MARINE ENERGY WALES

A partnership between technology developers, the supply chain, academia and the public sector working in collaboration to establish Wales as a “centre of excellence” for sustainable marine energy generation.

"With €100.4 million of EU Structural Funds prioritised for marine energy in Wales, two array scale Demonstration Zones, seabed agreements in place for 3 separate tidal projects and a number of proposals for tidal range projects, Wales has the potential to be a world-leader in the marine energy market.

"If you combine our diverse natural resources with grid connection possibilities, the transferable skills of the oil, gas, nuclear and offshore wind supply chain, world class research and port facilities, then it all adds up to make Wales an ideal location for technology development."

David Jones, Project Director, Marine Energy Wales

What is Marine Energy Wales?

A partnership between technology developers, the supply chain, academia and the public sector working in collaboration to establish Wales as a “centre of excellence” for sustainable marine energy generation.

The vision is to create a thriving and diverse sustainable marine energy industry, making a significant contribution to a low carbon economy. The benefits of this industry are felt throughout the entire supply chain creating green sustainable jobs, growth and skills.

The Marine Energy Wales Working Group

Marine Energy Wales Objectives

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

- Providing support and guidance for the marine energy sector
- Enabling the development of a commercially viable marine energy industry in Wales delivering local economic benefits
- Encouraging learning and collaboration through regular working group meetings
- Raising awareness of the country's key development opportunities
- Providing a conduit for information between industry, public sector agencies and Government
- Encouraging wide participation in the marine energy industry
- Promoting wider public understanding of the benefits of marine energy

Current Work Streams

Marine Energy Wales promotes Welsh marine renewable capability, attracting businesses to Wales through:

- Bespoke business advice
- Coordination of industry input into marine energy research
- Developing UK collaborative partnerships
- Consenting guidance and recommendations
- Support and promotion of the Anglesey Tidal Demonstration Zone and the Pembrokeshire Wave Demonstration Zone.

"The Marine Energy Wales team has done a fantastic job helping to push forward marine energy in Wales, bringing together all of the key players, and getting marine energy up the political agenda. Having been involved in developing marine energy projects in Wales for over 10 years now, I have certainly appreciated the support they have provided, and this active support network is clearly something that sets Wales apart.

Joseph Kidd, Commercial Manager, Nova Innovation

Support And Benefits

Marine Energy Wales supports developers, the supply chain and relevant organisations in a number of ways:

- Single point of access for marine energy developers
- A working group of all wave and tidal developers with an interest in Wales
- Links to Government departments including Economy and Infrastructure
- Representation of the sector at Ministerial level and at events across the UK
- Sub-groups dealing with key consenting and research issues
- Discussion and sharing of development opportunities and best practice
- Assists with stakeholder engagement
- Marine energy consents guidance for Wales
- Annual seminar that attracts hundreds of delegates from across Europe

"The Marine Energy Wales team is a pleasure to work with. It is well run, open, positive, informative, responsive and inclusive. It is an extremely useful point of contact for the development of our interest in Wales."

Robert East, UK Development Manager, OpenHydro

Why Wales?

With €100.4 million of EU structural funding prioritised for marine energy in Wales up until 2020, two Demonstration Zones (one wave, one tidal stream), seabed agreements in place for three wave and tidal stream projects, and a number of proposals for significant tidal range projects, Wales is well positioned to play a global leading role in marine energy.

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 $4ms^{-1}$
- 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
- Established energy sector supply chains and workforce with transferable skill opportunities
- Experience in constructing and deploying Wales' first tidal stream device
- 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

"It is to difficult to build a new industry on your own. Developers, supply chain and public actors in marine energy have to work closely together to secure the path towards commercial breakthrough. Marine Energy Wales is the driver and enabler of such collaboration and thus plays a vital role for us to succeed in our number one market - Wales."

Dr Martin Edlund, CEO, Minesto

Funding

EU Structural Funds

For the period 2014–2020, Wales was allocated European Structural Funds investment worth some £2 billion for the following programmes:

- West Wales and the Valleys programmes
- East Wales programmes, which include the European Social Fund and European Regional Development Fund

€100,428,444 EU structural funds are prioritised for marine energy in Wales, with a maximum intervention rate of 69.43%. These funds are administered by the Welsh European Funding Office (WEFO). The strategic objective (3.1) is to increase the number of wave and tidal energy devices being tested in Welsh waters and off the Welsh coast, including multi-device array deployments, thereby furthering Wales as a centre for marine energy production.

Horizon 2020

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market. Despite the transition from the EU, the UK will still be able to participate in Horizon 2020.

Welsh Government Funding

The Welsh Government has a number of business funding programmes which operate alongside private investment, and which have the potential to fill 'funding gaps'. Contact Welsh Government on 030006 03000 to find out more about the individual funding programmes.

"Our Welsh centre of operations and the associated development activity is part funded by the European Regional Development Fund for will continue to support us over the next two years as we progress to sea trials in the Milford Haven Waterway. The combination of an excellent maritime trials environment, a good supply chain, and a willing professional community, allied to the significant government backing for offshore renewables, makes Pembroke Dock an ideal place for renewable enterprises. It's why we are here and it's why we see a great future ahead for Welsh marine renewables."

