



STATE OF THE SECTOR 2019

**ECONOMIC
BENEFITS
FOR
WALES**



£96.2 million
invested in Wales

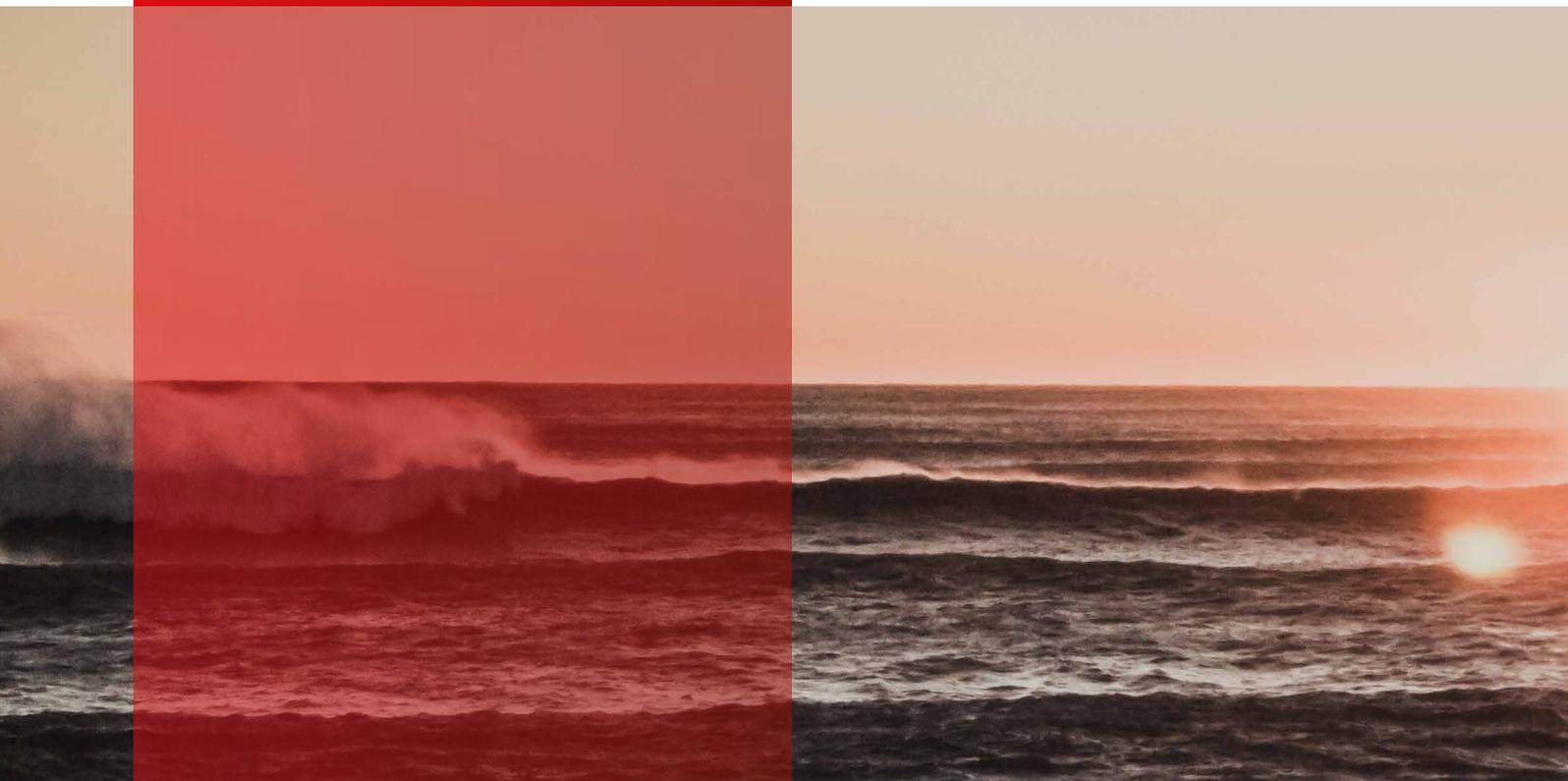
16 marine energy developers

Providing **skilled employment**

Seabed agreements for

362MW

Driving **inward investment**



Part of a world leading **innovative test centre network**

Early mover advantage in an **export market** worth **£76 billion**

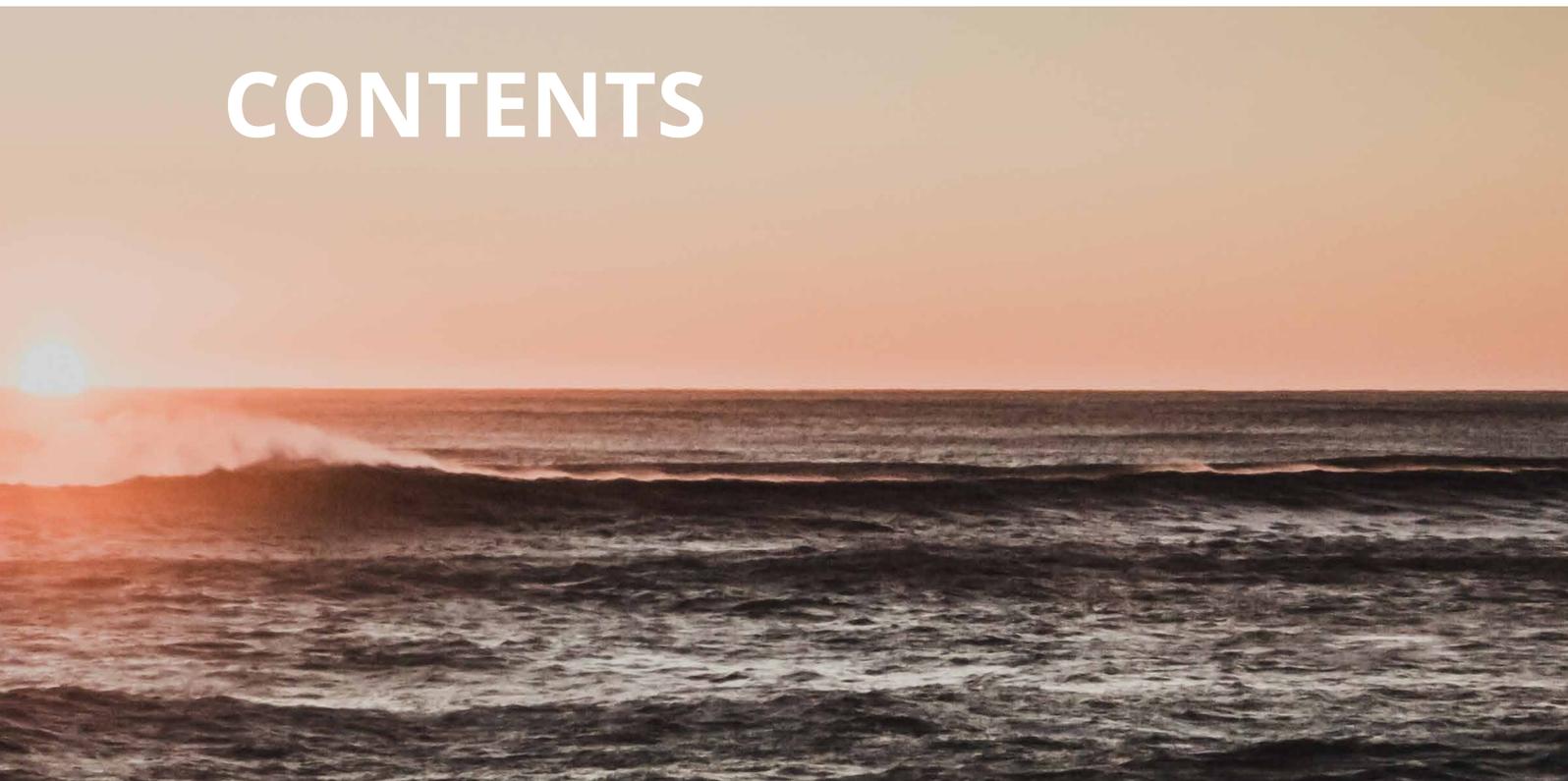
A **capable and ambitious supply chain**

Spurring **low carbon economic growth** in **coastal regions**

World class research

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INTRODUCTION AND KEY FINDINGS

The global resource potential for marine renewable energy is vast, and as yet, largely untapped. Theoretical estimates indicate that harnessing the incredible power of the sea could provide a clean, low carbon, sustainable electricity source to meet the demands of the entire planet.

With some of the best marine resources in the world, Wales is playing a vital role in this emerging global sector. And the benefits for Wales go far beyond the provision of clean energy. With the right support in place, Wales has the opportunity to be a global leader in an export market worth an estimated £76 billion by 2050.

In January 2019, Marine Energy Wales carried out a survey of the marine energy industry in Wales. The aim of this survey was to understand the contribution of the marine energy industry to the Welsh economy and to update previous reports carried out in 2015 and 2017. This report summarises the findings of the survey and provides information on wave, tidal stream and tidal range energy projects currently under development in Wales.

KEY FINDINGS

A total of **16 marine energy developers** are actively progressing projects in Wales with seabed agreements in place for over **362 MW of marine energy sites**. Further sites totalling almost 3.5 GW have also been identified.

£96.2 million has been spent to date in Wales on the development of the marine energy industry. The sector is driving **inward investment** with a number of international wave and tidal developers having relocated their headquarters to Wales.

With over **566 person years of employment to date**, the sector is providing **skilled employment** and spurring **low carbon economic growth in coastal regions across the country**.

Marine energy is offering real **diversification opportunities** for local **supply chain** companies. The Welsh **supply chain** has **capability, capacity and ambition to deliver** marine energy projects.

A number of **test and demonstration sites** are under development in Wales. These projects will provide test beds for innovative wave, tidal stream and floating wind technologies, enabling valuable learning across the sector and adding to the UK's **world-leading test centre network**.

Wales is home to **world class research facilities** offering a wide range of services to commercial businesses including a £17m SEACAMS2 research project.

Wales has the potential to establish an early mover advantage in an export market worth **an estimated £76 billion** by 2050, exporting marine energy technologies, skills, knowledge and intellectual property across the globe.

FOREWORD



**MARTIN
MURPHY**

A handwritten signature in black ink, appearing to read 'Martin Murphy'.

