



Wave & Tidal Energy

NETWORK

COMMUNICATION HUB FOR THE WAVE & TIDAL ENERGY INDUSTRY

SPOTLIGHT ON...
WALES

INDUSTRY UPDATES

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LEAD BY THE INDUSTRY FOR THE INDUSTRY

WELCOME TO WAVE & TIDAL ENERGY NETWORK EDITION 3

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.

LEAD ARTICLE – ENERGY TECHNOLOGIES INSTITUTE

Stuart Bradley, Strategy Manager, Offshore Renewables at the Energy Technologies Institute continues our *'Industry Lead Article'* feature – he covers industry cost comparisons and investment.

SPOTLIGHT ON WALES

As an introduction to this feature we welcome an exclusive article from the Welsh Government Minister for Natural Resources, Carl Sargeant AM, who shares his vision for a vibrant marine energy industry in Wales.

EDITORIAL CONTRIBUTIONS

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

Your contributions are vital to its success so please do not hesitate to get in touch with your stories.

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's digital information, 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.

MEETING YOU

We will be attending the RenewableUK's Wave & Tidal conference and exhibition in Edinburgh 25/26th February at the EICC. Please come and visit us on stand 10. We would be delighted to meet you.



Duncan McGilvray
Editor
Wave & Tidal Energy Network

[Click to view more info](#)

FOUNDING PARTNERS

WAVE & TIDAL ENERGY NETWORK

NOW INTO OUR 3RD EDITION WE WELCOME THE CONTINUED SUPPORT OF OUR 'FOUNDING PARTNERS'.

From an editorial standpoint we need advice and assistance in making sure that the publication is both successful and worthwhile to the industry moving forward and this is a very involved way of ensuring we communicate effectively across the whole industry.

We have a number of **'Founding Partners'** who have signed up to support our publication. There are one or two spaces remaining – if you would like to get involved please contact the sales team on **01765 644224** or email: **sales@greenenergypublishing.co.uk**

At the time of going to print our 'Founding Partners' should have received an invitation to a meeting taking place at RenewableUK's Wave & Tidal conference and exhibition in Edinburgh at the EICC in late February 2015.

If you have not received this email invitation please get in touch – we plan to meet at our stand in the first instance.

OUR FOUNDING PARTNERS:



SWANSEA BAY TIDAL LAGOON

Is undoubtedly the most important and ambitious long term project to hit this exciting industry. In this edition we investigate further.

At 320MW installed capacity, with first power expected in 2018, economic studies will be the largest marine energy development in the world. Developed by Tidal Lagoon Power Limited, it will have an entirely predictable 495GWh output each year of clean, green electricity and will power more than 155,000 homes for 120 years – that's about 11% of Wales' domestic electricity.

Tidal Lagoon Power plans to follow the Swansea Bay project with five full-scale tidal lagoons in UK waters; generating up to 8% of the UK's electricity requirements from the fleet. Mark Shorrocks, Chief Executive of Tidal Lagoon Power explains how the Swansea Bay Tidal Lagoon could change the shape of the UK's future energy mix in this absorbing article.

SPOTLIGHT ON WALES

The Swansea Bay Tidal Lagoon project is just one of the many articles within this substantial regional focus feature which proves that Wales is leading the way in tidal energy.

Duncan McGilvray
Editor
Wave & Tidal Energy Network

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Wave and Tidal IN THE UK

The UK has significant marine energy resources, which to date remain largely unexploited. This is in part because of the cost of the technological and commercial risk involved in deploying appropriate technologies. So reducing the cost of generation is the challenge before us.

COST COMPARISONS

Wave energy costs are presently high in comparison to other low carbon energy sources and more investment is needed before costs improve sufficiently to play a major contributory role in the UK energy mix.

Tidal is beginning to develop a credible cost reduction roadmap through accelerated technology development and plans for array-scale deployment. The biggest driver for substantial cost reduction comes through innovation, so further investment in this area is critical if wave or tidal energy sources are to succeed. But to deliver this investment, investors need confidence in a future market and therefore a return on their innovation risk capital.

THE LOW CARBON INNOVATION COORDINATION GROUP (LCICG)

LCICG believe that alongside a sizeable contribution to UK GDP, successful development of marine energy across both wave and tidal could yield 75TWh/y – over 10% of the UK's forecast electricity needs in 2050. To do this economically, the cost challenge has to be addressed and collaboration is a key principle that both wave and tidal industries should seek to adopt, using greater knowledge sharing.

ETI MARINE ENERGY TECHNOLOGY ROADMAP

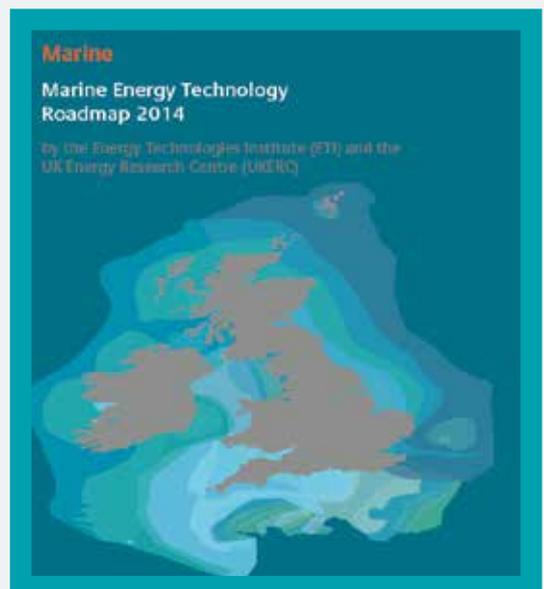
The ETI are looking into innovation to harness the UK's vast natural wave and tidal resources.

Recently published in collaboration with the UK Energy Research Centre (UKERC), the Marine Energy Technology Roadmap. Technology roadmaps are tools to provide a framework for stimulating innovation in specific technology areas in order to achieve a long term vision, target or goal.

ROADMAP AIM

The aim of this particular roadmap is to facilitate the establishment of a commercially viable marine energy sector (covering both wave and tidal) in the UK, supported by an extensive supply chain, thereby building the skills and capacity

necessary to enable the sector to make a material and cost-effective contribution to the delivery of the UK's energy and climate change goals.



It was a major update to the 2010 roadmap that was produced with UKERC which prioritised the key technology and deployment issues faced by the sector.

The roadmap has three specific purposes...

- To provide forward-looking marine energy technology cost and performance targets that can be used to benchmark industry progress in the future – these are generic targets for both the wave and tidal stream sectors
- To identify the specific technology development and demonstration activities required to progress the marine energy sector, including cross-cutting industry requirements along with specific activities for the wave and tidal stream sectors
- To prioritise potential technology development and demonstration interventions in the context of the specific role and remit of the ETI

RECOMMENDATIONS

It recommends the sector should target levelised cost reductions from today's 20-50p/kWh to 10-20p/kWh by 2020 and 5-8p/kWh by 2050 in order to encourage continued deployment. UKERC calculate the sector could be worth more than £70bn and support 68,000 jobs in 2050, but we have reached a critical point in the development of marine energy as decisions made now will determine whether or not it will fulfil its potential as a significant source of energy by 2050.

PRIORITISED INNOVATION

Innovation over the next decade needs to be prioritised to support installation and recovery demonstration and potentially small-scale array trials. This should reduce the cost of marine energy.

The roadmap identifies 40 technology and deployment issues faced and prioritises them from the perspective of the industry. This analysis includes target costs and performance levels with timelines for their delivery.

FUTURE PLANS

The key messages arising from the analysis are that technology validation (including array-scale installations) must take place over the next three to five years, to position the UK marine energy sector for commercial viability in the long-term.

These early deployments will also provide necessary learning by doing to help unlock further cost reductions. Also a target cost of energy of 8-10p/kWh for array-scale marine energy farms needs to be delivered by the mid-2020's to deliver a trajectory towards significant deployment in the UK by 2050.



Stuart Bradley
Strategy Manager
Offshore Renewables
Energy Technologies Institute

Marine installation of the world's largest commercial tidal energy array

James Fisher Marine Services (JFMS) has been selected by MeyGen Limited (MeyGen) to complete the offshore marine installation elements of the initial stage of the project (Phase 1A) that includes the installation of 4 x 1.5 megawatt turbines, support structure and export cables.

FUNDING AGREEMENT

This follows agreement of funding package by MeyGen to commence the construction of the world's largest tidal stream development in the Pentland Firth, Scotland and supports the development of JFMS's capabilities as an integrator of complex marine projects for the marine energy sector.

GROUNDBREAKING

JFMS announced that it has secured a contract with MeyGen to complete the offshore installation activities associated with the construction of the first phase (Phase 1A) of its ground breaking 398MW tidal array project in the Pentland Firth, Scotland.

When fully completed, the MeyGen project will have the potential to provide clean, sustainable, predictable power for 175,000 homes in Scotland from up to 269 tidal turbines secured on the seabed.

This follows the announcement recently that the MeyGen project, owned by AIMlisted tidal power company, Atlantis Resources (Atlantis), has successfully led a funding syndicate to raise approximately £50 million, which will be used to finance the initial stage of the wider MeyGen project.

WORLD FIRST

Under this contract JFMS will employ its considerable marine operational expertise in the installation of 4 x 1.5 megawatt turbines, support structures, submarine cables and other infrastructure offshore. Construction commenced recently and the first electricity will be delivered to the grid by 2016. The successful installation of the tidal array with MeyGen will be the first of its kind in the world and positions JFMS at the forefront of commercial scale subsea tidal turbine installations.

EXCITING PROJECT

Commenting on the successful contract award Jim Hey, Group Business Development Director of James Fisher said *"I am delighted that JFMS has been selected by MeyGen to complete this exciting project to further the development of tidal energy and strengthen the capabilities of the UK supply chain.*

"As an integrator of complex marine projects with access to the specialist resources and capabilities of the wider James Fisher group, this latest award builds on its successful track record of completing detailed planning and engineering studies for other tidal developments and delivery of other significant projects the marine sector.

HUGE INDUSTRY PROGRESS

"The marine energy industry has made huge progress over recent years, however the progression to construction, operation and maintenance of a commercial tidal array is a significant step that we are excited to be involve in." added Jim.

James Fisher and Sons



PARTNERS SIGN AGREEMENT TO INSTALL A FLOATING TIDAL ENERGY PLATFORM NEAR TEXEL



A group of leading offshore companies including Bluewater, Damen and Van Oord have joined together to realise an unique floating tidal energy platform which will be moored near Texel in the Waddensee, an intertidal zone in the southeastern part of the North Sea, to generate clean electricity from the tides.

PROVIDING CLEAN ELECTRICITY IN THE FUTURE TO REMOTE LOCATIONS WORLDWIDE

The platform is a trial for remote locations worldwide, such as islands in Indonesia, Philippines or the Pacific. It is of an innovative modular design and uses a new type of permanent mooring line. It will be the first time that a floating tidal platform is used for electricity production into the Dutch grid. It will be operational in the first half of 2015.

"This platform can be shipped and installed anywhere in the world, to provide clean electricity in remote areas and small islands, replacing expensive and polluting diesel generators" says Allard van Hoeken, Head of New Energy at Bluewater Energy Services.

STEPPING STONE TO LARGER PLATFORM

"This smaller test platform, while ready to use in remote locations, is also a stepping stone for our larger 2MW platform development."