Matthew Fairclough-Kay, Managing Director, Wave-tricity

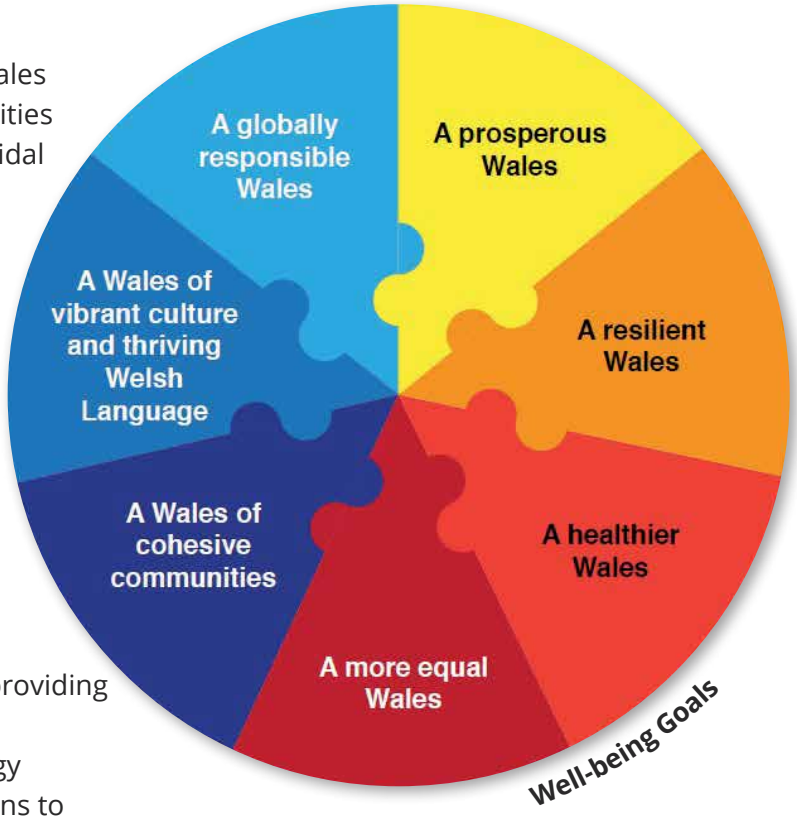
Government Commitment

The Welsh Government is strongly committed to unlocking the energy potential from Welsh waters and continues to bring together expertise across government, industry and academia to focus on the delivery of marine energy projects in Welsh waters. Wales has the potential to become a net exporter of electricity through careful and focussed use of its renewable energy resources.

Welsh Government supports growth in all marine energy sectors: tidal stream, tidal range and wave. Within Wales, they recognise that it may take time for these technologies to be deployed at commercial scales; therefore, they are committed to providing support to help the sector grow by demonstrating their potential and developing commercial operations.

Welsh Government recently published its 'Taking Wales Forward' statement which highlighted the opportunities to develop renewable energy, specifically detailing tidal lagoons and community energy as areas of focus.

Wales was one of the first countries globally to enshrine sustainability into statute, and its Future Generations (Wales) Act focusses on delivering seven well-being goals to improve the social, economic, environmental and cultural well-being of Wales. The marine energy industry fits well within these goals.



In September 2015 Edwina Hart AM, Minister for Economy, Science and Transport created a Marine Energy Task and Finish Group with the purpose of providing advice on a sustainable approach to deliver jobs, growth and wealth from the emerging marine energy sector. The Group made a series of recommendations to the Minister, one of which was the formation of Marine Energy Wales.