**CHAIR OF
MARINE ENERGY WALES**

The UK currently has a global lead in developing offshore renewable energy technologies and Wales is playing a very active role within this industry. Pioneering companies from within the UK and across the world which are showcased in this report continue to be attracted to Wales' excellent marine energy resource, significant funding opportunities, existing infrastructure, established energy supply chain and access to expert research facilities.

Much practical work continues in tidal stream and wave energy development, while tidal range, and more recently, emerging floating offshore wind solutions are being assessed for implementation. Swedish developer Minesto has now commissioned the world's first commercial scale low-flow tidal kite technology system off Anglesey in North Wales and Swansea based Marine Power Systems have successfully tested and validated their 1:4 scale WaveSub prototype. Australian developer Bombora have set up their EU Headquarters in South Wales and are building and testing their wave energy converter in Pembrokeshire. Nova Innovation from Scotland are planning to place an array of 100kW turbines off the Llyn Peninsula working alongside regional community renewable energy organisation Ynni Llŷn.

Wales is also developing a network of test and demonstration facilities including array scale capability at the Morlais Tidal Demonstration Zone off Anglesey and the Pembrokeshire Demonstration Zone (PDZ) supporting wave and floating wind. The Marine Energy Test Area (META) project based in the Milford Haven Waterway will focus on scale and component testing. Both META and the PDZ form part of the £76 million Pembroke Dock Marine project. This has been signed off as part of the Swansea Bay City Region Deal, which also includes a UK Offshore Renewable Energy Catapult (ORE Catapult) led Marine Energy Engineering Centre of Excellence (MEECE) based in Wales. These strategic developments, alongside enhancements to Pembroke Port infrastructure, will provide new and existing developers with a wide range of opportunities, placing Wales on the main stage for this emerging global market.

Whilst it is true to say that there was much disappointment in Wales over the UK Government's decision in 2018 not to support the original Swansea Bay Tidal Lagoon project, alternative exciting proposals are now in the first stages of consideration in both North and South Wales. Confidence is high that further tidal range developments will be on the horizon soon.

Without doubt, progression of the offshore renewable energy industry in Wales has been stimulated in recent years by the Welsh Government. It continues to provide one of the most supportive and encouraging marine energy landscapes in the world, underpinned in its delivery through new policy that includes the Marine Plan, Natural Resources Policy and the Well-being of Future Generations Act. The future seems assured and the Marine Energy Wales team and I will strive to play our part in ensuring the continuing development of our industry.

RESEARCH FINDINGS

Tidal stream energy : Tidal stream energy developers including Minesto and Nova Innovation along with the development of the Anglesey Tidal Demonstration Zone 'Morlais' have contributed a total of **£46.8 million** of direct investment to the Welsh economy to date. This represents **an increase of £17.4 million since 2017**.

Wave energy: Wave energy developers, including Marine Power Systems, Bombora and the development of the Pembrokeshire Demonstration Zone have contributed **£12.5 million** direct investment to the Welsh economy to date. This represents an **increase of £8.9 million** over the past two years.

Tidal range energy: Tidal range energy development in Wales, including Swansea Bay Tidal Lagoon and the North Wales Tidal Energy and Coastal Protection project have contributed **£6.2 million** of direct investment to the Welsh economy to date.

Total direct investment: Combining the investment into wave and tidal energy in Wales with publicly funded Welsh research projects brings the total investment to date in marine energy in Wales to **£96.2 million** – an increase of **£27.9 million** since 2017 and **£50.8 million** since 2015.

The £96.2 million of total investment into Welsh marine energy projects represents direct spend by project developers and research projects. Figures reported in previous research suggest that every £10 million of investment in resources in marine energy could be associated with total gross value added effects in Wales of around £2.5 million (including direct, supply chain and associated household effects)¹.

INVESTMENT INTO WELSH MARINE ENERGY PROJECTS TO DATE



¹ Fanning, T, Jones, C and Munday, M (2014) Regional Employment Returns from Wave and Tidal Energy: A Welsh Analysis. Regeneris Consulting and the Welsh Economy Research Unit.



Image credit: Bombora

Bombora now has 20 staff based in Pembroke Dock bringing together a wealth of experience from the marine, energy and offshore operations industries.

The Welsh Government's economic action plan 'Prosperity for All' states that Welsh Government wants 'all parts of Wales to benefit from economic growth and a fairer distribution of wealth and opportunity'. In line with Welsh Government's ambition, it is clear that coastal and peripheral regions of Wales are experiencing the greatest benefits from this nascent industry. Of the **£96.2 million** investment in Wales to date, **£46 million** has been invested into **North West Wales** (£32.5 million on Anglesey and £13.5 million in Gwynedd) and **£44 million** has been invested into **South West Wales** (£23.5 million in Pembrokeshire and £20.5 million in Swansea). Developments in these areas have been relying on local skills, services and infrastructure providing additional indirect economic benefits.

In terms of employment, marine energy technology developers and associated Welsh project development have directly created 302 person years of employment to date. Alongside Welsh marine energy academic research, this figure rises to over **566 person years of employment**. Whilst uncertainties surrounding the Swansea Bay Tidal Lagoon project have contributed to a reduction in FTE (full time equivalent) jobs in the marine energy sector as a whole (133 FTE jobs compared to 137 FTE jobs in 2017), there has been significant growth in employment in the tidal stream and wave energy sectors.

Of the **133 FTE jobs** created or retained, **53 FTE jobs are in North West Wales** (28 FTE on Anglesey and 25 FTE in Gwynedd) with **65 FTE jobs in South West Wales** (34 FTE in Pembrokeshire and 31 FTE in Swansea).

Predictions for the UK as a whole see the wave and tidal stream sectors supporting a total of **22,600 jobs by 2040**². Crucially, **50-60% of the economic benefit** of marine energy investment and jobs is expected to be generated **in coastal areas** in need of economic regeneration.

² ORE Catapult (2018) Tidal Stream and Wave Energy Cost Reduction and Industrial Benefit Report.

SUPPORTING PERIPHERAL ECONOMIES AND COASTAL COMMUNITIES

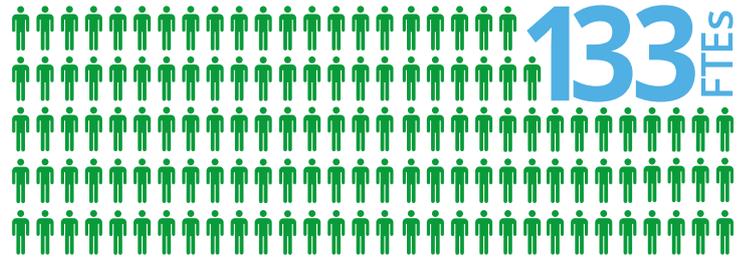


Image credit: Minesto

Swedish developer Minesto have recruited 23 FTE jobs in North Wales of which the majority are highly skilled jobs in electrical, mechanical and offshore engineering.

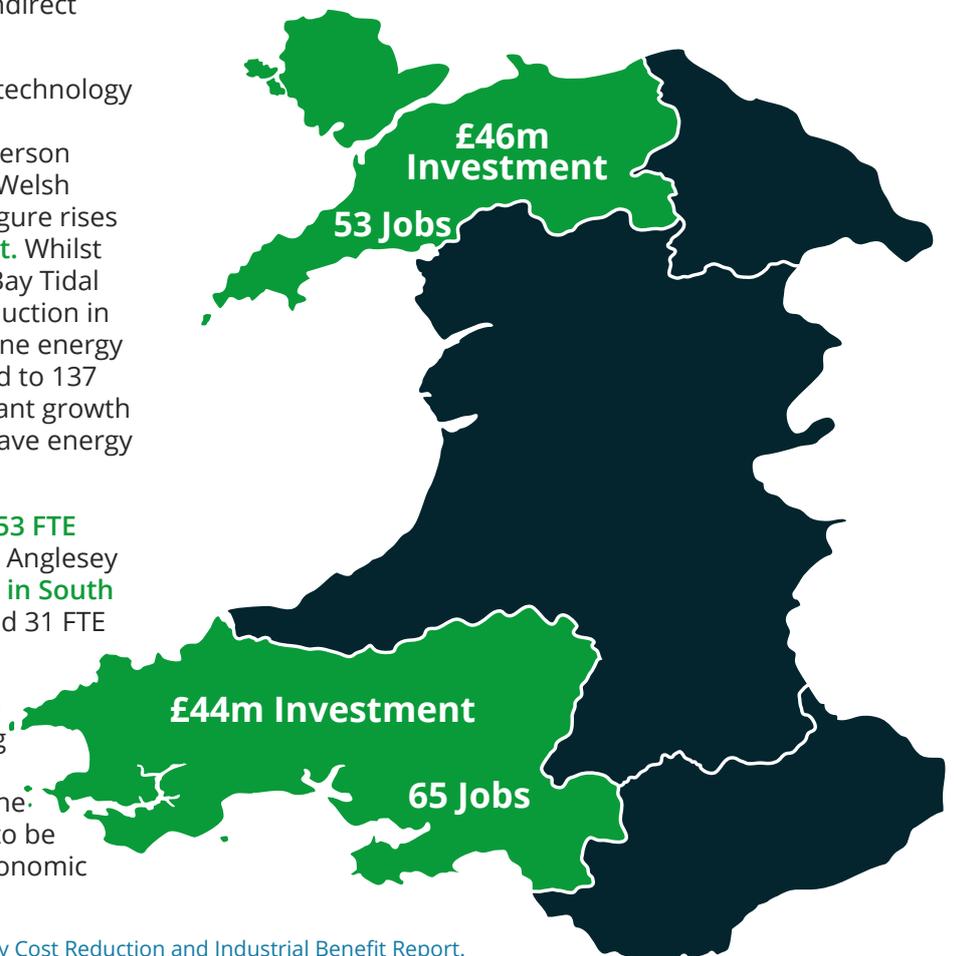




Image credit: Marine Energy Wales

A CAPABLE AND AMBITIOUS SUPPLY CHAIN



MARINE ENERGY WALES WORKING GROUP MEETINGS PROVIDE OPPORTUNITIES FOR SUPPLY CHAIN COMPANIES TO COLLABORATE.