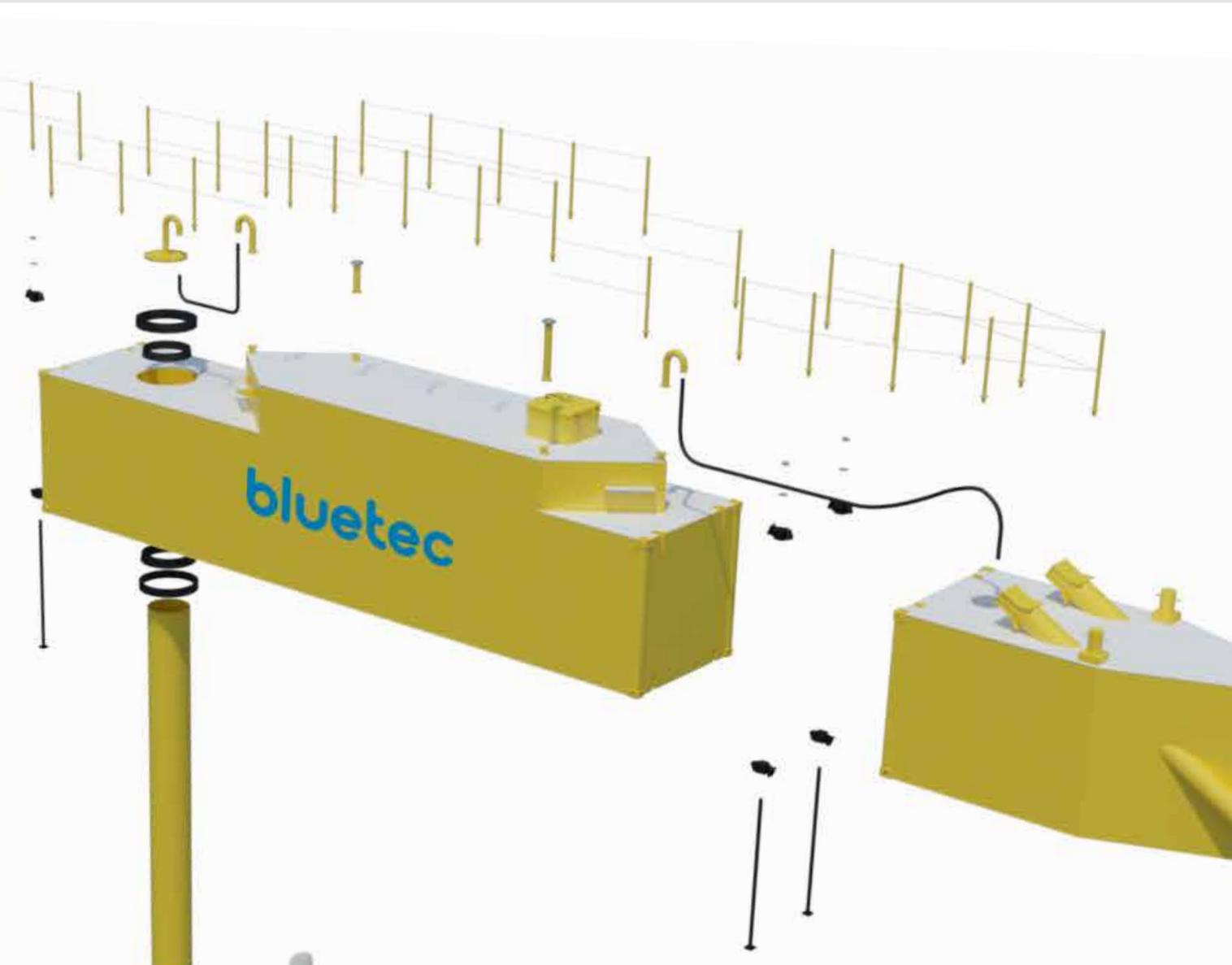
"Together with Bluewater we have adapted our modular barge product to a modular tidal power generation platform, that can be shipped by containers to any location in the world." says Arnout Damen, COO of Damen Shipyards. *"After container transport the modules can be assembled to shipbuilding quality vessels."*

UNIQUE CO-OPERATION

The unique co-operation between Bluewater, Damen, Van Oord, Tocado, TKF, Vryhof, NIOZ, Nylacast and TTC bundles extensive experience in the maritime and offshore industry, in the field of design and operation of mooring platforms, shipbuilding, offshore dredging and installation, tidal turbines, power cables, anchors, research at sea and synthetic materials.

BLUETEC PLATFORM DETAIL

The BlueTEC platform is developed for cost effective installation, operations & maintenance of tidal turbines. BlueTEC floats and can be towed to location without heavy lifting at sea. It accommodates all vulnerable electronics equipment inside the unit, where it is dry and protected, yet allowing for easy access for inspection, maintenance and repair.



The platform can be disconnected from the moored location and taken to a local port for heavy repair when needed. With this modular, flexible floating platform the global tidal energy industry reached a new state of the art.

TEXEL PLATFORM DETAIL

The Texel platform is the small, simple and robust version of BlueTEC. Aimed at remote locations, it consists of container size modules, can be assembled locally and installed without sophisticated equipment.

It holds a 200 KW turbine that can power local villages, cooling facilities and provide lighting at schools which will change local economies. It will be the first time that electricity generated from free-flowing tidal currents will be supplied to the island of Texel.

Damen

Delivering a full-power converter to a self-floating power plant

Vancouver-based Water Wall Turbine Inc. (WWT) has selected The Switch to provide a 500 kW full-power converter for its innovative self-floating power plant. This new commercially viable system extracts potential and kinetic energy from large, fast moving water currents for conversion into electric energy.

The Switch supplied its first 500 kW full-power converter recently for WWT's prototype project, which will be used for the Dent Island Resort, near Vancouver Island off the west coast of British Columbia, Canada. System testing of the integrated equipment is planned for the first quarter of 2015.

REPLACING EXISTING DIESEL GENERATORS

The vessel will power the resort, replacing existing diesel generators as the primary energy source and is integrated with battery energy storage. The diesel generators will provide system backup. Additional 1 MW plants are being planned for other remote resorts and communities in British Columbia.

PATENTED TECHNOLOGY

The WWT vessel leverages patented technology in a tethered above-water design to provide superior advantages over other tidal flow power generation concepts. Power extraction is extremely efficient in deep or shallow water currents. Environmental impact is minimal. The vessel offers easy accessibility for maintenance and construction. The technology is scalable from 500 kW to 1 MW, 2 MW and up to 5 MW per unit. The vessels provide bi or mono-directional operation for tidal and river currents.

PRODUCT KNOWLEDGE AND EXPERIENCE

“WWT was interested in The Switch converter because of our product knowledge and flexibility to work with them on the prototype,” says Risto Ahvo, General Manager of The Switch USA. *“They also appreciated the compactness of our design.”*

The Switch is a leader in permanent magnet generator (PMG) and full-power converter (FPC) packages for wind turbine applications that are similar to this specific co-generation current application. With over 7 GW of installed capacity, they have made their mark with efficient and reliable power generation, lowering the cost of energy.

As an operational reference in tidal wave applications, they delivered a PMG and FPC package in 2011 to the Wello Penguin wave power application in Orkney, Scotland.

DECISION MAKING CRITERIA

“We selected The Switch based on their know-how and experience of delivering converters that fulfill the strictest grid codes and utility demands for interconnection and power conditioning,” says Marek Sredzki, CEO of WWT. *“For us, it was also important to know that The Switch will be providing us with engineering application support.”*

The Switch

Water Wall Turbine Inc. (WWT)



BRITISH-MADE WAVE POWER SURGES CLOSER AFTER SUCCESSFUL TEST

Generating electricity from wave power in Britain took a step closer to reality recently after green energy company Ecotricity's innovative device, Searaser, successfully completed first stage testing at Plymouth University's CoastLAB wave tank.

The brainchild of British inventor Alvin Smith, Searaser is designed to overcome two of the biggest hurdles in the deployment of renewable energy on a scale that fulfils Britain's future electricity needs – cost and variable output.

REAL WORLD CONDITIONS

Ecotricity and the Searaser team have spent the past 18 months optimising the design of the device and modelling outputs in real world conditions around the coast of Britain – with the assistance of one of the world's leading marine energy consultants, DNV GL Group (formerly Garrad Hassan).

Mr Smith said the determining factor in making wave power efficient and therefore cost-effective, was resilience: *"The wave tank testing was carried out to validate the extensive computer modelling we've been undertaking."*

"We've put Searaser through the most extreme testing regime here at CoastLAB and it's passed every challenge."





UNIQUE TECHNOLOGY

Unlike other marine energy technologies, Searaser won't generate electricity out at sea but will simply use the motion of the ocean swell to pump high pressure seawater ashore, where it will be used to make electricity. The motion of the waves drives a piston between two buoys – one on the surface of the water, the other suspended underwater and tethered to a weight on the seabed.

As waves move past, the surface buoy moves the piston up-and-down, pumping volumes of pressurised seawater through a pipe to an onshore hydropower turbine to produce electricity.

The Searaser could be used to pump seawater into coastal reservoirs, from where it can be released at any time of the day or night, to make renewable electricity on demand.

VISION

Ecotricity founder Dale Vince said: *"Our vision is for Britain's electricity needs to be met entirely from our big three renewable energy sources – the Wind, the Sun and the Sea.*

"Out of these three energy sources, generating electricity from the sea is by far the most difficult due to the hostile ocean environment – it's also the least advanced of the three technologies but it has enormous potential.

"We believe these 'Seamills' have the potential to produce a significant amount of the electricity that Britain needs, from a clean indigenous source and in a more controllable manner than currently possible."

Vince said Ecotricity hoped to have a full scale prototype in the ocean in the next 12 months or so – and to be producing electricity from the first commercial array of 'Searasers' within a few years.

ENORMOUS POTENTIAL

Vince said: *"The potential is enormous. This is a British invention that could transform the energy market not just here in Britain but around the world. Our plan is to develop the technology and make them here in Britain, bringing green jobs as well as green energy to our country."*

Ecotricity

GEARBOX LIFE LEARNING FROM THE WIND ENERGY INDUSTRY

THE FOLLOWING ARTICLE WAS WRITTEN FOR THE WIND ENERGY INDUSTRY, HOWEVER WE BELIEVE THE INFORMATION AND PRINCIPLES EXPLAINED WILL APPLY TO THE WAVE & TIDAL ENERGY INDUSTRY BOTH NOW AND IN THE FUTURE.

The changing design of wind turbine gearboxes is putting increased pressure on lubricants to perform. We talk to Thorsten Sueling, European OEM Manager, ExxonMobil Fuels & Lubricants, about improving the life of your gearbox.

CAN YOU OFFER SOME INSIGHT INTO EXXONMOBIL'S OFFER FOR THE RENEWABLE ENERGY SECTOR?

ExxonMobil Fuels & Lubricants has been at the forefront of developments in the wind energy sector for more than 30 years and understands the challenges Equipment Builder engineers and wind farm operators face. The company is committed to helping wind farm owners optimise their productivity by improving equipment performance and minimising maintenance.

WHAT CHALLENGES DO TURBINE GEARBOX LUBRICANTS FACE?

The main challenge for wind turbine gearbox lubricants is their ability to cope with changing gearbox designs, which are focused on increasing gear ratios and output performance without adding weight to the gear configuration.

The drive to minimise up-tower weight has resulted in more compact gearbox designs with case hardening of the gear surfaces. Case-hardened gears are susceptible to micropitting and require a gear lubricant that protects against this form of wear.

In the 1990s, a change in wind turbine gearbox design increased power output from kilowatts to megawatts. This surprised and disrupted many lubricant manufacturers, and took its toll on wind farm operators and maintenance professionals that had to cope with unscheduled downtime and critical component wear due to increased load pressure on significantly more compact gearboxes. The market is now anticipating new design developments that will increase the power output of wind turbines gearboxes by 30 percent in the near future (from single to double-digit megawatt) another change that lubricants need to respond and adapt to.



In addition, new market growth for wind farms in more remote locations such as deserts or high plateaus of Asia Pacific, with temperatures ranging from -50 °C in China up to +45 °C in India, requires lubricants that offer a wide operating temperature range and strong corrosion protection. The use of fine filters to protect gearbox components from wear also means that the gear oil must retain an acceptable level of foam performance even after repeated cycling through such filters.

WHAT IS EXXONMOBIL'S RESPONSE TO THESE CHALLENGES?

To help the industry adjust to significant advances in wind turbine design technology, ExxonMobil has launched an advanced wind turbine gearbox oil, Mobil SHC™ Gear 320 WT, which was developed in collaboration with leading global OEMs to secure reliable wind turbine gearbox performance and lasting equipment protection.

The new gear oil is backed by a seven-year limited warranty for main wind turbine gearbox applications. The warranty guarantees long service life for the main gearbox in wind turbines, and it eliminates the need for an oil change for a minimum of seven years from initial fill, even under severe off-shore conditions. The duration of the warranty is an industry first and the guarantee is offered to all customers.