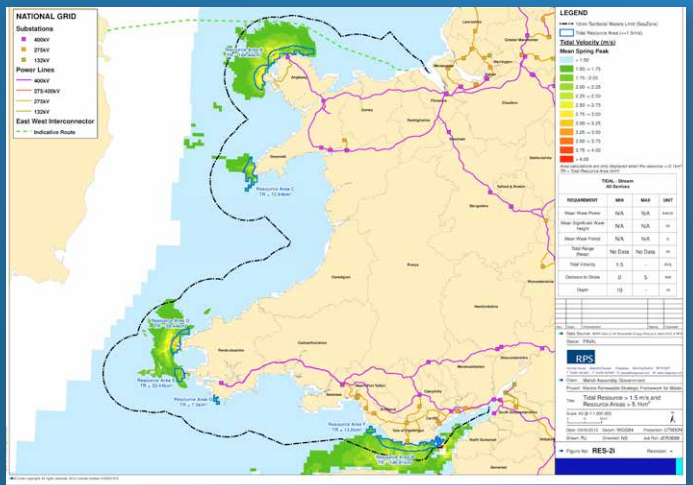
Resource

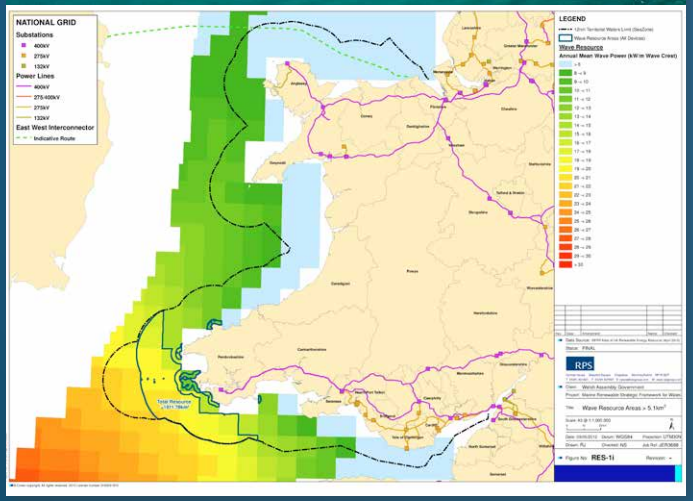
The Wales coast has a significant wave and tidal stream climate, as well as huge opportunities for tidal range. Welsh Government commissioned the Marine Renewable Energy Strategic Framework (MRESF) for Wales, a £1 million project mapping resource and potential constraints, which provides developers with an online mapping tool. The project confirmed there is the potential to deliver 6.4 GW installed capacity.

Anglesey has huge potential for tidal stream energy with a peak spring velocity of over 3 m/s. These tidal current speeds combined with water depth and seabed topography are among the best in the EU.

Pembrokeshire has the highest concentration of wave resource in Wales equating to an indicative capacity of up to 5.6 GW providing a significant opportunity for development of the industry.

Tidal range resource is also abundant across Wales and Tidal Lagoon Power aim to deliver up to 9 GW installed capacity through their four tidal lagoon projects across the country.





Demonstration Zones

In 2014 The Crown Estate announced that they had agreed seabed rights for six new wave and tidal current demonstration zones, with the aim of accelerating technology development and commercialisation. Of these 6 zones, 2 are in Wales and they were selected due to their resource potential, proximity to supply chain, port facilities and grid connection.

West Anglesey Tidal Demonstration Zone

The West Anglesey Tidal Demonstration Zone is located to the north-west of Holy Island, Anglesey. It is this geographical feature which leads to the acceleration of tidal flows in the area. The Zone, which is managed by Morlais Marine Energy, has an excellent tidal current resource and a relatively low wave regime. Morlais was established by Menter Môn following its appointment as managers of the zone by The Crown Estate.

The Site Offers:

- 37 km^2 seabed
- 38.4 m mean water depth
- 3 m/s peak spring tidal current velocity
- A 400 kV double circuit overhead line between Wylfa and Pentir.
- Deep water port facilities and support services

"The Welsh Government is committed to unlocking this potential and putting Wales firmly on the marine energy industry's global map. The benefits for Wales could be significant - not only for industrial and economic regeneration, but also in terms of reducing carbon emissions and promoting sustainable energy. The announcement is an important step which helps to define Wales as a Key location for marine energy deployment and leads the way for commercial renewable energy ventures."

The Rt Hon Carwyn Jones AM, First Minister for Wales on the announcement by The Crown Estate

South Pembrokeshire Wave Demonstration Zone

The Pembrokeshire Demonstration Zone is located off the South Pembrokeshire coast and is the largest seabed lease for wave energy in the world. Management of the zone is provided through a collaborative approach led by Wave Hub Ltd with partners including Marine Energy Pembrokeshire and Pembroke Port.

The zone has the potential to support the deployment of wave arrays with a generating capacity of up to 30MW for each project.

The Site Offers:

- 90 km^2 of seabed
- 50m water depth
- 19 kW/m wave resource
- A 400kv transmission line and substation located coastally at the Pembroke power station
- Deep water port facilities and support services

Enterprise Zones

Enterprise Zones are areas that have been identified to support new and expanding businesses by providing a first class business infrastructure and compelling incentives. They offer competitive operating costs for businesses, reduced business rates and enhanced capital allowances.

Anglesey Enterprise Zone

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.

Anglesey has an established reputation for low carbon energy generation including nuclear, wind and biomass. Given its natural resources (wind, solar and marine), skilled workforce (especially nuclear related skills), supply chain and research and development capability, the island already attracts major interest from the low carbon energy sector.

Haven Waterway Enterprise Zone

The Enterprise Zone offers renewable and traditional energy companies an experienced industry base and supply chain with a skilled workforce, an established distribution infrastructure, plus a variety of sites to suit a range of needs, and a network of universities with expertise in a range of energy-related fields.

The availability of a deep sea port combined with marine conditions suited to both wave and tidal technologies plus the added benefit of having grid access makes Haven Waterway Enterprise Zone an especially attractive location for marine energy companies as they move to demonstrate small and larger arrays.