All wave and tidal energy companies featured in this report are actively engaged with local supply chain companies. Of the companies who have built or are currently building devices in Wales, our research indicates that **at least 50% of their supply chain has come from within Wales to date**. Companies currently with projects under development have a similar aspirational Welsh supply chain content of 50%.

Supply chain companies across Wales are actively engaging in the sector and there are several clusters forming in Wales, primarily in regions close to project development. A research project conducted by MEW in 2018 found that **the Welsh supply chain has capability, capacity and ambition to deliver marine energy projects**. The fact that much of the supply chain activity is focused in peninsular, coastal regions, many in need of economic regeneration, adds an extra layer of value to the investment and jobs supported by the sector.

Further examples of supply chain companies involved in the Welsh marine energy sector can be found on page 10 and 12.

**70% OF MINESTO'S
SUPPLY CHAIN IS
DIRECTLY RESOURCED
FROM COMPANIES
IN WALES.**



Image credit: Minesto

FUTURE DEVELOPMENT PLANS AND OPPORTUNITIES

In 2018, the Offshore Renewable Energy (ORE) Catapult published a new evidence-based report 'Tidal Stream and Wave Energy Cost Reduction and Industrial Benefit'. This report demonstrates that the UK's marine energy industries can meet the requirements of the UK Government's 'Triple Test' - achieving maximum carbon reduction; showing a clear cost reduction pathway, and demonstrating that the UK can be a world-leader in a global market. Key findings from this report indicate that:

- With a UK deployment of 100MW per year from 2021/22, and a realistic share of a growing global market, the tidal stream industry could generate a net cumulative benefit to the UK by 2030 of **£1.4 billion**, consisting of £1.6 billion GVA from the domestic market and £1.1 billion GVA from exports, offset by £1.3 billion of revenue support.
- Assuming a 10 year lag behind tidal stream, wave energy will also add a net positive contribution to the UK economy, worth a net cumulative benefit to the UK by 2040 of **£4 billion**, consisting of £1.5 billion GVA from the domestic market and £3.7 billion GVA from exports, offset by £1.2 billion of revenue support.

With Wales' excellent marine energy resource, significant funding opportunities, existing infrastructure, established energy supply chain and development activity to date, it is likely that a significant proportion of this benefit will accrue to Wales.

Companies involved in this report were asked to detail their future spending plans in Wales. Figures provided were very encouraging with a 10 year predicted spending total of almost **£8.3 billion** (including several large scale tidal lagoon projects) if market and development incentives are in place.

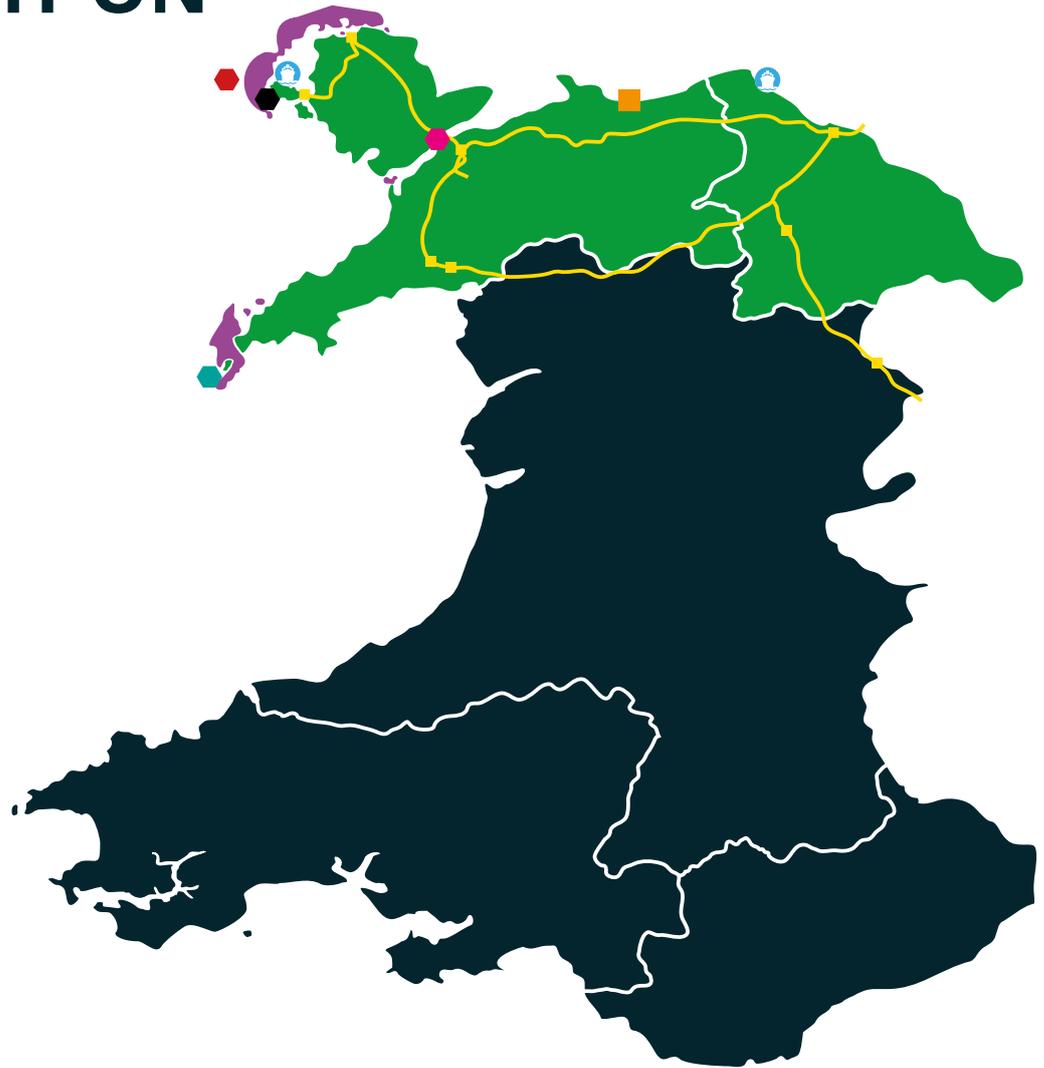
Several companies including Swansea based Marine Power Systems cited an ambition for rolling out development on a global scale using Wales as a manufacturing base. There are clearly many future opportunities for local supply chains through both domestic deployment and exports to international markets.

'Decarbonisation of the global economy is placing demand upon us and we need to adapt. We want to position Wales to take advantage of rapidly growing, new and emerging markets.'

Welsh Government's Prosperity for All: economic action plan.

SPOTLIGHT ON NORTH WALES

- Tidal Stream Resource
- Minesto
0.5MW installed
+ 10MW Phase 2
(Page 13)
- Morlais Tidal
Demonstration Zone
Potential for 240MW
(Page 22)
- Nova Innovation working
with YnNi Llŷn
Up to 1MW project
(Page 14)
- North Wales Tidal Energy
and Coastal Protection
Potential for 2.5GW
(Page 19)
- Marine Energy Engineering
Centre of Excellence (MEECE)
(Page 23)
- Ports



JOBS AND GROWTH: £46.5 MILLION HAS BEEN INVESTED INTO NORTH WALES. 55 FTE JOBS HAVE BEEN CREATED. THE MAJORITY OF THIS GROWTH AND INVESTMENT LIES IN NORTH WEST WALES WHICH INCLUDES AN INVESTMENT OF £32.5 MILLION AND 28 FTE ON ANGLESEY WITH AN INVESTMENT OF £13.5 MILLION AND 25 FTE IN GWYNEDD.

NORTH WALES

RESOURCE: There are significant opportunities for both tidal stream and tidal range energy in North Wales. Anglesey in particular has huge potential for tidal stream energy with a peak spring velocity of over 3m/s. These tidal current speeds combined with water depth and seabed topography are among the best in the EU.

GRID: North Wales already has an established energy generating network with the Wylfa Nuclear Power Station operational from 1971 to 2015. North Wales is also home to several hydroelectric power stations and offshore wind farms including Gwynt y Môr – the second largest operating offshore windfarm in the world. There is a 400kV double circuit overhead line which runs between Wylfa and Pentir which could be used by the marine energy sector

BUSINESS SUPPORT: Anglesey Enterprise Zone and the existing Energy Island Programme have been set up to bring high skilled jobs to the area through major energy investments. They will help to establish the island as a world renowned centre of excellence in low carbon energy generation.

NORTH WALES HAS AN ESTABLISHED ENERGY SECTOR SUPPLY CHAIN AND A WORKFORCE WITH TRANSFERABLE SKILL OPPORTUNITIES

Minesto has engaged significantly with small and medium sized enterprises (SMEs) across Anglesey and North Wales (such as **Anglesey Mechanical Solutions**, **Holyhead Boatyard**, **Jones Brothers and Mona Lifting**) to support engineering aspects of their project on Anglesey; helping these companies to expand their service offer to the market. Minesto has also worked with Orkney based marine contractor **Leask Marine** (with offices in South Wales) who have assisted with the installation (and subsequent recovery and storage) of Minesto's micro grid system buoy.

Nova Innovation is working with regional renewable energy organisation YnNi Llŷn and the **Bardsey Island Trust** to fully explore the possible local benefits of the Ynys Enlli tidal project.

Black and Veatch (with offices in Swansea) has been awarded the Design Services Contract for the **Morlais Demonstration Zone**. This includes designing the surface infrastructure connecting power generated by tidal arrays to the National Grid; as well as other support to bring the project to construction tender phase. **Aquatera** (also with an office in Wales) are currently assisting Morlais with socioeconomic analysis and support with the full EIA.

The emerging tidal energy industry around Anglesey could provide a significant opportunity for existing fishing vessel operators to diversify and provide a range of services in the development, construction and operation of projects.

PORTS:

The Port of Holyhead is located on the Isle of Anglesey, North Wales. Holyhead is a 24 hr, deep water, lock-free port, centrally located on the Irish Sea Coast within easy reach of several major conurbations both in the UK and Ireland.

The Port of Mostyn: is a privately owned and operated port. Over recent years, Mostyn has become one of the main centres in Europe for the assembly and installation of wind turbines; a large portion of its business is now dedicated to the offshore renewable energy sector.