CAN YOU TELL US MORE ABOUT THE WARRANTY?

The warranty covers the Mobil SHC™ Gear 320 WT and critical components lubricated by the oil. It states that ExxonMobil will replace or repair any equipment damaged as a direct result of lubricant defect or malfunction.

The warranty demonstrates ExxonMobil's confidence in the performance of our new product and our commitment to helping the wind energy industry remain competitive against traditional power generation technologies.

WHAT ARE THE KEY BENEFITS?

Following extensive bench and rig tests, Mobil SHC Gear 320 WT has proven to provide powerful protection against micropitting and wear, and to offer longer equipment and oil life when compared against traditional mineral oils. ExxonMobil’s lengthy warranty offer for Mobil SHC Gear 320 WT underlines the lubricant’s potential to exceed the performance of traditional mineral oils by extending oil drain intervals from 18 months to seven years.

Mobil SHC Gear 320 WT has demonstrated an excellent oxidative stability (a key factor in achieving extended oil life when gear oils are thermally stressed), viscometrics and low-temperature performance. The oil has demonstrated viscosity index at 187 (compared to 160 industry standard), and a pour point - the temperature at which it becomes semi solid and loses its flow characteristics – of -48°C.

The new gearbox oil also offers excellent water tolerance due to its proven water ingress capabilities – an essential lubricant feature for increasing the life span of off-shore wind turbines and service oil. This can help off-set equipment ageing as a result of contact with sea water, salt and salt vapour – all contributing to gear and bearing degradation. The lubricant is also approved for aquatic non-toxicity, as determined by the International Maritime Organisation (IMO) 493/02 test.

SAFETY IS A NUMBER ONE PRIORITY. HOW DOES THE NEW PRODUCT HELP IMPROVE SAFETY AND INCREASE PRODUCTIVITY?

Mobil SHC™ Gear 320 WT has been formulated to minimise foaming and leakage that helps to ensure better housekeeping and mitigates potential slips and falls. Long drain intervals can help mitigate potential safety risks caused by employee interaction with equipment; they can also lower maintenance costs and downtime, while maximising turbine availability and production. The new gear oil meets the industry need for improved safety by extending oil drain intervals to seven years.



Thorsten Sueling
 European OEM Manager
 ExxonMobil Fuels & Lubricants
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ED’S NOTE

This is an abridged version. We recommend you read the full article by clicking/scanning the link.

Scottish Renewables' Marine Conference

Coming as it did hot on the heels of the Independence referendum, Scottish Renewables' Marine Conference was always going to be lively.

With more than 350 delegates involved in the wave and tidal energy sectors, the event in Inverness provides a meeting of minds for this nascent sector.

The perennial challenges of grid connections, financing and the inherent difficulties of world-leading innovation were perhaps unsurprisingly constant themes.

POST-INDEPENDENCE REFERENCE SCOTLAND

In 2014, though, SR's Chief Exec Niall Stuart used his opening speech to highlight the organisation's asks for a post-independence reference Scotland.

Among them...

- A guarantee of robust grid connections to allow green power generated on the islands to be exported to the mainland, where it can be sold
- Joint thinking between government and agencies across the UK to jointly address the challenge of how we take the marine energy sector to the next level of development
- A more co-ordinated and strategic approach to the formation of energy policy across the UK and changes to the governance of energy regulator Ofgem



KEYNOTE ADDRESS

In his keynote speech, Mr Stuart said: *"Given the importance of the contribution that Scotland and the other devolved nations will make to the UK's energy ambitions and the growing importance of the sector to all our economies, we believe that it is time for a more co-ordinated and strategic approach to the formation of energy policy across the UK.*

"This should reflect our respective strengths, resources and priorities and be designed to deliver the optimal energy mix for the UK as we seek to keep down costs for consumers, increase energy security and cut carbon emissions."

INVESTMENT FIGURES

Key new investment figures from research by Scottish Renewables were also unveiled

at the conference, showing Scotland's flourishing wave and tidal energy sector has invested more than £217m in the country to date, with £31.8m spent in the last 12 months alone.

The Marine Milestones report also revealed almost two-thirds (62%) of the growing industry's supply chain is Scottish.

MEYGEN PROJECT

Funding wave and tidal projects can be a complex and lengthy process but as the MeyGen project – the largest tidal stream array in Europe, which achieved financial close shortly before the conference – showed, it is possible. Dan Pearson, the company's CEO, told how the process played out, as well as highlighting that the organisation was still hiring to fill new posts as the project progresses.



SALTIRE PRIZE

The Saltire Prize, a competition initiated by the Scottish Government to stimulate innovation and technology development throughout the sector, also played a part in proceedings at Inverness's Eden Court.

Saltire Prize Medal recipient Allan Thomson, founder of Wavegen, the first company in the world to connect a commercial scale wave energy device to the grid, asked "What model do we need to build a thriving, commercially successful wave energy industry in the decades ahead?"

And although he conceded "we don't know all the answers", the engineer said: "We know the right questions – there is no technical challenge in the wave sector that cannot be surmounted. I believe that if we adequately address these questions and take a new approach to solving them, we will arrive at our goal – commercially available wave energy stations producing power, fresh water and other unexpected innovative products."

COLLABORATION

Collaboration has always been a buzzword in marine renewables and the sector is quickly coming to learn that the long-term benefits of working together far outweigh the IP issues which can be thrown up by partnership projects.

Indeed, cross-Europe collaboration is also coming to represent new opportunities for wave and tidal energy, with the European Commission looking to Scotland for direction when setting up the European Commission's Ocean Energy Forum in 2014. The organisation, which aims to accelerate the commercialisation of the ocean energy sector, received attention during the final session of the Marine Conference, with Barry Carruthers, Marine Energy Manager at ScottishPower Renewables, calling the inclusion of wave and tidal energy in the EU's energy plans "an amazing achievement."

EXHIBITORS

Exhibitors including Norco, Hydrosphere and Gael Force were also in Inverness for the event, which was sponsored by Highlands and Islands Enterprise and showed the strength of the marine supply chain in Scotland.

Scottish Renewables






World Firsts for Wave & Tidal Power

10 years of wave and tidal EIA and consenting:
 World's first grid connected tidal turbine - consented | World's first tidal array - consented | World's first commercial wave array - consented

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royalhaskoningdhv.com

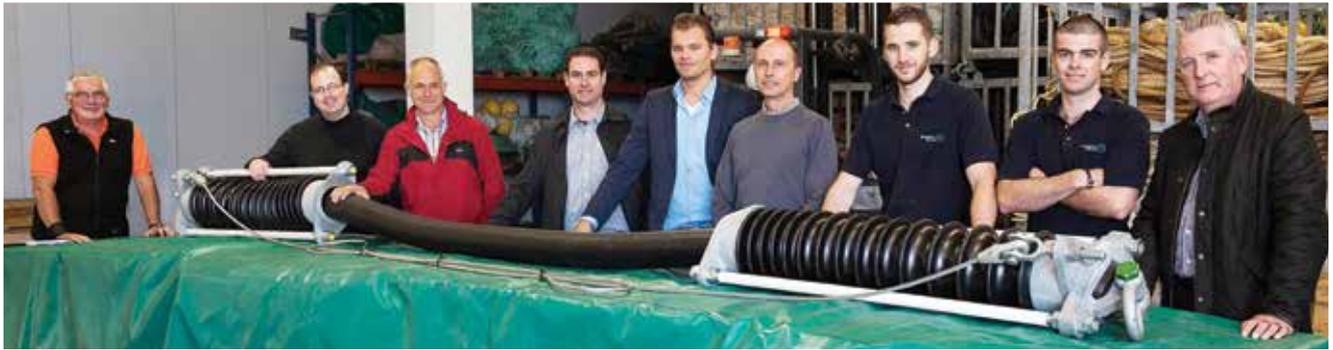
Elastomeric mooring solution deployed in Galway Bay Test Site

SmartBay Ireland is working with Irish company TFI Marine on the trial and validation of a novel elastomeric mooring system. This trial is being carried out at Ireland's marine test and validation facility in Galway Bay. SmartBay's technical team has managed the deployment of the buoy, installed and integrated sensors to validate performance. All data is being securely delivered to TFI via their dedicated web portal. Following several months of data collection using a standard mooring configuration equipped with load cells to measure the forces on the moorings, their team recovered and replaced these moorings with TFI Marine's novel elastomeric mooring system.

ANALYSIS

Information from the load cells will be analysed along with other sensors on the buoy which measure wave, weather and motion data to determine the efficiency of this new mooring design. This trial has received funding support by the Sustainable Energy authority of Ireland (SEAI).





MAIN CHALLENGE

One of the main challenges for floating devices within the ocean energy, oil & gas and aquaculture sectors is the design of reliable and cost-effective mooring solutions which can cope with the harsh and dynamic marine environment. The mooring system must be able to withstand storm conditions as well as the motions created by waves. This mooring device, developed by TFI Marine is expected to reduce the loads on moored objects by as much as 70% and minimise snatch loads that eventually lead to mooring failures.

The mooring tethers significantly reduce mooring forces; mooring system costs, footprints and noise emissions. The TFI Marine moorings can be used to secure navigation marks; research buoys, aquaculture cages, oil & gas installations and ocean energy devices.

GALWAY BAY TEST SITE

Brendan Farrell, Chief Executive of TFI Marine said, *“We recently installed, with the assistance of SmartBay, a demonstration data buoy fitted with our new dynamic mooring system. The availability of the exposed Smartbay, Galway Bay test site is ideal for showing customers the benefits of our new tether technology. The delivery by SmartBay, of live performance data back to shore makes it easy for us to demonstrate the elimination of snatch loads and reduction of peak loads by up to 70%.”*

TURNKEY SUPPORT

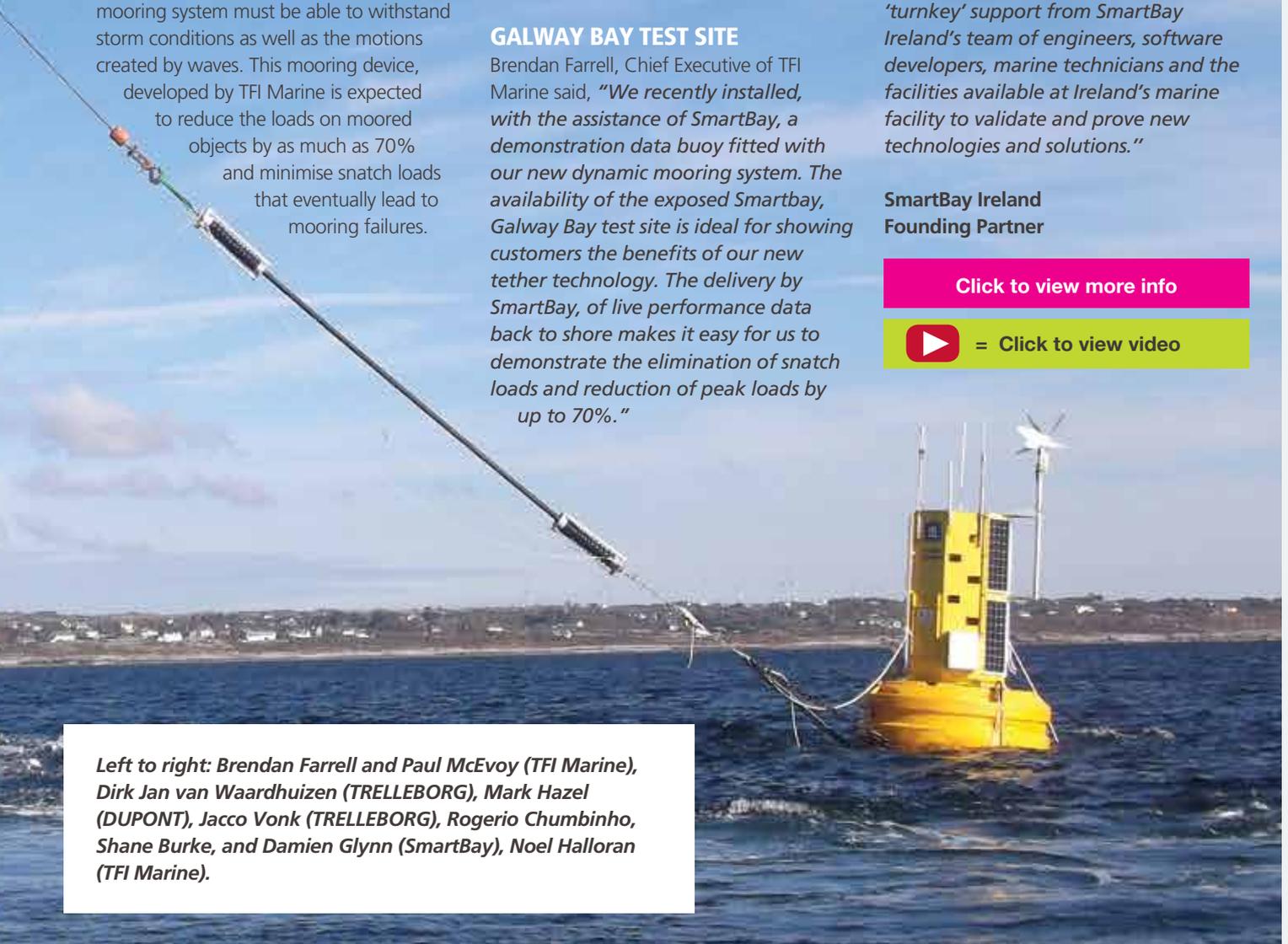
SmartBay Ireland General Manager, John Breslin highlighted that, *“We are delighted to be working with TFI Marine to validate their new dynamic mooring system. This project demonstrates the benefits of utilising ‘turnkey’ support from SmartBay Ireland’s team of engineers, software developers, marine technicians and the facilities available at Ireland’s marine facility to validate and prove new technologies and solutions.”*