Grid Connection

Anglesey

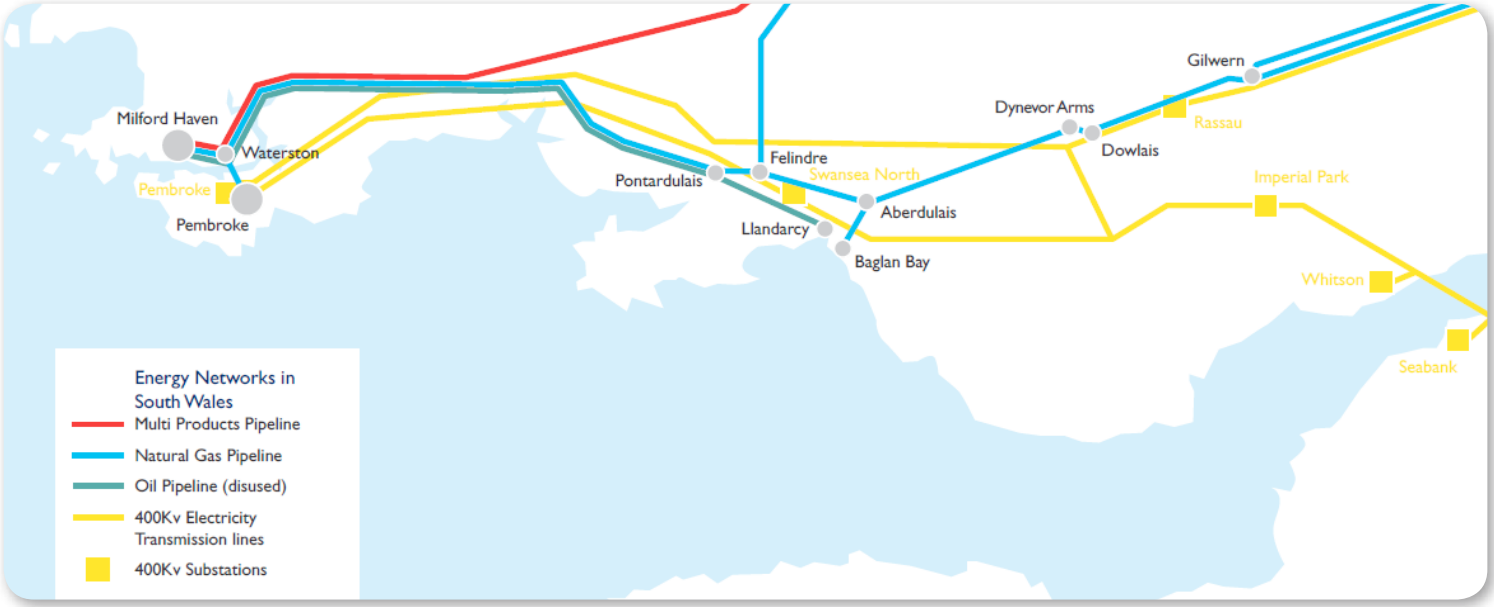
North Wales already has an established energy generating network through the Wylfa Nuclear Power Station, Dinorwig and Maentwrog hydroelectric power stations and several offshore wind farms. A 400 kV double circuit overhead line runs between Wylfa and Pentir and this could be utilised by the emerging marine energy companies.

The current national grid connections offer a suitable gateway to connect the energy production to the rest of Wales and the national grid. However the establishment of a new nuclear power station at Wylfa of 2.8 gigawatts (GW), could produce more energy than the existing power station, which could exceed the amount of electricity that the existing network could handle. The North Wales Connection is a proposed second connection for the Wylfa Newydd nuclear power station on Anglesey.

Pembrokeshire

In comparison to other UK coastal sites, existing land based grid connections are excellent in Pembrokeshire with a 400 kV National Grid connection being available at the Pembroke Power Station site. The region is also close to large population centres along the M4 corridor with high electricity demand.

As part of an evidenced based approach by Welsh Government, Halcrow consultants have completed a feasibility study on the infrastructure required for Marine Renewables off the Welsh Coast.



Ports

Port of Barry

The Port of Barry, nine miles west of Cardiff, is a key facility for the region's chemical industry, handling liquid bulks for major companies including Dow Corning. Barry also has considerable expertise in the handling of steel, scrap metal, containers, dry bulks, coal, and aggregates.