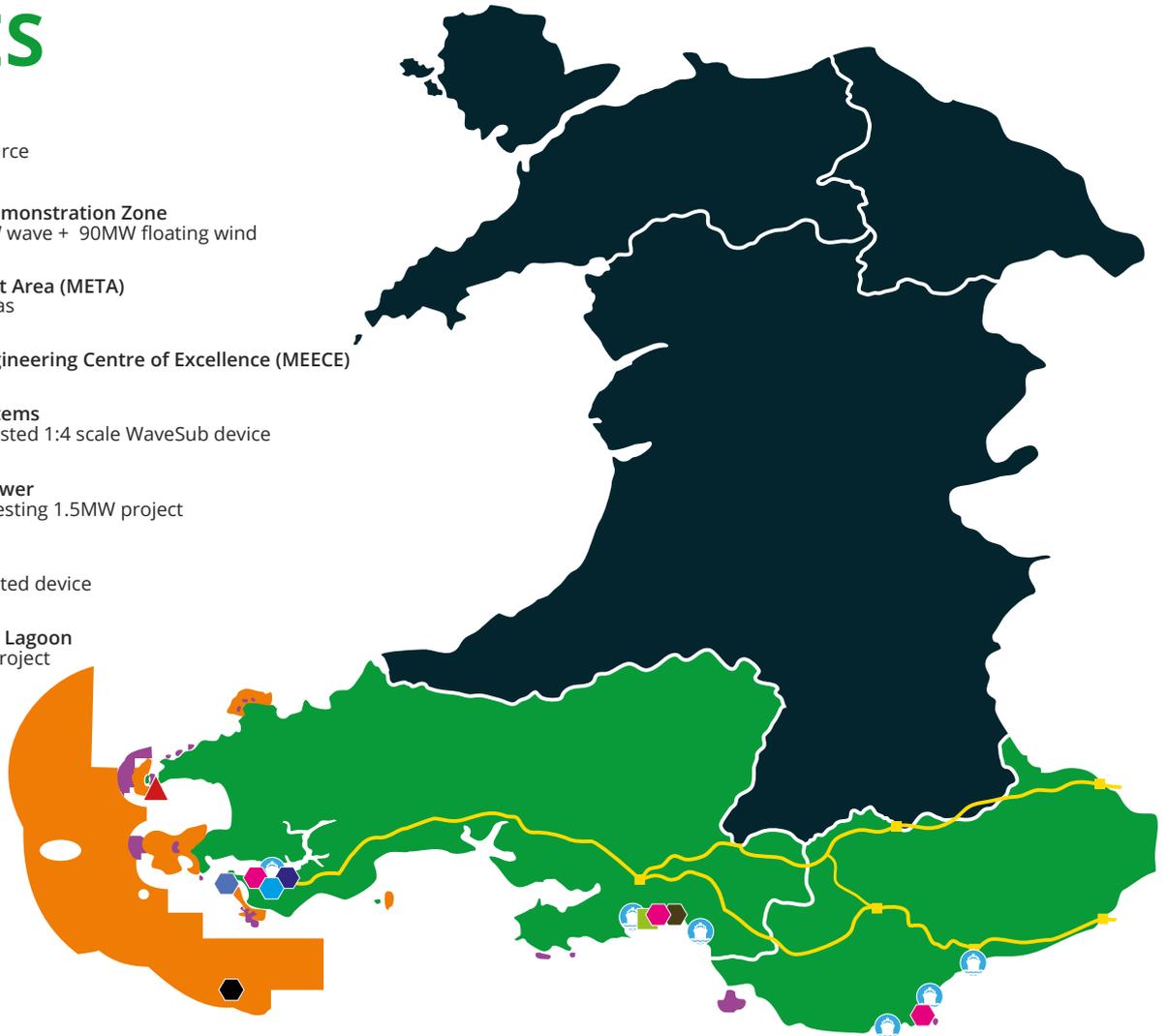
MARINE CENTRE WALES is a new centre for innovation in applied marine science that has been developed during the SEACAMS project. The Centre has been designed to facilitate interactions between researchers, businesses and policy makers.

RESEARCH:

SEACAMS2 is a three year £17 million project led by **Bangor University** in association with **Swansea University** seeking to deliver assistance to companies wanting to create a sustainable marine energy industry in Wales. Areas of expertise include marine ecosystems, design engineering, coastal zone management and hydrodynamics.

SPOTLIGHT ON SOUTH WALES

-  Wave Resource
-  Tidal Stream Resource
-  Grid 400kV
-  Pembrokeshire Demonstration Zone
potential for 90MW wave + 90MW floating wind
(Page 23)
-  Marine Energy Test Area (META)
Series of 8 test areas
(Page 21)
-  Marine Energy Engineering Centre of Excellence (MEECE)
(Page 23)
-  Marine Power Systems
Constructed and tested 1:4 scale WaveSub device
(Page 16)
-  Bombora Wave Power
Constructing and testing 1.5MW project
(Page 15)
-  Wave-tricity
Constructed and tested device
(Page 17)
-  Swansea Bay Tidal Lagoon
Potential 320MW project
(Page 18)
-  Seabed Lease
-  Ports



JOBS AND GROWTH: £48.8 MILLION HAS BEEN INVESTED INTO SOUTH WALES AND 74 FTE JOBS HAVE BEEN CREATED. THE MAJORITY OF THIS GROWTH AND INVESTMENT LIES IN SOUTH WEST WALES INCLUDING AN INVESTMENT OF £23.5 MILLION AND 34 FTE IN PEMBROKESHIRE AND AN INVESTMENT OF £20.5 MILLION AND 31 FTE IN SWANSEA

SOUTH WALES

RESOURCE: South Wales has a significant wave, tidal stream and tidal range climate. Pembrokeshire has the highest concentration of wave resource in Wales equating to an indicative capacity of up to 5.6 GW.

GRID: Existing land based grid connections are excellent in Pembrokeshire with a 400kV National Grid connection being available at the Pembroke Power Station site.

BUSINESS SUPPORT: The [Haven Waterway Enterprise Zone](#) offers renewable and traditional energy companies an experienced industry base and supply chain with a skilled workforce, an established distribution infrastructure, a variety of sites to suit a range of needs and a network of universities with expertise in a range of energy related fields.

SUPPLY CHAIN: PEMBROKESHIRE IS HOME TO AN ENERGY SECTOR SUPPLY CHAIN AND WORKFORCE WHICH SUPPLIES 25% OF THE UK'S PETROCHEMICALS, 30% OF THE UK'S GAS REQUIREMENTS AND INCLUDES STEEL FABRICATORS, MARINE AND OTHER ENGINEERING SPECIALISMS, BOAT BUILDERS AND SHIP REPAIRERS. THESE SKILLS ARE TRANSFERABLE AND ARE OF IMMEDIATE BENEFIT TO THE RENEWABLES INDUSTRY.

Pembroke Dock Marine: Pembroke Port has plans to reshape the physical infrastructure of Pembroke Port, Gate 4, to ensure maximum operational efficiency as part of the Pembroke Dock Marine project, which also includes META, PDZ and MEECE. Three marine energy devices have been fabricated in Pembroke Dock and deployed from Pembroke Port.

Mainstay Marine Solutions won both the first and second phase contracts for the design, engineering and maintenance support for the **Wave-tricity** device. They have been awarded a contract from Australian company **AMOG consulting** for the construction of their Wave Energy Converter (WEC) technology demonstrator device. The company also built the membrane test tank for **Bombora** and **Kingswood Engineering** fitted the overhead gantry crane to the tank. Mainstay's involvement in the sector has enabled them to extend and diversify their product offerings, provided an additional stream of income and helped even out boat production demand peaks and troughs.

Marine Power Systems worked extensively with **Ledwood Mechanical Engineering** based in Pembroke Dock to deliver their complex engineering and fabrication requirements, with additional components supplied by **Camplas Technology** of Bridgend and **3K's Engineering** of Llanelli. Orkney based marine contractor **Leask Marine** provided marine operation services for **Marine Power Systems** WaveSub towage activities within the Milford Haven Waterway and deployment activities for testing in Cornwall. **Leask Marine** has now established additional offices in Pembroke Dock, as part of the Marine Energy Hub and is also advising other developers on their designs. Leask's extensive sector experience enables them to reduce project costs and risk, with ease of installation, operations and maintenance at the forefront.

In 2017, Orkney based **Aquatera** (specialising in environmental and operational support for marine, coastal and land based activities), was commissioned by MEW to assist them with a supply chain assessment. Aquatera set up a satellite office in Pembroke Dock in 2018 and continues to support companies with Welsh interests in site assessment, consenting and socio-economic areas of their project development.

Transition Bro Gwaun (TBG) plan to install a community owned and led tidal flow project in Wales. TBG has drawn together a strong team of volunteers who lead the project and have worked with local supply chain company **MarineSpace**.

In 2018, MEW created a cluster of businesses at the **Marine Energy Hub** which included **Bombora** (now moved elsewhere due to growing team), **MarineSpace, Leask Marine, Wave Hub, ORE Catapult and Element Power**. The hub is located on the doorstep of one of the world's best marine energy resources and is a dynamic worksite where marine energy companies come together and share space, facilities and knowledge to unlock the sector's full potential.

PORTS:

There are 6 ports in South Wales with the potential to help deliver the needs of the marine energy sector (Barry, Cardiff, Newport, Port Talbot, Swansea and Milford Haven). The Port of Milford Haven is a major service provider for the UK's energy industry. Their southerly site, Pembroke Port, has been instrumental in delivering the needs of the marine energy sector to date. The Port of Swansea also has established expertise and resources required to handle renewable energy project components.

RESEARCH:

The Marine Energy Research Group within **Swansea University** has research expertise covering the combined effects of currents, waves and turbulence on turbines plus numerical modelling within the interaction of turbine. Swansea University is also working with Bangor University on the **SEACAMS2** project – a three year £17 million project seeking to deliver assistance to companies wanting to create a sustainable marine energy industry in Wales.

The Hydro Environmental Research Centre, Cardiff University provides computational modelling predicting flow, water quality, sediment and contaminant transport processes.



PROJECT UPDATE

Leading marine energy developer Minesto has had a physical presence in Wales (headquarters of Minesto UK Ltd) since 2015. After securing a 10MW Agreement for Lease in June 2014, Minesto has focused its Welsh activities on verifying the functionality and power production of the Deep Green Technology at utility scale at their Holyhead Deep site off Anglesey.



Minesto's Deep Green technology is the only known marine energy converter that can cost-effectively generate electricity from low-flow tidal streams and ocean currents – significantly expanding the UK and global exploitable energy resource.