**SmartBay Ireland
Founding Partner**

[Click to view more info](#)

[▶ = Click to view video](#)

Left to right: Brendan Farrell and Paul McEvoy (TFI Marine), Dirk Jan van Waardhuizen (TRELLEBORG), Mark Hazel (DUPONT), Jacco Vonk (TRELLEBORG), Rogerio Chumbinho, Shane Burke, and Damien Glynn (SmartBay), Noel Halloran (TFI Marine).



COMMERCIALY VIABLE TIDAL ENERGY...

Sustainable Marine Energy (SME) has successfully completed its first round of sea trials with its tidal energy platform, PLAT-O.

INNOVATIVE PLATFORM

The tidal energy industry has struggled with high costs for installation and maintenance, but SME is demonstrating that, by using its innovative platform which is moored under the surface of the water, these costs can be significantly reduced.

LOCATION

PLAT-O was launched from the company's facility in Venture Quays, East Cowes, Isle of Wight and towed to the test site at Yarmouth. Once at the site PLAT-O was submerged to installation depth and a series of tests were run. PLAT-O was then successfully resurfaced and towed back to East Cowes, where it will be prepared for its next series of trials.

The marine operations were run using small vessels, demonstrating that a step change reduction in the cost of installing tidal energy devices can be achieved. The results of the sea trials provide increasing confidence in the potential for tidal streams to provide a commercially viable source of renewable energy.

HUGE MILESTONE

Jason Hayman, Managing Director of SME, says: *"We have reached a huge milestone in the development of our solution to address the costs associated with delivering tidal energy. Over a short period of time we have achieved a great deal thanks to our capable and passionate team."*



COMES A MAJOR STEP CLOSER

"After this operation I am confident that PLAT-O provides the industry with a new approach which reduces the costs and risks associated with delivering tidal energy considerably. Over the next few months we will be ramping up the time that PLAT-O spends at site and running a series of tests which will culminate in the installation of PLAT-O at a more aggressive tidal site and generating power to the grid."

TERRIFIC ACHIEVEMENT

David Thomson, Managing Director of Orcades Marine Management Consultants, who manages the delivery marine operations for SME, adds: *"The progress that the team at SME has made culminating with this trial installation of PLAT-O should be regarded as a terrific achievement. I have been involved in many tidal installation operations and I have seen first-hand the challenges facing the tidal industry in relation to the cost of operations. It is clear to me that PLAT-O has the opportunity to succeed and provides a viable solution for the tidal energy industry."*

Sustainable Marine Energy



MARINE ENERGY IN WALES

We welcome The Welsh Government Minister for Natural Resources, Carl Sargeant AM, who shares his vision for a vibrant marine energy industry in Wales...

Wales is ideally suited for the establishment of a successful and competitive marine energy industry. We benefit from 1200km of coastline and the second highest tidal range in the world and have an estimated 5GW of wave and 1GW of tidal stream energy potential. Our deep sea ports are strategically located and our grid infrastructure is accessible.



CONTINUED >



ATTRACTIVE LOCATION

But it isn't just our fantastic natural resources and infrastructure which make Wales such an attractive location for the industry. We also have a strong manufacturing base, a skilled workforce and excellent research and innovation facilities. We are working across the Welsh Government to ensure a flexible and responsive approach that supports the pioneers in wave and tidal energy as we move towards a low carbon energy future for Wales.



GROWING INTEREST

There is a growing interest in the energy in our waters and I am encouraged by the work of the whole marine energy sector – industry, regulators, advisors, academia and the research community – and the partnership approach to delivering projects.

SUPPORT

I recognise that marine technology is at a pre-commercial development phase and needs significant support from Government. One example of the support that my department is able to provide is our work with the industry, the Crown Estate, Natural Resources Wales and key partners to overcome consenting risks and uncertainties.

RESPONSIBILITY

As Minister for Natural Resources, I have responsibility for the sustainable use of our wave and tidal resource and I am committed to working with the marine sector to ensure Wales has a thriving marine energy industry and that our communities receive the maximum economic and social benefits from projects.

PROGRESS

So what progress has there been to date? Wales is currently home to two projects with the necessary consents to deploy marine renewable energy devices and I am hopeful, subject to suitable weather and sea conditions, that we will see our first tidal stream device – DeltaStream Ysbyrd y Môr – in the water in the near future.

DeltaStream is a full-scale demonstrator device, developed by Cardiff based Tidal Energy Ltd and backed by £8M of European funds delivered through the Welsh Government. It is due to be deployed in Ramsey Sound, off the coast of Pembrokeshire. Our deploy and monitor approach to consenting in Wales has been used for DeltaStream to allow Tidal Energy Ltd and the marine sector to gather environmental information about how devices interact with the marine environment. This information will be used to enhance our knowledge of possible impacts and will assist with the consenting of future devices.

When operational, DeltaStream will provide clean, predictable and reliable low carbon energy through a cable connection to the Local Distribution Network.



DEMONSTRATION ZONES

We have been working with the Crown Estate to establish wave and tidal demonstration zones in Wales and I am delighted that Menter Môn and Wave Hub were recently successful in acquiring seabed rights from The Crown Estate. Their role as third party managers is to increase the attractiveness of our wave and tidal test and demonstration zones through their management and promotion. Menter Môn will manage the tidal stream zone off Anglesey while Wave Hub will manage our wave zone off Pembrokeshire. The Welsh Government is working closely with both to attract developers to our waters.

Swedish based Minesto, developer of the Deep Green tidal kite, has also secured seabed rights off the coast of Holyhead, North Wales.

NEW OPPORTUNITY

Lagoon technology is presenting Wales with an interesting new opportunity to harness the untapped tidal range resource. We currently have one project, Swansea Bay Tidal Lagoon, in the planning system. If consented, the 320MW lagoon would be the world's first man-made tidal lagoon, offering not only predictable low carbon energy but also a recreational and tourism amenity.

With so much positive activity going on in Wales we are beginning to see an exciting future ahead for marine renewables. We are doing all we can to streamline the planning system in Wales, which will benefit all future developments including those in the marine energy sector. But we know there is a lot more work to do in supporting the industry to develop and thrive and I would like to describe two of these initiatives.

INVESTMENT

The Welsh Government has invested £1M into developing the Marine Renewable Energy Strategic Framework (MRESF), which assessed the available wave and tidal resource within a sustainable framework and provides developers with an online mapping tool. Developers looking to deploy their devices in Welsh waters are encouraged to use MRESF to obtain information on our key resource areas and potential development constraints.

FUNDING

Funding is key for a successful marine industry. The European Regional Development Fund (ERDF), delivered through the Welsh Government has assisted a number of projects in Wales and with the recent approval by the European Commission of the ERDF programmes 2014-2020 for Wales, there will be further opportunities to support energy efficiency and renewable energy, including marine energy.

SHARED GOALS

By working in partnership towards shared goals we can build on the great progress on our journey towards creating a sustainable, low carbon future; in 2012 we generated the equivalent of 18% of our electricity consumption from renewable sources.

Marine energy will add to our energy mix and play an important role in providing clean, predictable and reliable power now and for future generations.

Wales' natural resources powered the Industrial Revolution and now we have the opportunity to do the same as part of the renewables revolution. I invite you to join us as we develop a resilient and prosperous renewable energy industry in Wales.

Carl Sargeant AM
Welsh Government Minister for Natural Resources

[Click to view more info](#)

West Anglesey Demonstration Zone THE MORLAIS PROJECT

The West Anglesey Demonstration Zone is an area which has been identified by the Crown Estate in consultation with statutory and other stakeholders as being a suitable location for the installation of marine energy devices in the short to medium term. The Zone has a good tidal current resource and a low wave regime.

MORLAIS CONCEPT

The project is designed to de-risk the up front development costs associated with tidal sites and hence attract some of the first tidal energy array projects in the UK. These are intended to range from Technology Demonstration projects which would be up to about 3MW in capacity up to full scale Commercial Arrays of 30MW.

It is intended that the first of these projects could be installed in the next 2 to 3 years with a full deployment up to around 100MW installed within the next decade.

OUTLINE COMMERCIAL ARRANGEMENTS

Menter Môn is a third sector organisation based on Anglesey and has been awarded a seabed lease for the Zone by the Crown Estate. This is initially for 45 years to provide security over the long term. Menter Môn is running the Morlais Project and aims to sub-lease areas within the zone to Project Developers.

The proposed arrangement is that the tenant developer will pay a seabed rent to Menter Môn; the majority of which will be paid on to Crown Estate as per any other UK based marine energy project. In addition to this, Menter Môn will be able to charge tenants an additional direct rental in respect of any 'added value' which is on offer to tenants.

BASIC SITE SUMMARY

Depth	Extents of 30-50m LAT with 2 localised shallower areas. Generally around 40m
Flow Speed	Modelled at 3.5-5.5kts Vmsp, Generally expected to be faster towards the north
Seabed Characteristics	Sand with rocky outcrops
Environmental Considerations	No major navigation routes, two existing subsea cable routes pass through zone. No SPA or Ramsar within Zone. Diving bird colonies on Holy Island.

EXPORT CONNECTION OBJECTIVES

The objective is to provision the onshore distribution network, including consents and construction, a shore station and potentially the subsea export assets from the Zone to shore.

CONSENTING OBJECTIVES

Obtaining permission to install marine energy projects is a critical factor in the deployment of large scale arrays of machines. By progressing the consenting process in the zone, Morlais intends to...

- Prioritise the environment to ensure sustainable development of the zone
- Help to manage stakeholder interests to make best use of the zone
- Attract developers to the zone to secure benefits for Anglesey
- Increase developer collaboration and information sharing
- Reduce consenting risk to tidal energy projects coming into the zone
- Accelerate deployment of tidal energy in the zone

The route to progressing consent in the Zone will involve large scale data collection and aim to greatly simplify the consenting process for potential tenants.