Port of Cardiff

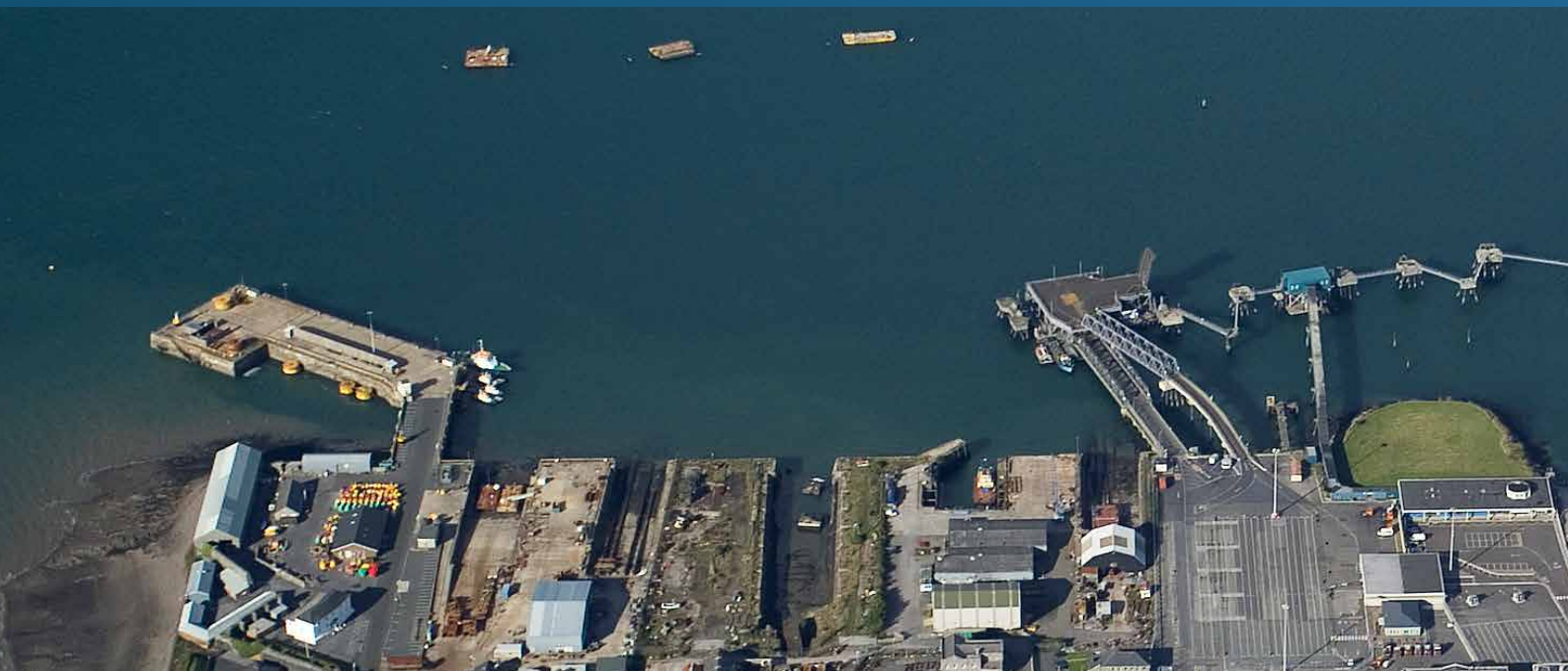
Located on the north side of the Severn Estuary, connected to the rail network, and within easy reach of the M4 motorway, the port has expertise in the handling of containers, steel, forest products, and bulk cargoes.

Port of Holyhead

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

Port of Milford Haven

The Port of Milford Haven is a deep water port and 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 renewables sector with the capacity and potential to take developers from device development through to operations and maintenance.



❯ Port of Newport

Newport has excellent links to the nearby M4 and direct rail connections. The port occupies a prime location to service the UK's main industrial and commercial regions. The Port of Newport is a steel, metals, recycling, and renewable energy hub.

❯ Port Talbot

Port Talbot is one of few ports in the UK capable of handling cape-size vessels of up to 170,000 dwt. The port comprises of the Tidal Harbour, which handles cape-size bulk vessels, and the docks which can accommodate smaller heavy-lift, project, and general cargo vessels.

❯ Port of Swansea

Swansea is ideally located to serve both the assembly and O&M needs of wind and tidal projects being developed in the Bristol Channel. The port has established expertise and the resources required to handle components for renewable energy projects. modate smaller heavy-lift, project, and general cargo vessels.

"Welsh ports have consistently supported the energy sector and we, at the Port of Milford Haven, see marine renewables as a key contributor to the UK's economic development and are investing to support it accordingly."

Tim James, Energy Manager, Port of Milford Haven

Supply Chain

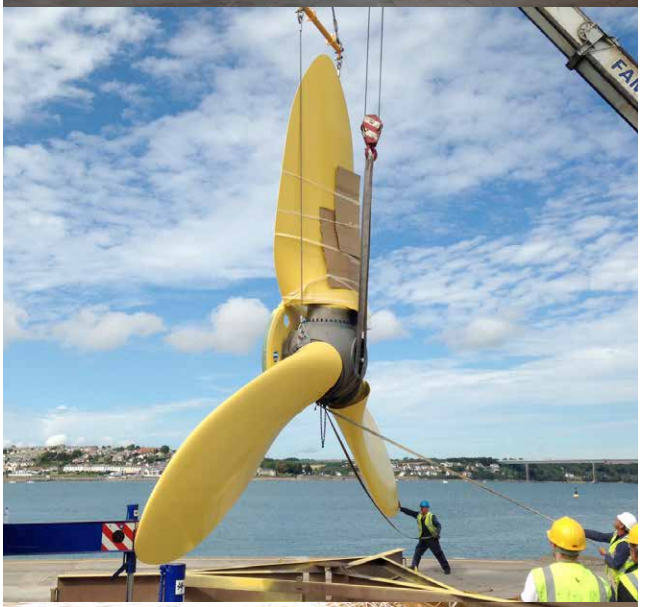
From consultancy and advisory services through to build, operational and decommissioning services, Wales can offer a complete supply chain for developers.

