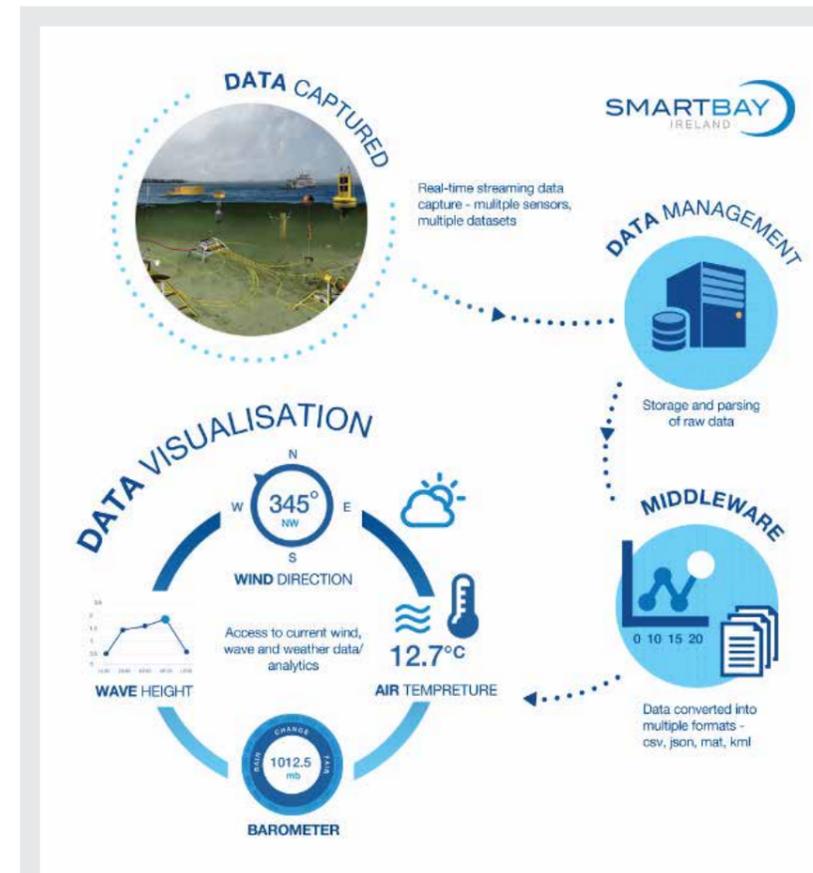
SmartBay Ireland Ltd

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The SmartBay data cycle



RIDING THE WAVE...

The second half of 2014 wasn't, unfortunately very promising for the wave and tidal industry in the UK.

Siemens announced that it was looking for a buyer for its wave and tidal technology business, Marine Current Turbines (MCT), which it bought in 2013, citing the slow pace of development in the UK wave and tidal market.

CASUALTIES

Fellow wave and tidal business, Pelamis, went into administration in November, with the deadline for sale passing in December. The current outlook for the business hinges on last minute private interest.

Other casualties include Aquamarine power, another technology developer in Scottish waters, which has been forced to make a number of redundancies and is mothballing the Oyster 800 device ahead of developing a new 'Wavepod' initiative.

MeyGen with its tidal stream project in the Pentland Firth and Scotrenewables with a test-bed in Orkney are the notable exceptions.

At GCube, they have worked with the latter firm for some time as it moved towards sea trials of a 2MW device in early 2015, just as they aim to support the wider industry despite its current trials and tribulations.

COMMITMENT

Some may ask why they are committing to a sector, which from the outside, appears to be in serious difficulty and produces no shortage of losses for the insurance industry.

But that would miss the wider point. At GCube they have a strong heritage of supporting early stage technologies and research and development. Most recently, having provided insurance services to prototype floating offshore wind turbines and abandoning wave technologies now when they demonstrate such potential, would be somewhat short sighted.

Conversely, whilst new technology should be supported where possible, the industry could help itself through more collaboration. One thing that has marked the wave industry compared to other renewables has been the sheer number of disparate technologies under development.

COLLABORATION

Collaboration between developers, whilst unlikely to be popular because of concerns surrounding intellectual property, would probably go some way to expediting the development process.

Indeed, at the installation phase, forming alliances and partnerships will be vital to longer-term success. Presently, companies like Hammerfest Hydro and Fred Olsen are finding that the market requires bespoke installation methods.

UNIFIED APPROACH

But the sheer number of separate solutions needed means that gaining the experience required to do the job well is very difficult, since the installation process differs on each occasion. Technology centres such as EMEC and Wavehub aim to facilitate such installations, but much more could be done to encourage a unified approach to commercial deployment.

In conjunction with this, there is a real likelihood that there will be a lack of vessels capable of deploying any major arrays of wave-tidal devices while the industry languishes in the shadow of offshore oil and gas and offshore wind.