Menter Môn

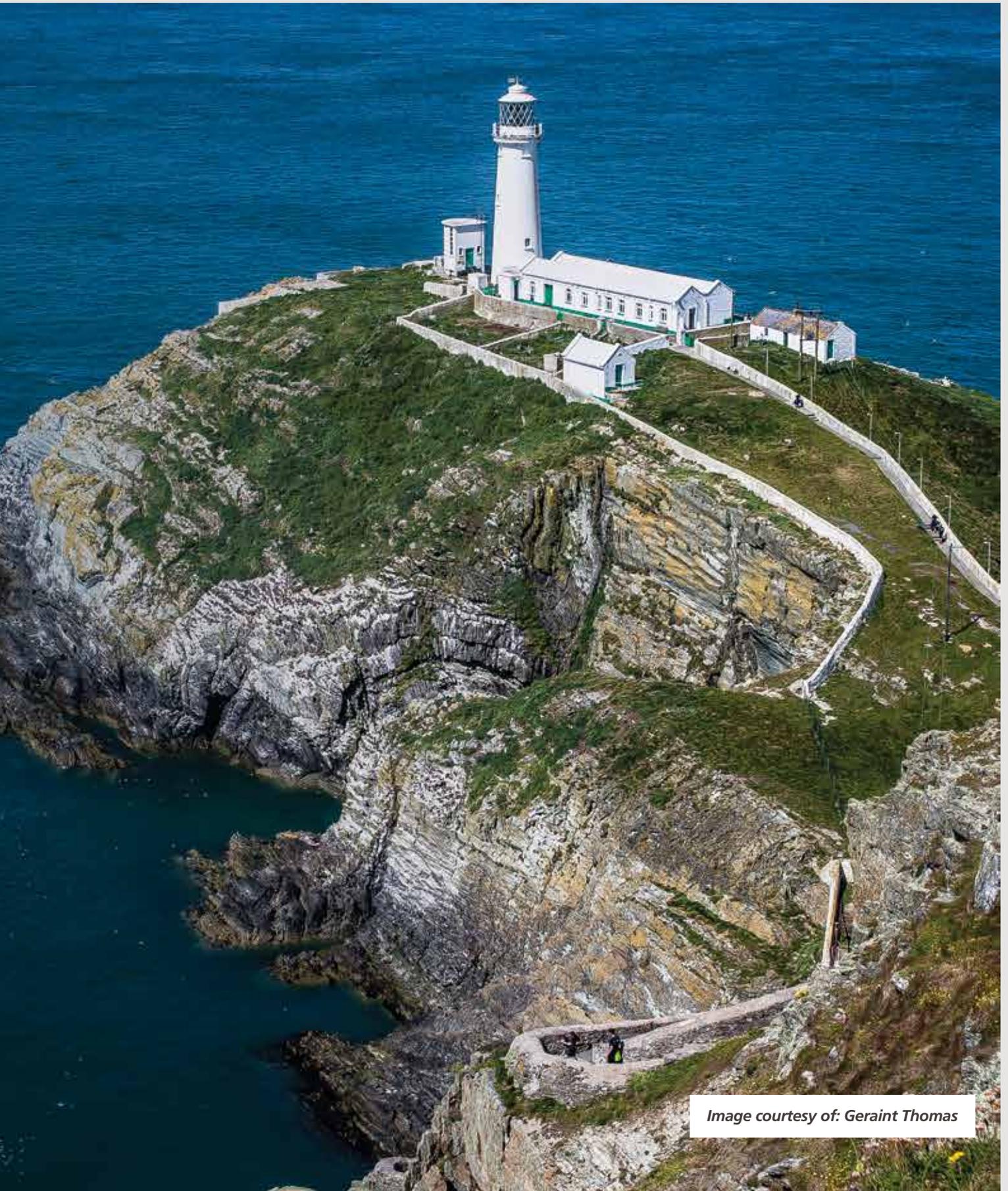


Image courtesy of: Geraint Thomas

Tidal Energy Limited Case Study

MUSTANG MARINE IS RENOWNED FOR BUILDING RUGGED, RELIABLE WORKBOATS IN THEIR DEEP WATER FACILITIES AT PEMBROKE DOCK. WHEN TEL ISSUED AN INVITATION TO TENDER FOR THE FABRICATION OF THEIR TIDAL ENERGY DEVICE, MUSTANG MARINE QUICKLY REALISED THAT THEIR DESIGN, FABRICATION, WELDING, ENGINEERING AND SYSTEMS CAPABILITIES DEVELOPED OVER 30 YEARS IN THE INDUSTRY MADE THEM IDEAL FOR THIS PROJECT AND RETURNED A BID SUBMISSION THAT DEMONSTRATED THEIR ABILITY TO SATISFY THE REQUIREMENTS OF THE PROJECT.

CONTRACT AWARD

Mustang Marine Limited was delighted to be awarded the contract to build the DeltaStream tidal energy device late last year and commenced fabrication of sub-assemblies in their suitably equipped workshops. From here, each item was grit blasted and coated with MGDuff Zinguard anticorrosion finish before being transported to the quayside at Pembroke Port for assembly.





SPECIFICATION

The interconnecting 15 metre steel tube sections of the triangular base-frame were over 2 metres in diameter and 20 mm thick and connected to fabricated interconnecting nodes incorporating a patented rock penetrating foot assembly designed to secure the structure to the ocean bed.

The nacelle assembly was fabricated and fitted out with the gearbox, drive train and generator by Mustang's experienced fitters and electricians in a clean fabrication hall. The nacelle attached to a heavily constructed yaw assembly incorporating the main pintle casting and hydraulic system.

INSTALLATION

This complete assembly was lowered into the base-frame, followed by connection of the main power electrical cables and rotor assembly. Mustang's facilities comprise of two covered and two open slipways, a ro-ro slipway, a wet basin and three build sheds which enables Mustang to build and launch vessels straight into the Milford Haven waterway.

The waterway provides perfect access to the installation site at Ramsey Sound, which is located just north of the mouth of the Haven.

PROVEN ABILITY

Mustang Marine has further developed their competences/skills building the DeltaStream device and is one of the very few businesses with the proven ability to build marine renewable devices capable of operating in the harsh environment of the waters surrounding the British Isles.

The company is looking forward to building further devices for Tidal Energy Ltd and would welcome the opportunity to build other energy devices in their boatyard.

Mustang Marine



MARINE ENERGY PEMBROKESHIRE (MEP)

Wales' profile as an ideal location for marine renewables has increased dramatically in recent years, due in part to the collaborative work by MEP and its members. Since its inception in 2010, MEP's main objectives have been to provide support and guidance for the Welsh marine energy industry. The current project work plan shaped by industry and funders includes promoting Welsh capability and attracting investment to Wales, bespoke business support, research co-ordination, developing consents guidance and consenting recommendations for Government.

MEP WORKING GROUP

The MEP working group, comprised of technology developers, supply chain, academia and the public sector provides a single point of access for marine energy interests in Wales. The success of this collaboration is highlighted by the number of businesses and organisations who are now members.

Originally comprising of 8 individuals in 2010, the working group now welcomes over 60 members including Welsh Government, The Crown Estate, RenewableUK, Natural Resources Wales, as well as all wave and tidal developers with an interest in Wales. The group meets regularly to discuss and share development opportunities and best practice on specific topics.

MEP image Ramsey sound - Dave Alexander



ANNUAL SEMINARS

MEP has also hosted fully booked annual seminars since 2010 with targeted candidates attending from around the world. The event provides industry, Government and statutory advisors with greater clarity on the current status and future plans for marine renewables in Wales. It also provides unique networking opportunities for the sector and has Ministerial presence each year.

This year's seminar, which will be held in March 2015 promises to be equally informative.

SOUTH PEMBROKESHIRE WAVE DEMONSTRATION ZONE

In July 2014, MEP was named as the local partner for the South Pembrokeshire Wave Demonstration Zone. These zones have been leased out by the Crown Estate with the goal of accelerating technology development. The Pembrokeshire Demonstration Zone is located 13km off the South Pembrokeshire coast.



With a 90km² area of sea bed and a wave resource of 19 kW/m, it has the potential to support the demonstration of wave arrays with a generating capacity of up to 30MW for each project. Third party management for the site is a collaborative approach being led by Wave Hub and partners including MEP, Pembroke Port and Pembrokeshire County Council.

EXPERTISE

The wealth of expertise in this collaborative environment has already achieved a huge amount for Pembrokeshire, Wales and the UK.

RECOGNITION

The work of MEP was recognised at the 2014 Tidal Today Energy Awards in November with MEP being shortlisted for the best example of industry collaboration.

Project Director of Marine Energy Pembrokeshire, David Jones, said *"Wales is entering a critical phase in the growth of marine renewable energy. There is increasing developer interest, new structural funds prioritising marine energy and Demonstration Zones for wave (Pembrokeshire) and tidal (Anglesey). Our last meeting saw new developers join us from America, Australia, Singapore and Sweden. We were very pleased to be shortlisted for this award, and delighted that two of our members won an award - Tidal Energy Limited (Best Small Company) and Pembroke Port (Most Supportive Supply Chain Company), highlighting that collaboration is key and that momentum in Wales is increasing."*

Marine Energy
Pembrokeshire

[Click to view more info](#)



WAVE ENERGY RESEARCH FOR PEMBROKESHIRE

LCRI Marine, a collaboration of all the leading academic marine institutions in Wales, is a project that aims to enable and support a sustainable marine energy sector in Wales by providing independent and world-class research.

The group are involved in the development and application of tools which optimise the performance of the technology that recover energy from waves, tidal streams and tidal ranges around the Welsh coast. In particular they consider the likely effects that these devices have on the environment and the effect that the environment has on devices.

PROJECT

The project which is led through Swansea University's College of Engineering, is helping to promote the waters off Pembrokeshire for electricity generation from wave power. This region has recently been highlighted as an area of excellence for wave power, via the creation of The Crown Estate Wave Demonstration Zone.

In July they announced the creation of six demonstration zones for wave and tidal energy around the UK coast, with two located in Wales; wave energy in Pembrokeshire and tidal energy off Anglesey.

LOCATION ATTRACTION

Pembrokeshire is particularly attractive for the development of commercial wave energy extraction projects due to the proximity to port facilities in Milford Haven and strong electrical grid connections. Detailed knowledge of the wave conditions however is lacking, which hinders accurate estimates of wave energy extraction levels. While there has been a wave buoy off the coast of Pembrokeshire for many years, it does not provide adequate information for the renewables industry to have high levels of confidence.

STATE-OF-THE-ART DIRECTIONAL WAVERIDER BUOY

LCRI Marine recently purchased and installed a state-of-the-art directional waverider buoy which provides a much more detailed description of the sea state, enabling both industrial developers and potential investors to have greater confidence in the suitability of the area.

The new buoy not only provides wave height information but, crucially, information about the wave spectra. Wave spectra describe the energy within different frequencies of a given wave condition and is vital for wave energy developers to predict how well their devices will work in a given area.

COMPUTER SIMULATIONS

Additionally the LCRI marine project is setting up computer simulations of the region so that spatial variability in resource about the region can be quantified and the areas that are most suitable for project development identified.

Commercial viability

It is believed that this study will demonstrate the commercial viability of wave energy extraction in the area and hence encourage investment in Welsh based projects and lead to growth of the renewables industry in the region.