Wales has the potential to be a world-leader in the marine energy market – as a significant generator and, just as importantly, as an exporter of marine energy knowledge, technologies and services. Lagoon and nuclear opportunities for supply chain businesses across Wales are already encouraging companies to collaborate to compete for contracts. An alliance of supply chain companies has recently been formed by engineering companies based in and around Pembroke Dock. Their combined capabilities will enhance their competitiveness when bidding for larger contracts.

Pembrokeshire is already 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 will be of immediate benefit to the renewables industry looking to base their project close to an abundant marine energy resource.

Anglesey also has an established energy sector with the Wylfa Nuclear Power Station operational from 1971 to 2015. A second plant (Wylfa Newydd) has been proposed. 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.

Local construction companies have benefited from all of these energy projects, and have diversified their skills which will suit marine energy developers targeting the area.



Morlais

Morlais Marine Energy was created by Menter Môn following its appointment as the managers for the West Anglesey Demonstration Zone by The Crown Estate. Menter Môn is a third sector social enterprise delivering projects across North Wales in various sectors. Menter Môn was established in 1995 to deliver EU rural development programmes, with its primary aim is to facilitate rural economic regeneration on Anglesey.

Menter Môn's primary motivation for acting as the manager for the West Anglesey Demonstration Zone is to secure maximum benefit for the economy of Anglesey. The project will involve developing the zone to accommodate marine technology developers as well as servicing their requirements once they have located on Anglesey. Both elements will require a wide range of services and skills which should be accessed locally whenever possible and practical. As managers of the zone, Morlais will manage and sub-let areas for test and demonstration activities alongside some of the first array scale commercial projects. They will also seek to add value to the zone by undertaking consenting activities and establishing grid connection to further support subtenant projects.

Marine Energy Pembrokeshire

Marine Energy Pembrokeshire is a project run by Pembrokeshire Coastal Forum a Community Interest Company which was established in 2000. Pembrokeshire Coastal Forum has sustainable development of the coast at its core and with that aim originates, manages and delivers marine related projects for the community, public, private and third sectors. Pembrokeshire Coastal Forum continues to manage Marine Energy Pembrokeshire alongside other relevant coastal projects that are viewed as best practice nationally.

Following its inception, Marine Energy Pembrokeshire grew rapidly. Working Group membership expanded from 8 original members to present levels of 80 which include tier 1 Welsh supply chain companies and all relevant UK organisations, including Government, regulators, advisory and industry bodies. Wales' position as a global leader in the development of marine energy is largely due to the work of Marine Energy Pembrokeshire. This is reflected in both the numbers at Working Group meetings and the Annual Marine Energy Pembrokeshire Seminar which has been fully booked since 2010.

Marine Energy Wales was set up in 2016 to continue the work that Marine Energy Pembrokeshire started.

Marine Centre Wales

Marine Centre Wales is a new centre for innovation in applied marine science that has been developed during the SEACAMS project. Situated on the shore of the Menai Strait, it is a new national resource for Wales to meet the need for integration of research, commerce, and policy in the marine sector.

The Centre has been designed to facilitate interactions between researchers undertaking blue skies research, businesses requiring answers to specific and pressing research questions, and policy makers working on rapidly evolving legislation. It provides businesses with access to expertise (in data gathering and numerical modelling) and facilities (e.g. high performance computing, laboratories and research vessels).

Marine Energy Hub

A Marine Energy Hub exists in Pembrokeshire through a joint initiative between Marine Energy Pembrokeshire/ Wales and the Port of Milford Haven. The hub is located on the doorstep of one of the world's best marine energy resources. It is a dynamic worksite where marine energy companies can come together and share space, facilities and knowledge to unlock the sector's full potential.

The hub is located within the Marine Energy Wales offices in Pembroke Dock, overlooking the Milford Haven Waterway and is owned by the Port of Milford Haven.

"MarineSpace has established itself as one of the leading companies in Wales providing development and consenting support to the marine energy sector, with key clients including Mentor Mon, Wave Hub Limited and Tidal Energy Limited. Having an office in Pembrokeshire has been a key part of that success so we are delighted to have moved into the new Marine Energy Hub. We see it as a great opportunity for us to work even more closely with developers and other organisations involved in marine energy to help push the sector forward."

Jonny Lewis, Director, MarineSpace

The Economic Impact of the Development of Marine Energy in Wales

Marine Energy in Wales: Investment/Jobs/Supply Chain

In November 2014, Marine Energy Pembrokeshire carried out a survey of the marine energy industry in Wales, aiming to assess the economic contribution of the sector. In Wales, to date there has been a total investment by technology and project developers of £34.5 million. Including the investment made into publicly funded research projects brings this total to £44.5 million. Technology and project development and academic research has created over 174 years of employment in Wales. This is a considerable level of investment will grow substantially as technologies approach commercialisation.