Image credit: Minesto

Following the successful commissioning of the first 0.5MW Deep Green system in the Summer and Autumn of 2018, Minesto will move into the second phase in the development of the Holyhead Deep site where it will gradually expand the site by installing further devices to develop a commercial demonstration array of up to 10MW installed capacity.

BENEFITS FOR WALES

To date, Minesto has invested circa £27 million of private equity and ERDF funding in its project and operations in Wales. 23 FTE jobs – of which the majority are highly skilled jobs in electrical, mechanical and offshore engineering – have been recruited within the Minesto organisation in the UK, with circa 70% of Minesto's supply chain (18-20 companies) directly procured from companies based in Wales.

An execution of the long-term ambition of a phased expansion of the Holyhead Deep project to an 80MW commercial tidal energy array would see further substantial inbound investments as well as a considerable number of direct jobs and supply chain opportunities created in North Wales – in addition to supplying the equivalent of some 60,000 Welsh homes with affordable, reliable and predictable clean electricity.



Image credit: Minesto



Image credit: Minesto



Image credit: Nova Innovation

PROJECT UPDATE

Nova Innovation is one of the world’s leading tidal energy companies. In 2016 they deployed the world’s first offshore array of tidal turbines in Bluemull Sound, Shetland. Nova has chosen Wales as the location for the next stage in their journey of technical innovation to drive down the cost of tidal energy production. Drawing on lessons from the wind industry, they believe the way to do this is to demonstrate commercial devices at a small scale, before scaling up as the technology matures.

Nova’s Ynys Enlli Tidal Energy project will involve placing an array of their M100 100kW turbines in Swnt Enlli (Bardsey Sound) between Ynys Enlli (Bardsey Island) and the Llŷn Peninsula mainland in north Wales. To deliver the project, Nova will build on their experience and expertise from Shetland, where they have made ground-breaking technical advances, such as installing Tesla battery storage to deliver baseload tidal power to grid. These advances will help to deliver the Enlli Tidal Energy project, as well as a future Nova Tidal Array within the West Anglesey Tidal Demonstration Zone.



Image credit: Nova Innovation



Image credit: Nova Innovation

BENEFITS FOR WALES

Nova’s ambition for their Ynys Enlli tidal project is to deliver locally generated renewable electricity that will create significant tangible benefits for local people and communities. To date 25% of project spend for their Bluemull Sound project has been in Shetland and 80% in Scotland. Nova hopes to achieve similar levels of local content for their Welsh projects, delivering significant supply chain and employment benefits. Nova is working with regional renewable energy organisation YnNi Llŷn and the Bardsey Island Trust to fully explore the possible local benefits of the Enlli tidal project.

WAVE ENERGY DEVELOPERS IN WALES



Image credit: Bombora

PROJECT UPDATE

Bombora is a multi-award-winning ocean energy company that has developed an innovative and patented wave energy converter called the mWave™. Designed in Perth, Western Australia, the mWave delivers low cost, low impact, renewable electricity for global commercial use in national and island electricity grids. The mWave rests on the sea floor like a fully submerged reef, making it invisible while extracting maximum energy. The mWave is non-disruptive to ocean users and can survive stormy conditions. Its flexible rubber membranes pump air through a turbine to generate electricity.

BENEFITS FOR WALES

Bombora transferred its operations and core team to Wales at the end of 2017. This team has been strengthened with a major recruitment programme. Bombora now has 20 staff based in Pembroke Dock bringing together a wealth of experience from the marine, energy and offshore operations industries. This recruitment programme coincided with the launch of a 2½ year, £15 million project to construct and test the first 1.5MW mWave in the ocean off the Pembrokeshire coastline. Critically, Bombora has secured a £10.3 million Welsh European Funding Office grant supporting this project.

Bombora also successfully completed a multi-million capital raise in 2017 with Enzen, a rapidly growing global energy consultancy business. This relationship provides Bombora with access to capital and Enzen's extensive energy project network and progressive business systems.

Bombora is currently developing long term supply chain relationships with a wide range of specialist suppliers to complete their project in Wales. Bombora has already let contracts to a number of local manufacture and supply companies. These suppliers will support Bombora's future commercial projects across Europe and the globe.



Image credit: Bombora



MARINE POWER SYSTEMS

PROJECT UPDATE

MPS is developing renewable energy devices to exploit the immense marine energy resources that exist in our oceans across the globe. Its vision is to see affordable, reliable and scalable offshore energy farms built at sea to supply the demand for clean power. MPS' WaveSub wave energy converter is an important step in the journey towards commercialisation. A 1:4 scale WaveSub prototype has been tested at sea and has validated the USPs of the technology. MPS is now in the process of the design, manufacture and testing of a full scale WaveSub.



Image credit: Marine Power Systems



Image credit: Marine Power Systems

BENEFITS FOR WALES

MPS' 1:4 scale WaveSub project was part-funded by the European Regional Development Fund (ERDF) through the Welsh Government, with MPS receiving over £3 million in grant support which has largely been spent in Wales. MPS is supportive of creating a Welsh marine energy supply chain, with many of its suppliers for this operation and the full scale WaveSub being based in Wales and therefore feeding into the local economy. The WaveSub benefits from being able to be towed significant distances; MPS therefore see a significant opportunity for the manufacture and commercial roll-out of devices from Wales. This will create a substantial export opportunity, with MPS establishing itself as a long-term sustainable business creating highly skilled jobs in a range of disciplines.

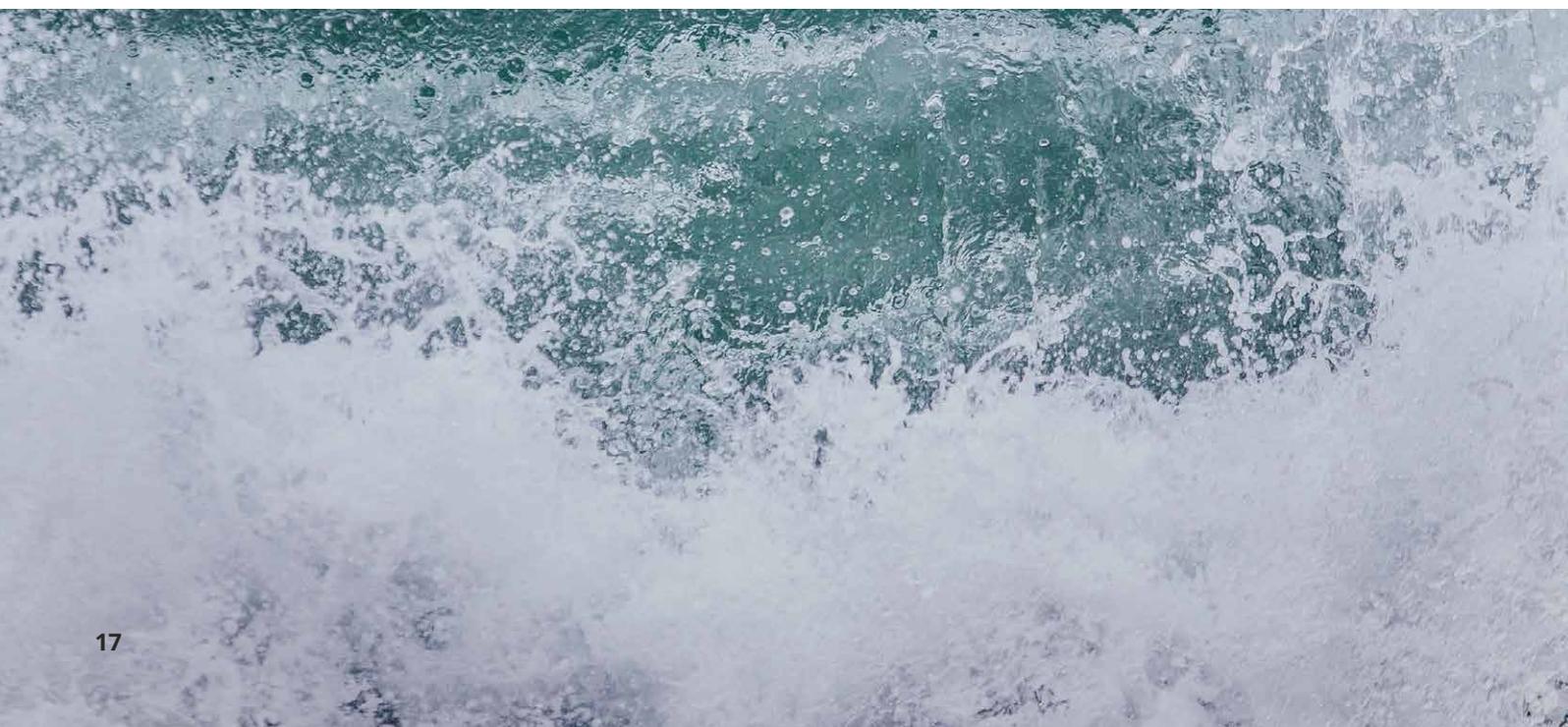


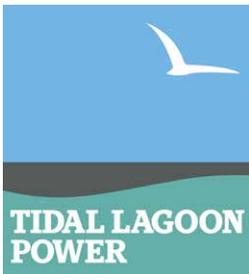
PROJECT UPDATE

Wave-tricity has a mission to develop a commercially viable, real world, wave energy convertor. Its technology, the Ocean Wave Rower, will generate clean energy by capturing the natural motion of the waves and plans to make use of the worldwide resource of wave energy estimated to be greater than 2TW. The device will underpin a wide range of product capabilities that will not only provide energy to homes across the globe, but is aimed also at nations/islands principally where the cost of generation and energy security are of national importance. It will also be utilised to offer a desalination solution and to assist disaster relief providing a rapidly deployable and robust platform from which to generate clean water and energy to disaster hit regions across the world.

BENEFITS FOR WALES

The company secured £4 million in ERDF funding through the Welsh Government, which was matched by £1.8 million from the company. This created new jobs in both engineering and operations as well as supply chain opportunities for local businesses. The contract for the build of the test platform and installation of the associated technology was won by Pembroke Dock-based Mainstay Marine Solutions who worked on the construction of the device in 2017. Since 2017, the device has been undergoing sea trials in the Milford Haven Waterway. Wave-tricity now intend to construct a full-scale concrete hybrid generation platform, which will be a large and complex build. Detailed engineering design is anticipated to commence in Q1 2019.