FOCUS

What the sector could do with is a clear market leader with a truly scaleable product, who can do it cheaper, quicker and with fewer losses. There is, after all, no need to evolve if your environment remains constant.

Jonny Allen
Offshore Underwriter
GCube

Collaboration on novel foundation system

McLaughlin & Harvey and SeaRoc have successfully formed a new team to deliver their project to demonstrate a novel foundation system in a tidal stream site, using rock anchor drilling technology. The companies are working in partnership to deliver a mooring system for the SR2000 floating tidal turbine, which will be deployed at the European Marine Energy Centre (EMEC) tidal test site this year.



FUNDING

The companies have secured approximately £1Million of funding through a collaborative grant arrangement with the Carbon Trust, under the Scottish Government Marine Renewables Commercialisation Fund (MRCF) and Invest Northern Ireland. On completion McLaughlin & Harvey will have fully demonstrated their remotely operated seabed drilling technology which has been part of an ongoing R&D programme.

MARINE OPERATIONS STRATEGY

SeaRoc has used its knowledge and experience to develop a marine operations strategy which uses existing and cost-effective marine equipment to provide a platform at sea from which McLaughlin & Harvey can deploy their equipment and carry out their drilling works in a safe and efficient manner. The project partners will each make a contribution in-kind towards financing the project and Scotrenewables Tidal Power Ltd., developers of the SR2000 tidal turbine, will contribute over £450,000 in cash.

WORKING TOGETHER

Adam Holland, Marine Renewables Manager, McLaughlin & Harvey, *"We are very excited about this project, which has been part of our ongoing in-house R&D programme for a number of years. Our goal here is to demonstrate a step change reduction in the cost of marine renewable energy installations using conventional, civil engineering techniques to deliver foundations in a novel application."*

Nick Murphy, Head of Wave and Tidal Projects, SeaRoc, *"It is great to be part of this team, which brings together our complementary skills to deliver an integrated design for marine energy projects. We are really pleased that we could find a project which delivers the various interests of so many organisations so well."*

GOVERNMENT SUPPORT AND COMMITMENT

Energy Minister, Fergus Ewing commented, *"I am very pleased that we are able to assist in the development of this novel foundation system through our Marine Renewables Commercialisation Fund, which will be used with Orkney based Scotrenewables' SR2000 tidal turbine. This system will be tested at the European Marine Energy Centre (EMEC) in Orkney, the world's only accredited testing facility for wave and tidal energy prototypes. There is no doubt that harnessing the power of our seas is challenging, more so than we ever envisaged. However, the Scottish Government remains committed to building a successful marine industry in Scotland."*

"The McLaughlin & Harvey and SeaRoc project is a perfect example of Government and industry working collaboratively and across borders to develop innovative new concepts that will play a crucial part of cost reduction in the first array projects."



INDUSTRY LEADERS' COMMENTS

Barry Johnston, Chairman, Scotrenewables Tidal Power Ltd commented, *"McLaughlin & Harvey's and SeaRoc's experience of delivering complex, international tidal energy projects really boosts the strengths of our existing team. The SR2000 project gives a perfect opportunity to trial rock bolt anchors in a real life tidal energy site and we are very happy to facilitate this as we recognise the long term potential for cost reduction which this technology can bring to the tidal sector."*

Andrew Lever, Carbon Trust's Director of Innovation Scotland commented, *"The drilled rock anchor project aims to significantly reduce the foundation and installation costs for marine renewable devices, which collectively account for over 40% of CAPEX. We are pleased to be working with the McLaughlin & Harvey consortium who have shown great commitment and enthusiasm for the project to date and we look forward to successful project delivery going forward."*

Carol Keery, Invest NI's Director of Research and Development, commented, *"McLaughlin and Harvey has built up significant expertise in the marine sector and this installation technology for turbines has the potential to open up a significant range of opportunities for the business. Our R&D grant support encouraged this inter-company and cross-border enterprise to engage in collaborative testing and I would encourage other companies to explore how similar collaborative projects could help drive forward their business growth."*

SeaRoc

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Wave & Tidal Event 2015 and Call for New Funding Approach

RENEWABLEUK HAS WELCOMED THE LATEST ANNOUNCEMENT BY THE SCOTTISH ENERGY MINISTER FERGUS EWING ON THE WAVE ENERGY DEVELOPMENT BODY TO BE SET UP BY THE SCOTTISH GOVERNMENT TO HELP SECURE THE INDUSTRY'S FUTURE.

KEYNOTE ADDRESS

During his keynote speech at RenewableUK's Wave & Tidal energy conference in Edinburgh Mr Ewing gave details of the £14.3 million budget for Wave Energy Scotland, along with its business plan, the first call for funding and its programme of activity.