The Economic Potential

Welsh Government commissioned an assessment of the potential economic contribution of marine energy to Wales. The study, based on three potential scenarios highlighted the huge impact the wave and tidal stream sector could bring.

Scenario 1:

A 30MW wave installation and a 30MW tidal stream installation has the potential to support over £70m of GVA across Wales, based on total investment of £150m. It could also provide 2,000 person-years of employment associated with development and installation, with a further £2m in GVA and 50 FTE jobs per annum throughout the period of generation.

Scenario 2:

300MW in marine energy capacity (two 30MW wave installations and eight 30MW tidal stream installations) would deliver just over £300 million of GVA for Wales. It could provide 8,500 person-years of employment during development and installation phases. The operational phase would support £7.8 million in GVA and 180 jobs per annum across Wales.

Scenario 3:

A substantial roll out of 1GW in wave and tidal energy could deliver £840 million of GVA impact to Wales (based on a total investment in Wales of the order of £1.5bn in 2013 prices) and deliver 24,000 person-years of employment. For this scenario, it is estimated that £20 million of GVA and 440 FTE jobs per annum would be supported across Wales through generation activities.

Research

World class research is being carried out throughout Wales providing developers with excellent resources in the research sector. Marine Energy Wales has links to all of the research projects being carried out in Wales at present with many project managers sitting in on the working group.

SEACAMS2

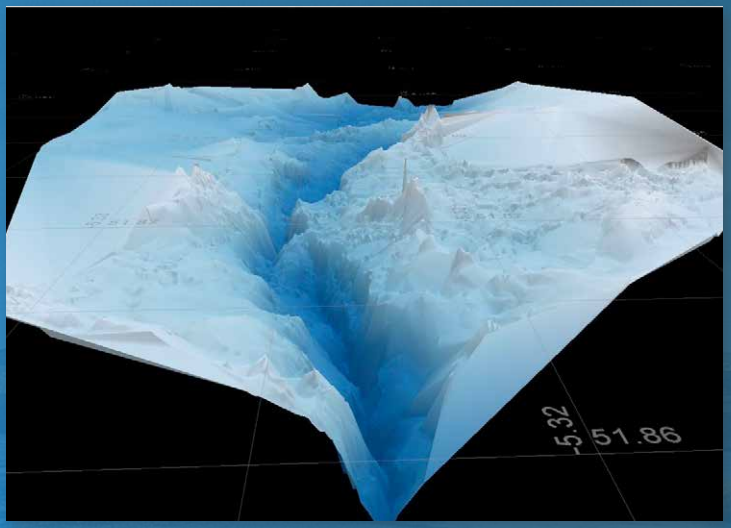
SEACAMS2 is a collaborative project between Bangor and Swansea Universities which have a wide range of expertise covering all areas of marine science, ranging from marine biology to marine physics and oceanography. The announcement of £12 million of funds for the project was made in September 2016. It is part-funded by European Regional Development Funds until July 2019. The aim of SEACAMS2 is to promote economic activity in Wales through collaborative research and development projects with marine renewable energy developers and allied businesses. Research outputs will lead to growth of SMEs and job generation through the expansion of commercial opportunities and activities in the marine renewable energy and allied sectors in Wales.

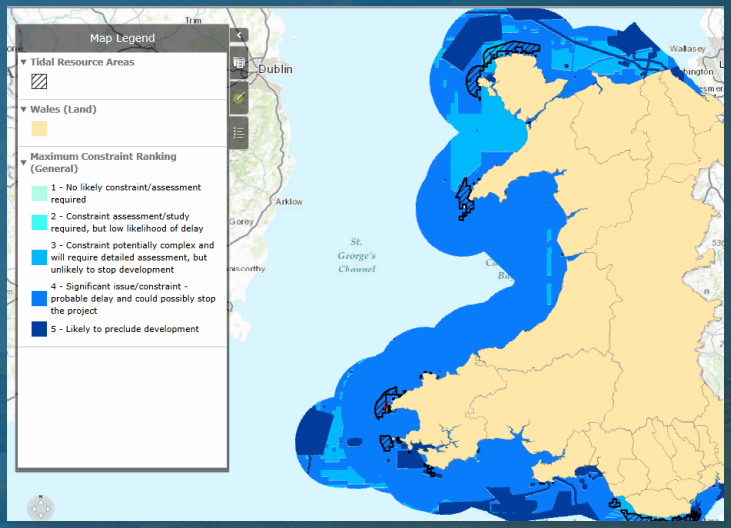
Natural Resources (NRW)

Natural Resources Wales (NRW) brings together the functions of the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales, as well as some functions of Welsh Government, including responsibility for Marine Licensing. NRW have carried out research on marine mammals, seabirds, seascapes, benthic species as well as providing natural heritage evidence to support strategic planning for marine renewable energy. NRW have also produced draft advice on scoping an EIA for marine renewable energy developments. NRW strongly supports the need for coordinated research into the effects of wave and tidal stream technologies, in order to ensure the sustainable exploitation of marine renewable energy in Welsh waters. Along with Welsh Government and The Crown Estate, NRW are members of the Steering Group for the UK Offshore Renewables Joint Industry Programme for Ocean Energy (ORJIP OE, which aims to coordinate UK marine energy research.