TIDAL RANGE ENERGY DEVELOPERS IN WALES

PROJECT UPDATE

At 320MW installed capacity, Swansea Bay Tidal Lagoon could be the largest marine energy development in the world. Developed by Tidal Lagoon Power Limited, it would have an entirely predictable 495GWh output each year of clean, green electricity and is estimated that it will power 155,000 homes for 120 years – that's about 90% of Swansea Bay and 11% of Wales' domestic use.

BENEFITS FOR WALES

Tidal Lagoon Power's ambition is for half of the investment for their £1.3 billion project in Swansea to be retained within the Welsh economy. In addition to significant supply chain and employment benefits, this project could provide an international watersport centre, an Offshore Visitor Centre and the creation of new habitat, sea reefs and seabed sanctuaries.



Image credit: Tidal Lagoon Power

CURRENT STATUS

The project is currently on hold following a UK government decision to reject a Contract for Difference (CfD) support agreement. This was despite continued support from the Welsh Government. A Tidal Lagoon Taskforce was established in 2018 to enable stakeholders to consider the full suite of options for financing and delivering the tidal lagoon independent to Westminster. In October 2018, the taskforce concluded that the development of a tidal lagoon needs to be led by the private sector without the reliance on government or local government subsidy. A Prior Invitation Notice (PIN) was published inviting companies and investors to undertake the delivery of the development. In December 2018, 11 companies responded to the PIN expressing an interest in delivering a tidal lagoon for Swansea Bay.



North Wales Tidal Energy Ynni Llanw Gogledd Cymru

PROJECT UPDATE

NWTE is driving development of the North Wales Tidal Lagoon, with a sea wall potentially stretching over 30 km from Llandudno to Prestatyn and impounding an area of 157 km².

With an installed capacity of 2.5GW, generating over 4.5TWh per annum, the North Wales Tidal Lagoon could deliver entirely predictable blue power to over 1 million homes (nearly 90% of the homes in Wales) and create over 20,000 job opportunities across Wales and the UK.

The project's wide-ranging benefits have gained increasing attention as providing a powerful alternative to the employment and energy gap caused by the suspension of the Wylfa Newydd nuclear power plant.



Image credit: North Wales Tidal Energy

BENEFITS FOR WALES

- Coastal protection - against rising sea levels and storm surges for the infrastructure, businesses and communities along the coast. Marine and bird life could also benefit from protected waters, sand dunes and breeding sites.
- CO₂ reduction - saving approximately 2 million tonnes of CO₂ each year, the lagoon could make a significant contribution to Wales' ambitious greenhouse gas emission targets.
- Land capture - by alleviating the risk of flooding, the lagoon could make over 500ha of land available for business and residential development.
- Reliability and grid stability - the predictability of tidal range and the scale of the North Wales Tidal Lagoon project offers the baseload, energy storage, inertia and voltage/frequency control needed by the National Grid.
- 100+ year asset - tidal lagoons are designed to last for generations. Once its capital cost has been paid off, the lagoon could deliver ultra-low-cost energy for 70+ years with no waste and no decommissioning needed.

FLOATING OFFSHORE WIND IN WALES

Floating offshore wind developments refer to offshore wind turbines mounted on floating structures that allows the turbine to generate electricity in water depths and bathymetry where fixed-foundation turbines are not feasible. Unlike fixed offshore wind turbines, floating offshore wind is still in the demonstration phase.

A recent report into the Future Potential for Offshore Wind in Wales by the Carbon Trust³ notes that Wales has abundant wind resource in offshore locations, combined with good port, transport, and grid infrastructure in North and South Wales. It also notes that Pembrokeshire has excellent wind resources in deep water offshore locations, suitable for floating wind power. The Pembrokeshire Demonstration Zone (detailed on page 23), has the potential to support a pre-commercial 90MW floating wind demonstration project. A number of other global companies are also considering Wales for the development of future floating offshore wind projects.



Image credit: Principle Power Inc

³The Carbon Trust (2018) Future Potential for Offshore Wind in Wales

DEVELOPING A WORLD CLASS CENTRE OF MARINE ENERGY IN WALES

Wales is currently developing a wide range of marine energy test and demonstration facilities. These facilities will provide wave, tidal stream and floating offshore wind developers with component, scale and full array scale, grid-connected testing, development and fabrication opportunities. Combined, they will enable valuable learning across the sector allowing developers to reduce the time, risk and cost of developing new technologies. These facilities add value and fit into the existing network of UK test centres and directly support Welsh projects and wider UK deployments, placing Wales on the main stage for this emerging global market.

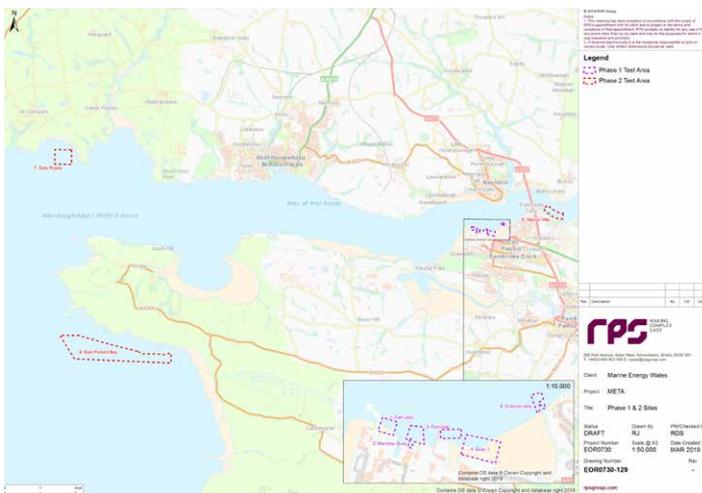


UNDEB EWROPEAIDD
EUROPEAN UNION



Uywodiwrth Cymru
Welsh Government

**Cronfa Datblygu
Rhanbarthol Ewrop
European Regional
Development Fund**



EARLY STAGE MARINE TESTING

META will be a series of eight pre-consented, non-grid connected test areas in the Milford Haven Waterway, Pembrokeshire. Aiming to bridge the gap between tank testing and the Welsh Demonstration Zones, these sites will be suitable for a range of component, sub-assembly and marine renewable energy device tests including deployment and recovery and Operation and Maintenance methods. The eight test areas are sheltered and accessible, yet still representative of real sea environments and within immediate vicinity of experienced and established energy sector supply chain with transferable skills.

As well as being part of the Swansea Bay City Deal, this £1.9m project is supported by EU and Welsh government funds along with the Coastal Communities Fund. It aims to provide marine energy device developers with an easy access testing facility to de-risk future deployments. META will fill the gap for early stage marine energy testing in the UK to enable developers to prove the technology before advancing to commercial scale demonstration.

As part of the project, an educational programme is being developed and offered to Pembrokeshire schools, with a specific focus on marine energy development, coastal zone management and sustainable use of the coast.

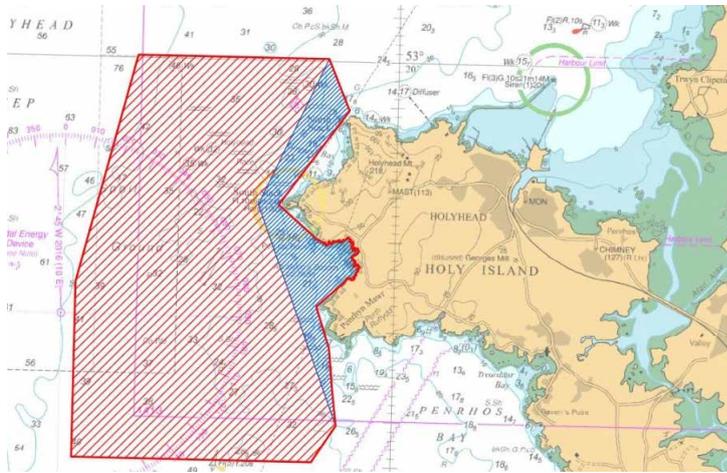
Image credit: Marine Energy Wales



PROJECT STATUS

A scoping opinion is due to be received from NRW imminently, and a subsequent Environmental Impact Assessment will inform the Marine License Application, which will be submitted Spring/Summer 2019. META is aiming to be open in the summer of 2019 for component and sub assembly testing, and are aiming to have achieved consent to be operational for wave and tidal device testing in 2020.

WELSH DEMONSTRATION ZONES - ACCELERATING TECHNOLOGY DEVELOPMENT



The West Anglesey Tidal Demonstration Zone and Pembrokeshire Demonstration Zone are two of several zones around the United Kingdom which have been leased by The Crown Estate in a bid to encourage and accelerate marine energy technology development. These zones are array scale demonstration zones aimed at testing multiple devices. They were identified because they offer appropriate wave and tidal energy potential and access to necessary infrastructure, including ports and electricity grid.



WEST ANGLESEY TIDAL DEMONSTRATION ZONE

The West Anglesey Tidal Demonstration Zone, known as Morlais, comprises 35km² of sea bed around the promontory of Holy Island. The zone has a good tidal current resource and a relatively low wave regime. It was created by Menter Môn following successfully securing a 45-year lease from The Crown Estate. The deployment of tidal energy converter technologies within the zone is planned to scale up over time to a potential maximum electricity generating capacity of 240MW. Morlais aims to secure maximum benefit locally through establishing Anglesey as a hub for the marine energy industry. This is the first large scale third sector community marine renewable energy project.

Seven developers and manufacturers from around the world have signed agreements for berths in the zone with a further four due to complete in March 2019, including several tidal stream technology devices and balance of plant. The companies who have secured berths in the zone include **Aquantis**, **Instream Energy Systems**, **Nova Innovation**, **TidalStream**, **Tocado**, **Verdant Isles** and the most recent to join **Orbital Marine Power**. There are ongoing negotiations with other developers who are keen to sign up to the project. The consent applications will be submitted in Summer 2019, with infrastructure to be built between June 2021 and December 2023.



Orbital Marine Power

Leading Scottish based tidal technology developer has signed an agreement to demonstrate its award-winning tidal technology at Morlais. Orbital aims to develop a commercial scale tidal array of their recently unveiled 'O2' 2MW tidal turbine which Orbital believes will be the most powerful tidal generating platform in the world. Each 2MW unit is capable of producing electricity equivalent to the demands of 1,500 typical UK homes.