ENORMOUS POTENTIAL

Commenting on Mr Ewing's announcement, RenewableUK's Wave & Tidal Development Manager Dee Nunn said: *"This is great news for the wave energy sector; a resounding endorsement of the enormous potential of the industry at the very time when it's needed most."*



"Following a number of setbacks in recent months, this key announcement will help us to move forward"



He told delegates: *"I am very pleased to offer a significant budget of over £14 million to kick start Wave Energy Scotland. This is the biggest technology development programme the wave sector has ever seen."*

Mr Ewing said 12 former Pelamis Wave Power employees, which collapsed in November, have been awarded a contract to work with Wave Energy Scotland to utilise their knowledge and skills, noting that: *"I am also very glad that we were able to deliver on our aspiration to capture the know-how from device development and retain some of the best brains working in marine energy in Scotland."*

with a renewed sense of confidence. By working with some of the former staff from Pelamis, Wave Energy Scotland will retain knowledge and skills which have been built up during years of experience in developing wave devices in real sea conditions. This intellectual capital is vital to ensure that Britain retains its global lead in marine energy."



CONTINUED SUPPORT

"We'd like to thank the Scottish Government for its tireless work in continuing to support marine energy in innovative ways. Wave Energy Scotland looks set to be a key player in terms of technological development."

"What we need now is for all UK Governments to work together in a closely co-ordinated way to support wave and tidal energy and secure the economic benefits for all parts of the nation. This will help the sector to mature and attract much-needed investment, driving down costs in the long term as we successfully harness one of our most powerful natural resources."

New approach for Wave & Tidal funding

RenewableUK is highlighting a new study which calls for a fresh approach by the UK Government and devolved administrations to the way funding is allocated to the wave and tidal energy sector, to ensure the industry realises its enormous potential.

CAPITALISING ON CAPABILITY

The report 'Capitalising on Capability' by the Marine Energy Programme Board, which advises the Government on how to develop the industry, was launched today in Edinburgh at RenewableUK's Wave and Tidal 2015 conference.

It says British companies are well-placed to capture £76 billion of a global market by 2050, adding up to £4 billion to UK GDP. Companies surveyed by RenewableUK for this report have spent nearly £450 million in the UK's marine energy supply chain. Importantly, the companies surveyed said they had spent around £7 of privately sourced money for each £1 of public funding they received. This investment supports around 1,700 people working in the wave and tidal energy sector and the industry has the potential to support up to 20,000 jobs in the next decade.

JOINT VISION

However, the report says that, to maintain the UK's global lead and become fully commercialised industries, wave and tidal energy need sustained and consistent practical and financial support from governments at all levels. The study urges the UK, Scottish and Welsh Governments and Northern Ireland Executive to work with the MEPB to provide a joint vision of the role of marine energy out to 2030 and beyond, together with a suitably funded strategy to commercialise wave and tidal technologies. The study warns that without a unified approach, there is a risk of duplication of effort and important measures falling between the gaps.

ENSURING SUITABLE GUARANTEES

The report also warns that although the support provided by the Renewables Obligation and Contracts for Difference schemes has created an attractive market for commercial marine energy projects in the UK, it is impossible to secure the level of private capital needed for smaller pilot projects to demonstrate their performance. This is vital to ensure that suitable guarantees can be offered about how larger projects will perform, to make them "bankable".

CO-ORDINATED FINANCE PACKAGE

The report says a co-ordinated finance package from public and private sources is required to fund these pilot projects. It points to a recent report by the Offshore Renewable Energy Catapult which identified around £300 million in support needed to take these sectors to the next level and to drive down overall costs in the long term.

The MEPB advises that this could be drawn together by all parts of UK Government and from European funding to grow the sectors over the next 5 to 10 years. This will help to address the difficulties which led to the recent collapse of Pelamis Wave Power, as well as Aquamarine shedding staff and Siemens' withdrawal from Marine Current Turbines.

MOVING FORWARD – UK AT THE FOREFRONT

RenewableUK's Wave & Tidal Development Manager, Dee Nunn, said: *"By implementing the actions outlined in this timely report, the UK could secure its position at the forefront of the global marine energy sector, putting recent setbacks behind us. The measures being put forward would enable industry to capitalise on the excellent resource and test facilities we already have in the UK to move the technologies to a commercial position."*

"It would lead to financial close for at least 3 pilot tidal arrays on UK waters by 2018 and the first wave arrays at demonstration centres such as WaveHub off the coast of Cornwall and the European Marine Energy Centre (EMEC) off Orkney."

"This report shows that with our excellent maritime heritage, British supply chain companies are well placed to build the UK's wave and tidal projects as they grow, as well as capturing a significant proportion of the export market in Europe and beyond to countries such as Canada, South Korea and Japan."

RenewableUK

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