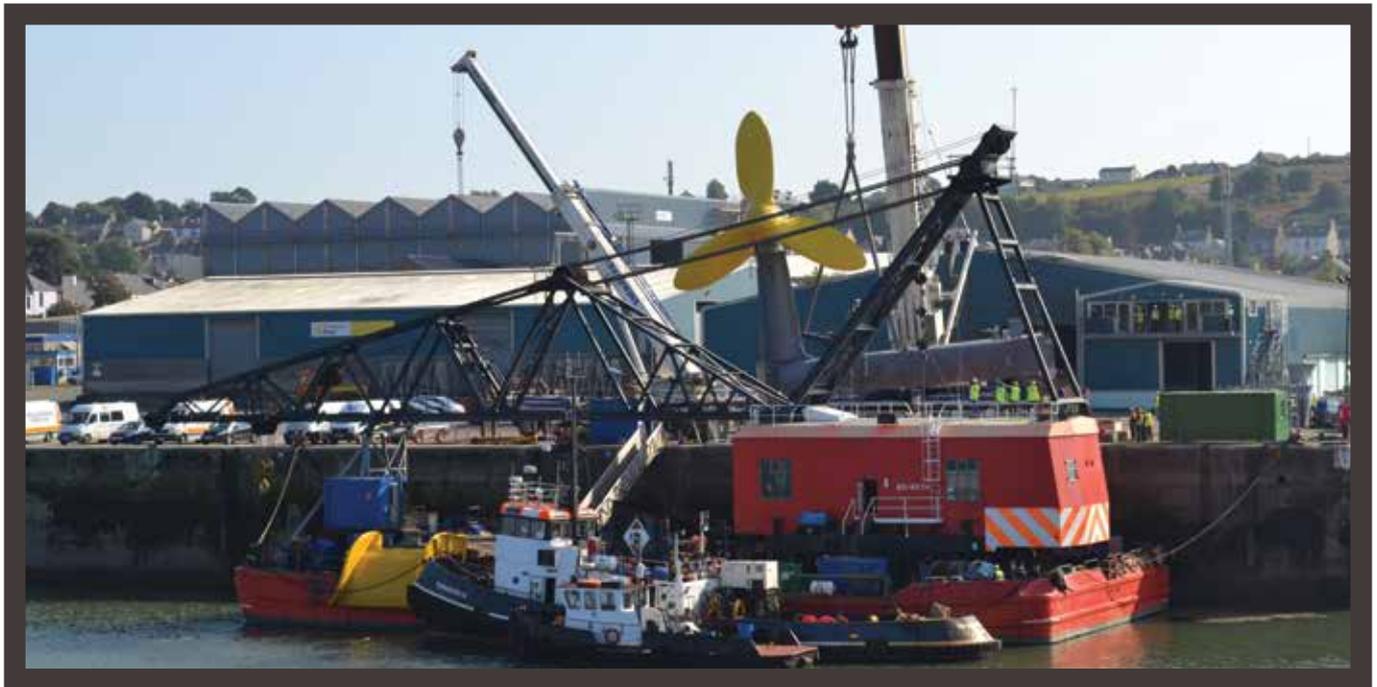
Iain Fairley
LCRI Marine





COST SAVINGS FOR DEVELOPERS

One of the biggest challenges facing the renewables industry is managing costs. At the commercial end it is about making the price attractive to the consumer by driving down the £/kWh, while at the developmental stages (where wave and tidal energy currently resides) it is a balance between applying significant investment to drive the project forward while avoiding wasted expenditure.



COLLABORATION

A key area that allows developers to manage costs is collaborative working within the supply chain. As members of Marine Energy Pembrokeshire and a key infrastructure provider within Pembrokeshire and the Haven's Enterprise Zone, Pembroke Port collaborates with the other members of the supply chain to identify where, by working alongside each other, they can help de-risk projects and give developers a competitive edge.

SUPPLY CHAIN ACCESS

As Tidal Energy Limited develops the tidal energy device, DeltaStream, they can access a full supply chain on site and in the surrounding area. Such proximity and close working means that delays are minimised and less time and money is wasted mobilising supply chain companies to site.

This ultimately means that they can focus their energy on device development rather than waiting on distant suppliers.

PORT SPECIFICS

Importantly, the port is an unrestricted access, deep water site within easy steaming distance of superb marine energy resources. It is a secure site, yet accessible around the clock and throughout the year. This flexibility is often crucial in the early stages, with port operatives on hand to receive and unload components and giving developers the ability to access their devices as and when required.

OPTIONS

The port also offers developers a variety of options for internal and external spaces for laydown and specialist fabrication - allowing the device to remain in one location during test phases, deployment, operations and through to decommissioning.

Not only does this offer an excellent opportunity to manage logistics costs but also, by maintaining a base close to water and a skilled supply chain, means that early stage in-water tests can be carried out quayside resulting in significant cost savings and potentially, a faster development phase.

Pembroke Port



Partnership appointed to Natural Resources Wales' Marine and Coastal Framework Agreement

One of the UK's leading environmental and engineering consultancies, JBA Consulting and its strategic partner, marine experts Partrac, have been appointed by Natural Resources Wales (NRW) as independent specialists on its Marine and Coastal Casework Framework. The partnership will provide a range of services under the Framework's Coastal/Marine Physical Processes and Geomorphology Lot.

MARINE INFRASTRUCTURE PROJECTS HUB

With its extensive coastline, strategically located deep ports and ambitious renewable energy targets, Wales is becoming a hub for major coastal and marine infrastructure projects. As a result, NRW is increasingly required to advise on complex and technically challenging projects such as the proposed tidal lagoons around the coast of Wales. In order to ensure that the advice provided to the Welsh and other UK Governments, developers and other stakeholders is to the highest standard, NRW has sought independent expert input in a range of areas.





EXPERT MARINE ADVICE

JBA Consulting and Partrac will provide expert advice on coastal/physical process and water quality aspects of marine and coastal casework, in particular marine renewable energy proposals. This will include recommendations for data collection/collation, analysis, modelling and interpretation to ensure that a robust impact assessment is undertaken. Further responsibilities will be to review detailed modelling outputs and advise on robustness/validity.

CONTINUED RELATIONSHIP

Commenting on the appointment, Dr Mark Lawless, Director at JBA Consulting said *"We are delighted with the appointment and look forward to continuing our relationship with NRW and our Strategic Partner, Partrac. The combination of JBA's expert modelling skills and Partrac's innovative and highly experienced data acquisition experience, means we are ideally placed to provide holistic advice on the physical and geomorphological processes which are associated with coastal and marine developments.*

"Our project team has delivered more than 100 marine and coastal related projects in Wales and throughout the UK over the past 10 years. Through this work, we have developed an in depth understanding and knowledge of the UK marine and coastal environment and are eager to apply these skills to the varied and pioneering projects being developed in Welsh waters."

THE FRAMEWORK WILL REMAIN IN PLACE UNTIL 2018.

Partrac

[Click to view more info](#)

JBA Consulting



Can Wales take the lead in marine energy?

Minesto's Deep Green power plant has attracted much attention lately from the global marine energy industry and media. Early in 2014 it also became known that The Crown Estate, manager of the UK seabed, awarded an 'Agreement for Lease' for a commercial demonstration site for Deep Green to produce electricity from tidal currents.

Carried out according to plan, Swedish marine energy company Minesto will set up a 10MW marine energy array in 2016, providing electricity to approximately 8,000 households and could make Wales a world leader in marine energy.

EXPERIENCE

After producing electricity for almost a year in the waters of Strangford Lough, Northern Ireland, Minesto was appointed in The Crown Estate's wave and tidal stream leasing round. For Minesto this calls to start the installation of a 10MW marine energy array in 2016 in The Holyhead Deep outside of the Welsh coast.

"By providing these additional seabed rights we are pleased to be enabling further technology development and commercialisation, which will be critical if the UK is to unlock its significant natural resources for wave and tidal current energy." Those were the words of Rob Hastings, Director of Energy and Infrastructure at The Crown Estate, when announcing the exclusive 'Agreement for Lease' in July 2014.



LOCATION

Wales has 1,200 kilometres of coastline that is very rich in low velocity tidal currents, which makes the area one of the most suitable places in the world for low velocity tidal energy, holding a potential of several 1000's of MW, which in turn also makes it ideal for an innovation such as Deep Green.

INFRASTRUCTURE

In addition, Wales also has strategically located deep-sea ports and access to the national UK grid. The access to the UK grid is of special importance since it reduces the time for commercial roll-out and most likely will contribute to make Wales the leading region for marine energy in the UK. For Wales this could have a huge impact on the economy. A report commissioned by the Welsh government shows that marine energy could boost the Welsh economy by up to £840m annually after 1GW has been deployed.

TECHNICAL AND INNOVATION SUPPORT

The Carbon Trust, which has provided technical and innovation support to Minesto since 2007, were very excited to see that they were appointed the Agreement for Lease since their innovative technology has the potential to significantly expand the UK's tidal resource, by unlocking lower velocity tidal flows and lowering the cost of marine energy, but also opens the route to commercial roll-out of the technology.

TOWARDS COMMERCIALISATION

Invented by an engineer at Swedish aircraft manufacturer Saab in 2001 and spun-off into marine energy by Nordic technology company Minesto since 2007, Deep Green has now taken an important step towards commercialisation. The Deep Green power plant is comprised of a wing and a turbine, which is secured to the seabed with a tether and moves with high speed in an 8-shaped path in the tidal or ocean current, reaching a speed ten times higher than the ocean current speed. The unique ability to increase the relative flow by a factor of 10 makes it possible to produce electricity from low velocity tidal and ocean currents, 1.2-2.5 m/s, where no other known technology operates cost-effectively. The energy output is increased by a factor of 1,000 since the velocity and energy has a cubic relationship.

BREAKTHROUGH

The breakthrough ocean trials with a 1:4 scale Deep Green power plant in Strangford Lough, Northern Ireland proves cost-effective power production from slow currents. The trials also proves that Deep Green overcomes the challenges with slow currents and deep sites and provides a solution that will be able to make countries like the USA, South Africa and Taiwan carbon neutral and independent energy producers, instead of hugely dependent on fossil based and imported energy.

WORLD LEADER

For Minesto this underpins the company's position as the world leader for energy production from low flow tidal and ocean currents and the company will now actively work together with local partners to ensure that Wales becomes a leading region for marine energy.

The project will now proceed with in depth environmental studies, detailed seabed mapping, cable routing and commercial activities. The Holyhead Deep site is located approximately seven kilometres from the Welsh shore where the water depth is 80-90 metres and the tidal currents are 1.5-2.5m/s. The area has been carefully selected to maintain separation from shipping lanes and to minimise the impact on other sea users.

RELIABLE ENERGY SOURCES

Safe and reliable energy sources are of high strategic value. Global investments in renewable energy have increased by over 430 per cent from 2004 to 2012, totalling more than \$214 billion in 2012. Many nations can move away from unsustainable energy import dependency to a healthy and secure supply of clean energy – good not only for them but also for the entire planet. In this process, marine energy has a big part to play not only in Wales.

It is simply too clean and too beneficial to the planet and its inhabitants to be ignored by politicians, investors and the global energy industry. For Wales, who choose to embrace marine energy, it can lead to a massive job creation, increased revenues and a more sustainable energy production.

Anders Jansson
CEO
Minesto



HARNESSING THE POWER OF THE TIDES





**HARNESSING
THE POWER OF
THE TIDES**

AT 320MW INSTALLED CAPACITY, WITH FIRST POWER EXPECTED IN 2018, ECONOMIC STUDIES WILL BE THE LARGEST MARINE ENERGY DEVELOPMENT IN THE WORLD. DEVELOPED BY TIDAL LAGOON POWER LIMITED, IT WILL HAVE AN ENTIRELY PREDICTABLE 495GWH OUTPUT EACH YEAR OF CLEAN, GREEN ELECTRICITY AND WILL POWER MORE THAN 155,000 HOMES FOR 120 YEARS – THAT’S ABOUT 11% OF WALES’ DOMESTIC ELECTRICITY.

Tidal Lagoon Power plans to follow with five full-scale tidal lagoons in UK waters; generating up to 8% of the UK’s electricity requirements from the fleet. Mark Shorrock, Chief Executive of Tidal Lagoon Power explains how the Swansea Bay Tidal Lagoon could change the shape of the UK’s future energy mix.



CONTINUED 



AN ISLAND NATION

We are an island nation with a largely untapped marine energy resource, yet in 2012, renewables provided just 11.3% of electricity generation and we know that Britain's electricity reserve generating margin could fall to as low as 2% by the winter of 2015/16. It's not such a tricky puzzle to solve.

Tidal lagoon power is a renewable technology which uses the rise and fall of the tides to generate electricity. While no tidal lagoon has ever been built before, tidal range turbine technology has been in operation in barrage schemes since the 1960's.

NEW JOURNEY

Swansea Bay Tidal Lagoon marks the start of a new journey for Swansea, for Wales and for the UK as a whole. We have a fantastic opportunity to deliver clean, green and predictable electricity from a network of lagoons. With differing high tide times around UK, the fleet could offer a 24 hour continuous renewable electricity source.

At Swansea Bay, we will generate in both ebb and flood conditions, employing turbines that can work efficiently in both flow directions to make the most of the natural resource available.