"Tidal energy's potential is significant, but the infrastructure is still developing. Demonstration zone projects such as Morlais are crucial stepping stones in helping marine energy reach maturity and commercial viability," Robbie Gibson, Black & Veatch's director for renewable energy in the UK.

PEMBROKESHIRE DEMONSTRATION ZONE

The Pembrokeshire Demonstration Zone (PDZ) is a 90km² area of sea leased from the Crown Estate by Wave Hub Ltd, the operating company of the Wave Hub test site in Cornwall. The PDZ is located between 15 and 21 kilometres off the south Pembrokeshire coast with water depths of between 50-62 metres. It has the potential to support three wave energy arrays of up to 30MW generating capacity each, together with a pre-commercial 90MW floating wind demonstration project. The site benefits from a 19 kW/m wave resource and 10 m/s wind resource. It also offers excellent grid connection possibilities, including 132kV transmission line and substation located on the coast, along with world-class deep-water port facilities and support services.

A feasibility study was completed in 2018 and the Environmental Impact Assessment process has started. Detailed design and environmental surveys are planned to start in 2019 to enable a consent application to be submitted in 2021.

MEECE MARINE ENERGY ENGINEERING CENTRE OF EXCELLENCE

MEECE, delivered by ORE Catapult, will be a Centre of Excellence for marine energy engineering based in Pembroke Port with capability in Anglesey, Cardiff and Swansea. MEECE will provide specialist knowledge, experience and capability for the benefit of the industry. MEECE will provide a centre for collaboration through coordinated, joint-industry / cross-industry approaches, whilst disseminating lessons learned for future projects and improving industry productivity and effectiveness.

MEECE will bring the expertise and capabilities of Welsh universities and of the ORE Catapult into direct contact with technology developers and their supply chains, supporting more innovation, and capturing and embedding that innovation in Wales.

Pembrokeshire Demonstration Zone

Managed by Wave Hub Ltd



Wave Hub Ltd has an office in the Marine Energy Hub in Pembroke Dock and plans to recruit two full time members of staff in 2019. Wave Hub Ltd is working in partnership with Milford Haven Port Authority, Offshore Renewable Energy Catapult and Marine Energy Wales to secure this funding and deliver the project over the next 5 years.

CATAPULT

Offshore Renewable Energy



Image credit: Tidal Energy Ltd

PEMBROKE DOCK MARINE

MEECE, META and PDZ join the Port of Milford Haven's port infrastructure development to form Pembroke Dock Marine, a Swansea Bay City Deal bid which is currently at Business Planning stage. The focus is to drive marine energy innovation and maximise operational efficiencies through the development of a world-class centre for marine energy. This will enable developers to design, test, build and deploy devices, while benefitting from Pembrokeshire's proximity to superb natural energy resources and an experienced, high-skill supply chain.

THE PEMBROKE DOCK MARINE PROJECT COMPRISES FOUR KEY ELEMENTS:

- 1 Pembroke Dock Infrastructure (PDI)**
PDI is focused on reshaping the physical infrastructure of Pembroke Port, Gate 4, to ensure maximum operational efficiency. This element of the project aims to create large open plan fabrication and laydown areas and create enhanced land to sea transition spaces including a supersize slipway and dedicated berthing for work boats to meet the needs of modern industry.
- 2 Marine Energy test Areas (META)**
See page 21
- 3 Pembrokeshire Demonstration Zone (PDZ)**
See page 23
- 4 Marine Energy Engineering Centre of Excellence (MEECE)** See page 23



Image credit: Port of Milford Haven

BY CREATING A UNIFIED, DEDICATED DEVELOPMENT AND DELIVERY SITE, PEMBROKE DOCK MARINE WILL:

- Support developers through the provision of **infrastructure, facilities, knowledge and skills** across the life-cycle of technical readiness levels as they move towards commercialisation.
- Help **reduce the price** of marine derived energy.
- Support regional **economic growth**.
- **Minimise risk** for investors and developers.
- Contribute to **UK energy security** by creating the right facilities for industry to harness home-sourced, reliable, renewable low carbon energy.
- Directly contribute to **UK and Welsh decarbonisation targets** by enabling industry to upscale devices efficiently.



Image credit: Port of Milford Haven

INVESTING IN SCIENCE, RESEARCH AND INNOVATION

**WALES IS HOME TO TOP QUALITY RESEARCH AND EDUCATION FACILITIES.
BELOW IS A SNAPSHOT OF RESEARCH PROJECTS CURRENTLY ACTIVE WITHIN WELSH UNIVERSITIES.**

SURFTEC, SURVIVABILITY AND RELIABILITY OF FLOATING TIDAL ENERGY CONVERTERS, EPSRC, 2016 - 2020

Computational modelling and real sea deployment deployment measurements will provide a tool for floating tidal devices and arrays. Measurements have been taken from the deployment of Sustainable Marine Energy's PLAT-I device in Connel Sound, Scotland and Grand Passage, Canada. EMEC are providing input on extreme loadings (survivability) and working with Black and Veatch on guidelines.



Image credit: Jack Hughes, Swansea University



Image credit: Iain Fairley

DST-UAV, DISCRIMINATION OF SEDIMENT TYPE USING UNMANNED AERIAL VEHICLES, NERC, 2018

DST-UAV considered the potential of UAVs to map intertidal sediment type. The project was developed to answer questions from NRW and Tidal Lagoon Power about suitable low-cost tools to measure changes in intertidal sediment type related to coastal tidal energy lagoons. Results are presented open-access in Remote Sensing Journal.

QUOTIENT (QUANTIFICATION, OPTIMIZATION, AND ENVIRONMENTAL IMPACTS OF MARINE RENEWABLE ENERGY), NRN-LCEE (SER CYMRU), 2015-2020.

Quotient aims to improve our understanding of the role of marine renewables in the future energy mix, specifically resource assessment and optimization, and interactions between renewable energy devices and the environment. The Cluster research themes are: 1. Resource assessment 2. Optimization 3. Impacts of renewable energy devices on the environment 4. Impacts of the environment on renewable energy devices. Based on these themes, Quotient has so far led to £21M of grant income (around £7M of which is in Wales), 23 peer-reviewed journal articles, several books, and book chapters.

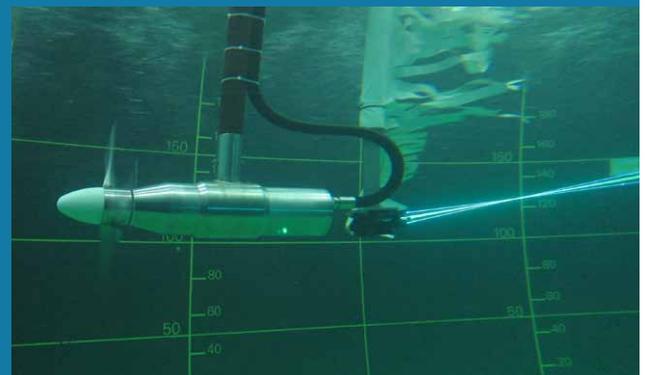


Image credit: Tim Ebdon, Quotient PhD student, Cardiff University

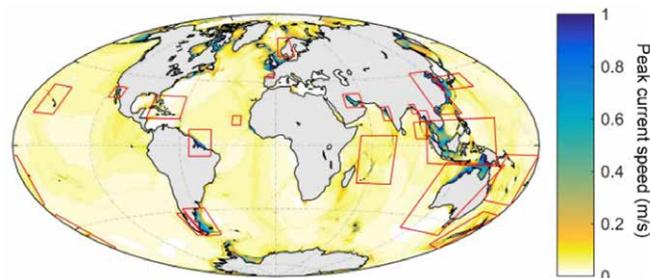


Image credit: Matt Lewis, Bangor University

METRIC, IMPROVING METHODS OF CHARACTERISING RESOURCE, INTERACTIONS AND CONDITIONS OF MARINE RENEWABLE ENERGY, EPSRC. 2018-2021.

This fellowship will map the global marine renewable energy resource to inform a high-tech, globally exportable and sustainable industry; with 3 core themes: (1) Global resource mapping (2) Ocean conditions spatial and temporal variability (3) Improvement of ocean-modelling methods.

UNITED KINGDOM CENTRE FOR MARINE ENERGY RESEARCH, ARRAY MODELLING, EPSRC, 2016-2019

The UKCMER programme aims to achieve numerical-experimental similarity for marine devices. Based on experiments in the Edinburgh University Flowave facility, the Swansea University workpackage has developed computationally efficient models of turbine arrays that predicts turbine performance and has the correct wake velocity and turbulence field. Subsequently this gives high fidelity estimates of array layout performance.

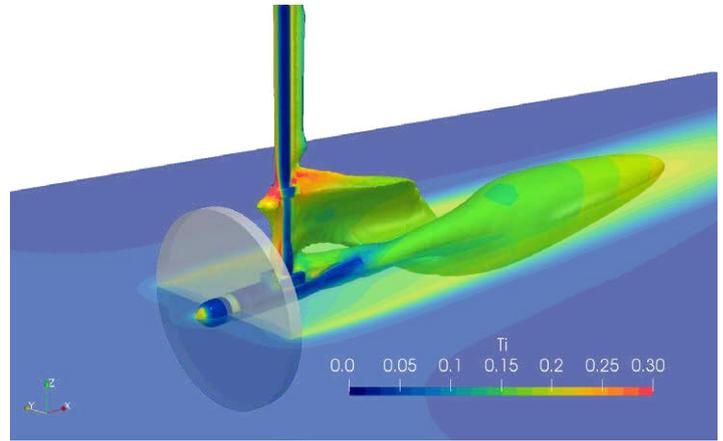
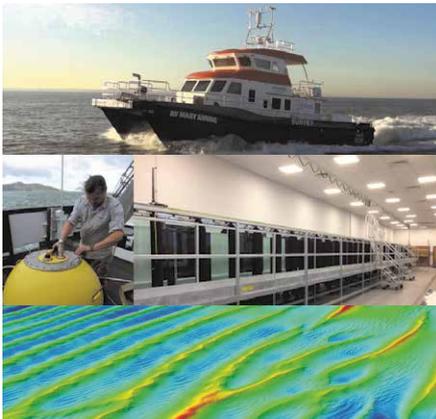


Image credit: Matt Edmunds



SEACAMS2, SUSTAINABLE EXPANSION OF THE APPLIED COMMERCIAL AND MARINE SECTORS, WEFO, 2015-2020

A five year £17m RD&I programme led by Bangor University with Swansea University, to support the marine renewable energy sector in Wales via collaborative projects on commercial development, climate change resilience, and resource efficiency. Research emphasis is on resource assessment, site characterisation and environmental impacts of MRE, particularly on biota and sediments.