FIRST OF ITS KIND

Although the Lagoon is the first of its kind, all component parts of the project have been proven elsewhere in the world, keeping technology challenges and risks low.

The general sequence is as follows...

- With flood generation the lagoon is empty and the turbines and sluice gates are closed
- The sea level rises and when it reaches about 4 to 5 metres above the lagoon water level, the turbines are opened
- While the lagoon is filled through the turbines, electricity is generated
- When the head difference drops down to about one metre, the power generation and flow through the turbines reduces quickly
- In order to let as much water in for the next tidal cycle, sluices are opened to quickly fill the lagoon to a maximum level
- When the sea level equals the lagoon level, the turbine and sluice gates are closed. This marks the start of ebb generation, where exactly the reverse sequence takes place

PREDICTABILITY

Because the tidal water levels are entirely predictable, it is possible to compute the expected energy output for years to come. Through an ongoing process of operational optimisation, the expected power output for the Swansea Bay Tidal Lagoon is to exceed 495 GWh per annum, enough to power more than 155,000 homes. That's about 11% of Wales' domestic use.

LAGOON SPECIFICATIONS

The total length of the lagoon wall is about 10km, with 9.5km of bund wall and 400m of concrete structures housing 16 turbines and 8 sluice gates. It encloses an area of about 11.5km² of sea water.

A NEW INDUSTRY

Importantly, Swansea Bay Tidal Lagoon represents the beginning of a whole new industry in South West Wales. The aim is to source around half of the content for the project – or approximately £500m of capital expenditure – in Wales itself. Overall UK content for the project could be as high as 65%. This will mean new jobs in traditional skill-sets as well as cutting-edge design and engineering.



**HARNESSING
THE POWER OF
THE TIDES**

CONSTRUCTION PHASE

The construction phase alone will generate about 1900 full time equivalent jobs in construction, followed by 181 jobs in operations and associated leisure activities. Economic studies have found that the construction phase would deliver £316m Gross Value Added, with each year of operation contributing a further £76m GVA.

HEART OF THE COMMUNITY

Furthermore, with some 86% of local people in support of the lagoon, this is energy infrastructure that will be at the heart of the community. It will stimulate regeneration, culture and education, leisure and tourism. Swansea Bay Tidal Lagoon will be a catalyst for social and economic growth; providing a diverse public amenity, a dramatic sporting and cultural venue and a magnet for tourism.

FOLLOW UP LAGOONS

It is the intention to follow Swansea Bay with five full-scale lagoons. Early feasibility studies are already underway in a number of locations throughout the UK with survey work and data gathering having begun to inform proposals, support engineering designs and act as a foundation for environmental assessments. Continuing to work in partnership with a wide range of stakeholders to achieve an optimal balance between power output, economic profile, environmental sensitivity and social acceptance. If successful, they can deliver 8% of the UK's electricity demand for 120 years.

ECONOMIC STUDIES

Economic studies have demonstrated that the fleet of six lagoons would contribute £27bn to UK GDP during construction alone. In operation, they would secure long-term, diversely skilled, industrial employment for local people and iconic energy infrastructure at the heart of the community.

SIMPLE LOGIC

Further studies found that tidal lagoons can offer large-scale, low carbon power at a significantly cheaper price than offshore wind. The more water we impound, the more power we produce, the less support we require. It really is that simple. And with an operating life of over one hundred and twenty years, tidal lagoons offer future generations even lower cost electricity following an initial period of strike price support.

SOMETHING POSITIVE FOR ALL

Swansea Bay Tidal Lagoon will be a ground-breaking infrastructure project, with something positive to offer everyone living in the Swansea Bay area. But the implications of this project run far deeper: it will open up a new option for secure, affordable and sustainable electricity generation in the UK and beyond.

Mark Shorrocks
Chief Executive
Swansea Bay Tidal Lagoon

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Investment of £1 billion for Swansea Bay Tidal Power Station

Prudential becomes cornerstone investor in world-leading infrastructure project – the first step in a tidal energy network which aims to generate up to 8% of the UK's electricity and a world-leading infrastructure development designed to generate electricity by harnessing the power of the sea.

SIGNIFICANT STEP

The company's commitment is a significant step to securing the future of the power station, which will become the world's largest tidal energy provider when it opens in 2018. It will also form the first step in the development of a network of coastal lagoons which could generate up to 8% of the UK's electricity needs.

The deal forms part of Prudential's commitment to invest alongside five other major UK insurance companies a total of £25 billion in the UK's infrastructure over the next four years.





**HARNESSING
THE POWER OF
THE TIDES**

PROJECT

The project will generate over 495GWh of electricity every year for 120 years, enough to provide nearly all of the domestic electricity for the Swansea Bay region. The project will also help the UK meet its carbon reduction targets by saving more than 236,000 tonnes of CO2 each year.

The construction of the power station is scheduled to begin in 2015 and will create almost 2,000 jobs.

INVESTMENT

Prudential's long-term insurance funds will provide the funding through its European asset management arm, M&G Investments. In the UK, Prudential currently manages around £25.8 billion of direct infrastructure investments.

Tidjane Thiam, Group Chief Executive, Prudential plc said: *"The financing of this power station is emblematic of the role that Prudential plays in transforming the hard-earned savings of millions of our customers into long-term, productive investment in the UK economy."*

"Such investments provide our customers with strong and sustainable returns, create good jobs and increase productivity and economic competitiveness. Prudential is committed to invest in infrastructure projects that benefit the national economy. We are also proud to play our part in the development of this world-leading renewable energy technology."

MAJOR MILESTONE

Mark Shorrock, Chief Executive, Tidal Lagoon Power Ltd, said: *"Securing the backing of a world-renowned investment institution marks another major milestone for the Swansea Bay project and is a clear endorsement of our vision to introduce tidal lagoon infrastructure into the UK's low carbon energy mix. Tidal lagoons will employ British industry to harness a British natural resource and return profits to British institutions."*

Prudential plc



Non-Executive Chairman of Tidal Lagoon Swansea Bay Plc appointed

Keith Clarke CBE, FEng, FICE, RIBA, was recently named as Non-Executive Chairman of Tidal Lagoon Swansea Bay Plc (TLSB), the company preparing to begin construction of the world's first tidal lagoon power plant in spring 2015.

EXPERIENCE

With more than forty years' experience, Keith has worked in all sectors of the UK and international construction industry, including Government. As Executive Vice President of Skanska AB he was responsible for both Middle East and specialist contracting services in the UK, Hong Kong, China, Poland, Czech Republic, India and South Africa, as well as group-wide code of conduct, sustainability and competition policies.

Prior to this he was Chief Executive of Trafalgar House Construction and then Kvaerner Construction, leading both organisations to growth and has held executive positions at Olympia & York and New York City Public Development Corporation, as well as working as an adviser to the Qatari Government.

WS ATKINS

As Chief Executive of the UK's largest engineering consultants WS Atkins for the 8 years to 2011, Keith led the business to considerable growth, increasing revenue by forty percent and supporting its investment in the Middle East and its involvement in the 2012 Olympic & Paralympic Games. He is also credited with shaping Atkins to respond to opportunities created by the low carbon economy.

His other current roles include: Non-Executive Director, Future Cities Catapult; Chair, Forum for the Future; Non-Executive Director, EngineeringUK; Adviser, InfrastructureUK; Non-Executive Director Sirius Minerals; Member of Advisory Board, Environmental Change Institute, Oxford; Vice President (Learned Society), Institution of Civil Engineers; Visiting Professor, Imperial College and Aston University.

EXCITING PROJECT

Keith Clarke, Non-Executive Chairman of Tidal Lagoon Swansea Bay Plc commented; *"This is an extremely exciting project whose time has come. It will set the standard for a new kind of energy infrastructure and has truly global implications. It is the right project at the right time for me and I am relishing the prospect of getting back into major project delivery and building a best-in-class team."*

Mark Shorrock, Chief Executive of Tidal Lagoon Swansea Bay Plc added; *"We want the Swansea Bay Tidal Lagoon to establish a blueprint for a series of tidal lagoons that allow the UK to harness its incredible range resource."*

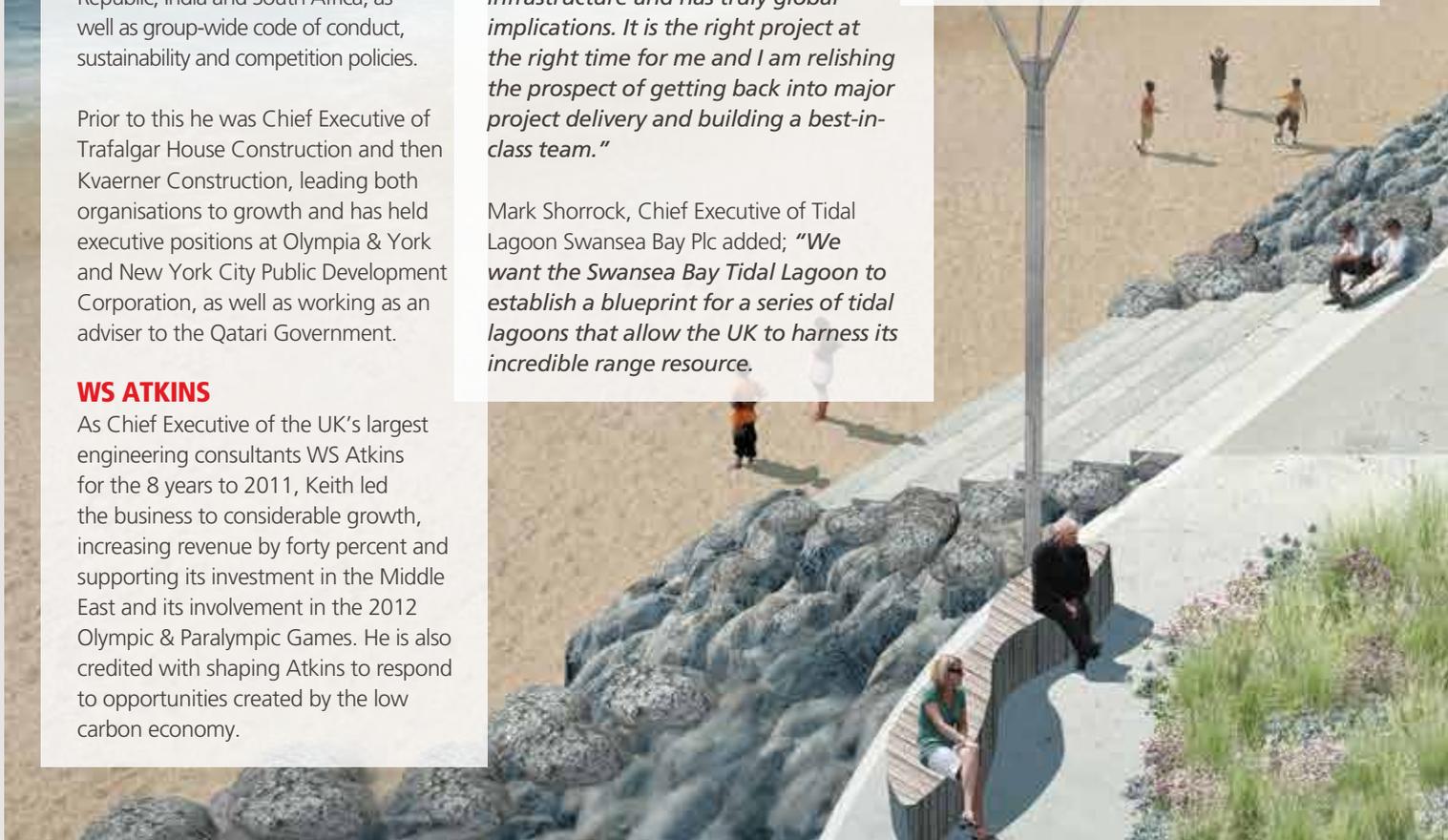
HUGE ASSET

And concluded; *"Keith understands the challenges of building large infrastructures and the climate imperative to do so in a low carbon manner. And he has grown exceptional teams to achieve exceptional results. He'll be a huge asset for us."*