MONITOR - MULTI-MODEL INVESTIGATION OF TIDAL TURBINE RELIABILITY, INTERREG ATLANTIC AREA, 2018-2021

MONITOR coordinates input from partners across Europe working on testing at sea, lab work and simulations to inform a reliability model of tidal stream turbines. From this model we will identify the key design parameters, and the data gathered will determine what factors (e.g., environmental conditions, control schemes) have the greatest overall effect on turbine reliability.



Image credit: José Nuño, Magallanes Renovables



Image credit: Innogy Renewables UK Limited

ECOSTRUCTURE (CLIMATE CHANGE ADAPTATION THROUGH ECOLOGICALLY SENSITIVE COASTAL INFRASTRUCTURE), ERDF IRELAND/WALES COOPERATION PROGRAMME, 2017-2020

Ecostructure aims to promote the incorporation of secondary ecological and societal benefits into coastal defence and renewable energy structures, with benefits to the environment, to coastal communities and to the blue and green sectors of the Irish and Welsh economies

MARINE ENERGY WALES SUPPORTING THE WAVE AND TIDAL INDUSTRY IN WALES

This report clearly demonstrates the positive impacts marine energy is having in Wales. Positive impacts on peripheral economies, where well paid high skilled jobs are being created in coastal communities. Positive impacts on the local supply chain where the sector has provided Welsh companies with diversification opportunities and resilience as other energy markets slow down or have not progressed in Wales. Positive impacts on Welsh universities as world-leading research is carried out, creating opportunities to link with other cutting-edge expertise and skills. Positive impacts on inward investment as global innovative companies set up their British, European and global headquarters here in Wales.

These impacts are also felt across the UK where in particular Scottish, Welsh and Cornish companies have collaborated on projects and development. Alongside this, public support for marine energy is at a record high with community groups also beginning to play an active role in the sector.

The UK currently has a global lead in marine energy with concepts proven, devices breaking records and projects progressing towards commercialisation. After first starting to work on marine energy in Wales in 2008, it feels that momentum is building and Wales is playing an active role in keeping the UK at the forefront of this global innovative sector. With a history of developing energy projects with imported technology, marine energy may be the only low carbon technology that is ours to own and export into a growing market.

Whether the UK holds on to this lead and benefits fully from this new low carbon opportunity will depend on UK Government policy. The publication of the ORE Catapult report demonstrating that marine energy can pass the 'Triple Test' - achieving maximum carbon reduction; showing a clear cost reduction pathway, and demonstrating that the UK can be a world-leader in a global market, is extremely encouraging. As MEW, we will continue working with the Marine Energy Council and colleagues from across the UK to raise these points to UK Government.

Wales, along with other devolved nations and regions is supporting marine energy, both for the socio-economic reasons highlighted in this report and for the significant opportunity it provides us with to decarbonise our energy systems. With the recent IPCC report stating that urgent and unprecedented changes are needed to limit climate change catastrophe, I have no doubt energy from our oceans will need to play a future role in mitigating what is the most significant threat to the planet.



**DAVID
JONES**

**PROJECT DIRECTOR
MARINE ENERGY WALES**

⁴IPCC (2018) Global Warming of 1.5 °C

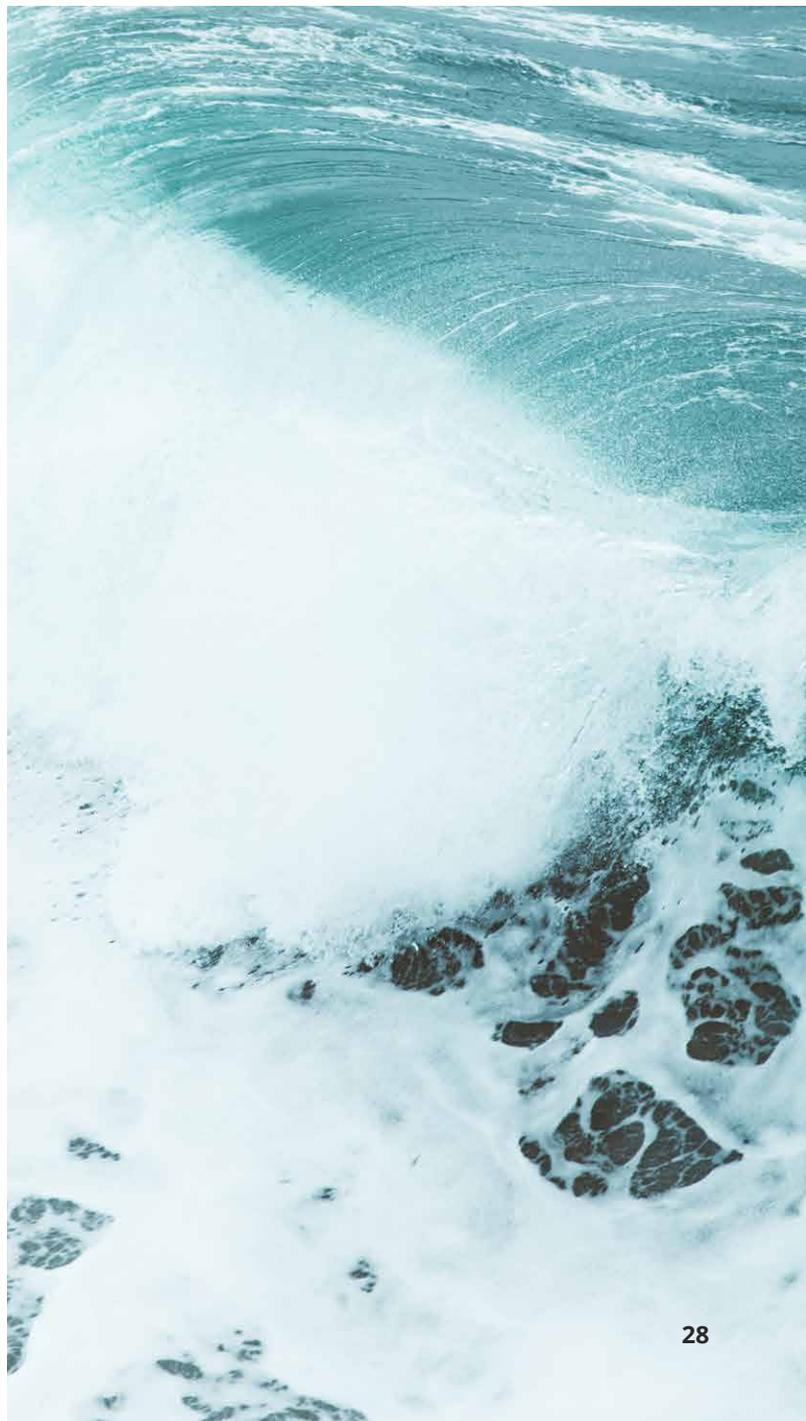


Supporting the marine energy industry in Wales Marine Energy Wales brings together technology developers, the supply chain, academia and the public sector to establish Wales as a global leader in sustainable marine energy generation, making a significant contribution to a low carbon economy. The benefits of this industry are being felt throughout the country with the creation of green sustainable jobs, growth and skills providing significant development opportunities for Wales.

MARINE ENERGY WALES OBJECTIVES

To create a thriving and diverse marine energy industry in Wales by:

- **Providing support and guidance** for the marine energy sector by means of a single point of access, helping the sector to develop skills, make sound business decisions and connecting businesses with key industry contacts.
- **Encouraging learning and collaboration** through regular working group meetings which are viewed as unique on a UK level and highly valued by industry, allowing accelerated business-to-business relationships and knowledge sharing.
- **Raising awareness of the country's key development opportunities**, unlocking creativity and ideas for the development of the sector through ongoing stakeholder engagement, including the annual Marine Energy Conference that attracts delegates from across the world.
- **Representing the industry at Government departmental and Ministerial level**, maintaining the key profile of the marine energy opportunity and ensuring that it features strongly in policy.
- **Encouraging wide participation in the marine energy industry** through widespread networking at local, national and global marine energy events.
- **Promoting wider public understanding of the benefits of marine energy** including the commitment to developing a low carbon sustainable economy which utilises our world leading position to create significant job and growth opportunities within the country.



WHY WALES?

The country has a number of factors that make it an ideal location for marine energy development with up to 6.4GW (over 10GW including the Severn Estuary) of estimated generating capacity:

- €100.4 million of funding prioritised for marine energy in Wales
- An indicative wave capacity of up to 5600MW
Tidal streams of up to 4ms⁻¹
- The potential for 8,720MW installed capacity from four tidal lagoons
- Long term, dedicated political support from Welsh Government
- 400kV transmission lines and substations located coastally at resources areas
- Array scale Demonstration Zones in Anglesey and Pembrokeshire
- Eight strategically located ports sited along the north, west and south coast
- Expert supply chain companies with a wealth of sector expertise including experience in constructing and deploying marine energy devices
- Established energy sector supply chains and workforce with transferable skill opportunities
- Dedicated, government backed, Enterprise Zones with business development incentives
- Access to expert academic and research facilities
- Marine Energy Wales providing a single point of access for marine energy developers interested in Wales



“We are striving to make Wales a leading player in the marine energy field with energy generated from waves and the tide playing an important role in our ambitions for a low-carbon economy”.

“Our aim is to generate 70% of our energy from renewable sources by 2030. The marine energy sector can play a significant role in helping Wales achieve this target and will be closely aligned with Wales’ first National Marine Plan”

“All this underpins our ambition to build a thriving industry generating well-paid jobs and business opportunities in Wales. We want to continue to attract developers from around the world to our Welsh waters”

**FIRST MINISTER
MARK DRAKEFORD**





MARINE
ENERGY WALES
YNNI MOROL CYMRU



OUR FUNDERS



OUR MEMBERS



**If you require this report in Welsh please contact:
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