Swansea Bay Tidal Lagoon

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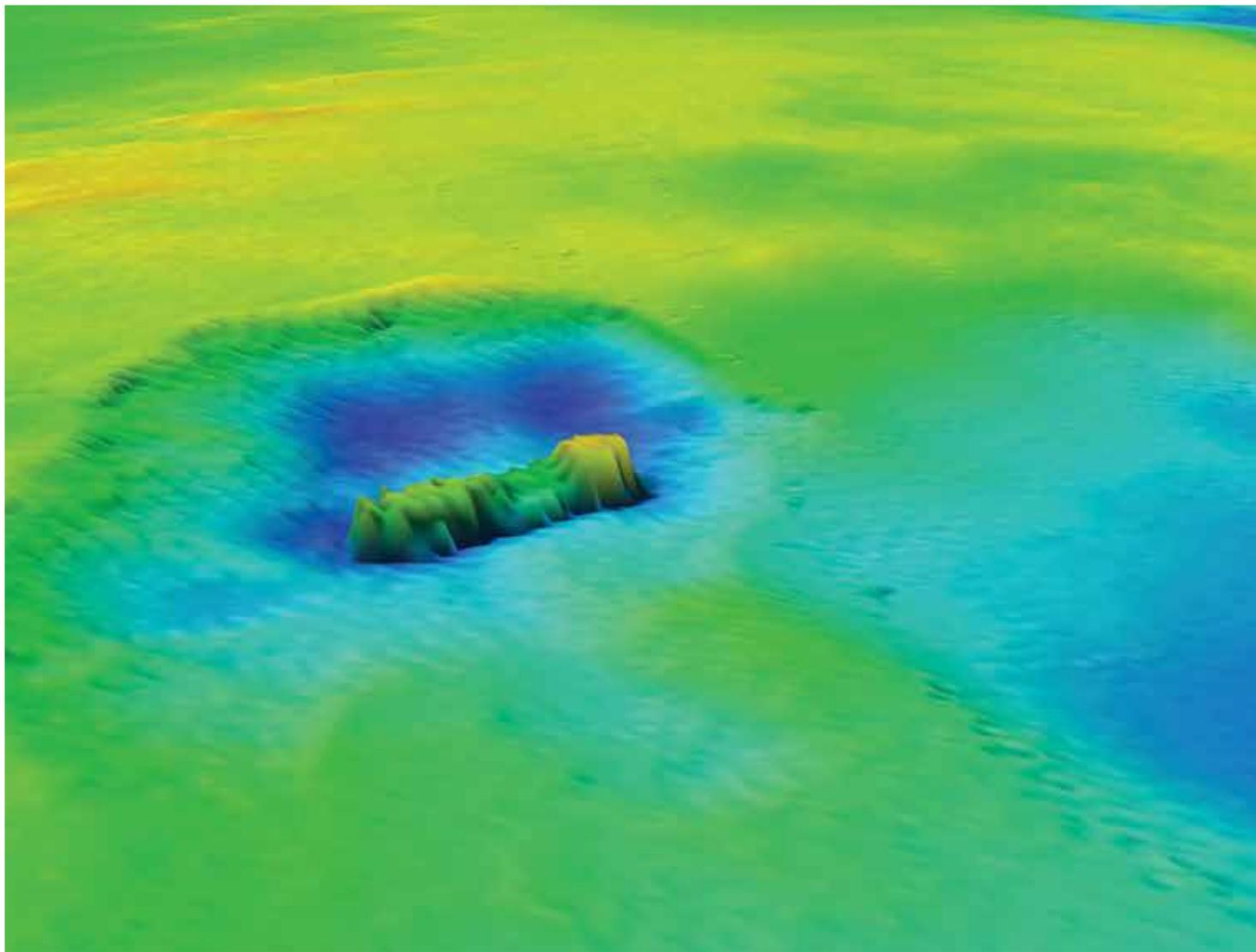




**HARNESSING
THE POWER OF
THE TIDES**



Research in the North Wales Demonstration Zone



The Bangor University led SEACAMS project (Sustainable Expansion of the Applied Coastal and Marine Sectors) has secured funding from the Welsh European Funding Office (WEFO) to undertake research in the West Anglesey wave and tidal demonstration zone.

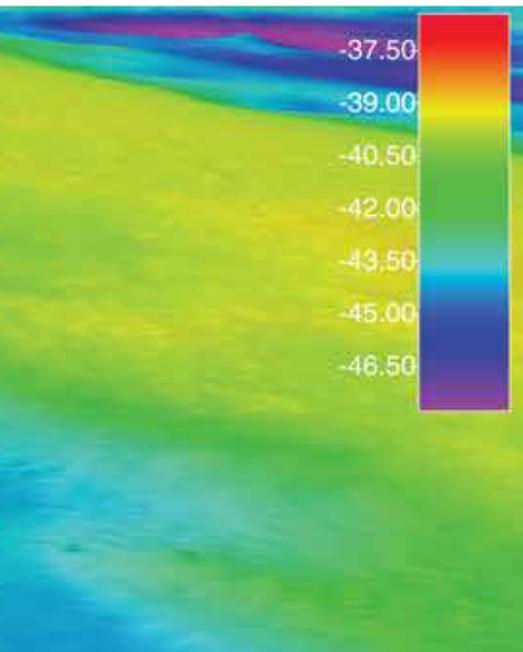


ONE YEAR STUDY

The one year study will also provide assistance to regeneration company Menter Môn, who manage of the zone and Swedish tidal energy developers Minesto, who lease an area to the northwest, in relation to their ongoing Deep Green project.

The work is being undertaken within Bangor University's Centre for Applied Marine Sciences (CAMS) and utilises resources based within the School of Ocean Sciences in Menai Bridge, including the R.V. Prince Madog to investigate the physical and biological characteristics of the region encompassing the zone.

It is also envisaged that the research will contribute to assessing the hydrodynamic resource and predict potential environmental impacts as well as facilitating grid connection projects and assisting in any associated consenting processes.



INTERESTING INITIAL FINDINGS

Initial multibeam and sub-bottom surveys have revealed surprising details as to the variability of the seabed in a region characterised by exceptionally fast tidal currents, including the presence of a number of sand waves covering large areas of the southern part of the zone.

The work has also revealed the nature and precise extent of outcropping bedrock within the northern region. This initial work, coupled with ongoing state-of-the-art hydro-dynamical modelling studies, will further underpin research into sediment transport and ecology that will be crucial in helping Menter Môn, Minesto and other prospective developers determine optimum sites within the zone for potential development.

DEPLOYMENT FUNDING

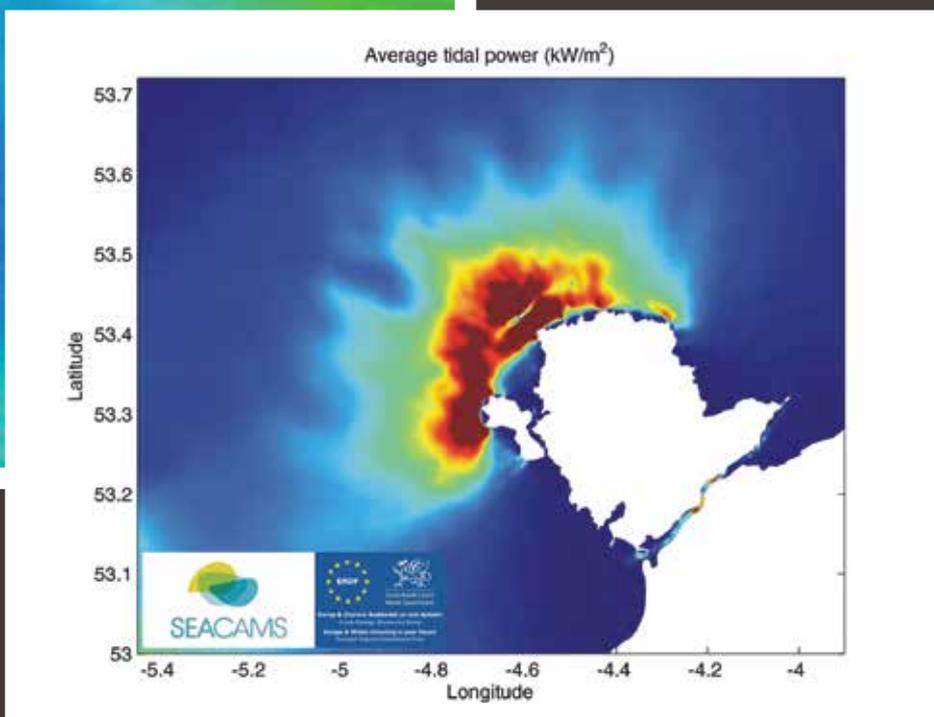
The funding has resulted in the deployment of a wave buoy within the zone, which provides real-time data via the CEFAS WaveNet programme. Several new 5 beam ADCP systems have also been deployed, which will facilitate research into aspects of turbulence and wave-current interactions in regions characterised by high tidal velocities.

The latest video and acoustic monitoring technologies are also being utilised in order to conduct research into many aspects of marine ecology, including marine mammal behaviour. Near-shore processes are also being investigated, using the latest generation of acoustic instrumentation to measure waves, currents, turbulence, suspended sediment flux and bed-level change in shallow-water areas.

UNIQUE RESEARCH

This unique research project will result in a data set that will make this zone one of the most comprehensively understood regions within Welsh territorial waters and contribute significantly to addressing knowledge gaps in our understanding of marine environmental processes and associated offshore marine renewable energy developments.

SEACAMS (Sustainable Expansion of the Applied Coastal and Marine Sectors)



LEADING THE WAY

With its 1,317 miles of coastline, Wales is playing a vital part in the development of the tidal energy industry. In a series of 'firsts', Cardiff-based tidal stream technology company Tidal Energy Ltd (TEL) and its innovative DeltaStream device are leading the way in this vital area of renewable energy production. The DeltaStream is amongst the world's first demonstration devices to generate green, sustainable and predictable tidal power.

SPECIFICATION

Invented by Pembrokeshire engineer Richard Ayre, the patented DeltaStream design consists of three independent 400kW nacelles mounted on a triangular frame which sits on the seabed and weighs around 150 tonnes with a frame 16m long by 20m high. The company is also working with contractors to install the necessary infrastructure to support what will be the first grid-connected freestanding tidal turbine.

GREEN ENERGY AWARDS

This led to the company receiving a major accolade from Renewable UK's Wales Green Energy Awards in the 'Supply Chain Development' category in October 2014. They were also awarded 'Best Small Company' in the International Tidal Today Awards 2014. The installation process, where the turbine and foundation are installed together, will be another cutting-edge step in the development of this project.

LOCATION

Situated in the waters of Ramsey sound in north Pembrokeshire, this is the first project to receive precautionary 'deploy and monitor' environmental consent in a designated Marine Special Area of Conservation'. It incorporates a number of design features to minimise any potential impact on the surrounding environment.

An extensive suite of monitoring equipment will also be installed on and around the device in situ.

FINANCIAL SUPPORT

Securing the required funding is a key part of any successful development initiative and the DeltaStream is the first private marine project to be fully developed in Wales. Crucially, it has secured significant funding from the Welsh Government through its Welsh Government European Funding Office (WEFO).

Finance invested has been match-funded by Tidal Energy's majority shareholder, Welsh renewable energy company Eco2 Ltd. Further support has been granted through the Welsh Government's SMARTCymru programme which is funded by the European Regional Development Fund (ERDF).

This funding, from the Industrial Research category, will be used to develop removable nacelles, thereby reducing the significant operational costs associated with maintenance and further facilitating the continued evolution of the project.

PROJECT AIM

Utilising the plentiful resources of the country to produce clean and sustainable renewable energy is an important aim of this project. Together with the jobs created, the advances in technology and engineering that are emerging from the working partnerships involved in design and production and the support of the Welsh Government, the DeltaStream project is proving to be a model for tidal energy production not only for Wales, but the United Kingdom as a whole. With a tidal shoreline of 11,072 miles, that presents a great deal of opportunity in this sector.

Tidal Energy Ltd (TEL)





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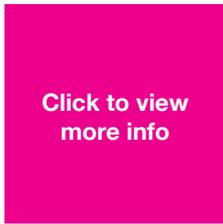
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