QUOTIENT

Quotient is a Research Cluster within the Sêr Cymru National Research Network for Low Carbon, Energy and Environment (NRN-LCEE). Funded from January 2015 to December 2018, the QUOTIENT Research Cluster will produce scientific research that will examine how wave and tidal energy resources interact with one-another, over a variety of spatial and temporal scales, from centimetres to kilometres and from sub-second to multi-decadal. Research within the cluster will determine how we can best manage marine renewable energy extraction, for multiple resource types, for future energy extraction scenarios, informing future energy policy and investment in the electricity network.





Marine Energy Pembrokeshire Research Evaluation

Marine Energy Pembrokeshire was commissioned by Welsh Government to carry out a 3 stage Welsh research evaluation report, aiming to increase the accessibility of all marine energy research in Wales. A comprehensive database can now be found on the website. This review also sought to improve collaboration between industry and academia. The aim is to make sure that wherever possible research projects are steered by developers providing industry with assistance in carrying out their project development needs.

Marine Renewable Energy Strategic Framework (MRESF)

The MRESF project investigated the potential marine renewable energy resource of Welsh Territorial Waters (TWs) and considered potential scenarios for the sustainable development of that resource primarily as an aid to policy development and also an indicator of resource for potential developers. The analysis and GIS mapping has been undertaken in five steps, designed to consider and apply a range of siting criteria for marine renewable energy devices within Welsh TWs. All of the data and evidence collated through the MRESF are now available through the Welsh Government's Marine Planning Portal.

Marine Energy Infrastructure Study (MEIS)

To follow on from MRESF, the Welsh Government commissioned the Marine Renewable Infrastructure Study. This involved the preparation of a number of options for marine energy development, in particular the associated marine infrastructure which is required to support energy developers. The stage 2 study considered the MRESF data in detail along with grid connection and landfall arrangements, environmental sensitivities, consenting requirements, local ports and supply chain before recommending projects within specified deployment zones to be taken forward to more detailed feasibility studies and eventual construction.

Development Highlights

The significant marine energy resource in Wales, combined with excellent support services, grid networks, research and collaboration has generated wide development interests across the country.

Marine Power Systems

Marine Power Systems (MPS) Ltd. was founded to develop the WaveSub Wave Energy Converter – a second generation device that directly addresses the fundamental challenges of extracting wave energy. MPS has completed two phases of the development of the technology. Phase 1 delivered a proof of principle prototype device that has undergone successful sea trials and energy generation tests at the world renowned National Renewable Energy Centre (NaREC). Phase 2 was a detailed desk engineering project to fully understand the cost of energy that the WaveSub was likely to deliver. Phase 3 will see MPS design, build and test a ¼ scale prototype at sea in Pembrokeshire.

Minesto

Minesto are developing a unique 'tidal kite' technology called Deep Green, which is the only known, proved technology that can operate cost-efficiently in low velocity tidal and ocean currents. Off the coast of Anglesey the company is on track to deliver on their Holyhead Deep project – the first low velocity tidal energy project in the world. The Crown Estate has awarded Minesto an 'Agreement for Lease' for a commercial demonstration site and Minesto are planning to launch a first 0.5 MW demonstrator of the Deep Green concept in 2017. The site will eventually be scaled up to a 10MW array which will supply electricity to approximately 8,000 households.

Ramsey Sound

In December 2015, Tidal Energy Ltd installed a single 400kW DeltaStream unit off the coast of Pembrokeshire at Ramsey Sound for a twelve month demonstration period. The project delivered a fully commissioned grid connected device that proved the technical and operational performance of the Deltastream technology. World leading and ground breaking research was also carried out on the interactions of seals and harbour porpoise with a tidal turbine.

St. David's Head

Marine Eco2 Ltd, a leading renewable energy development company have a 10MW seabed lease off the St David's Head peninsula in Pembrokeshire. There is a 10MW agreement for grid with Western Power distribution and 2 years of environmental monitoring relevant to the site.

Tidal Lagoon Swansea Bay

At 320MW installed capacity, with first power expected in 2018, Swansea Bay Tidal Lagoon will be the largest marine energy development in the world. It is estimated that it will power 155,000 homes for 120 years – that's about 90% of Swansea Bay. 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. Furthermore, because the tidal water levels are entirely predictable, it is possible to compute the expectedenergy output for years to come.

Wave-tricity

Cornwall-based Wave-tricity have received funding to develop and test their 'Ocean Wave Rower' device. The £5.8m scheme will generate energy from sea waves off the Pembrokeshire coast and in September 2016 secured £4m in EU funding through the Welsh Government. The two-year project aims to pave the way for full-scale deployment of the technology and the development of a long-term sustainable business in West Wales following the successful testing.

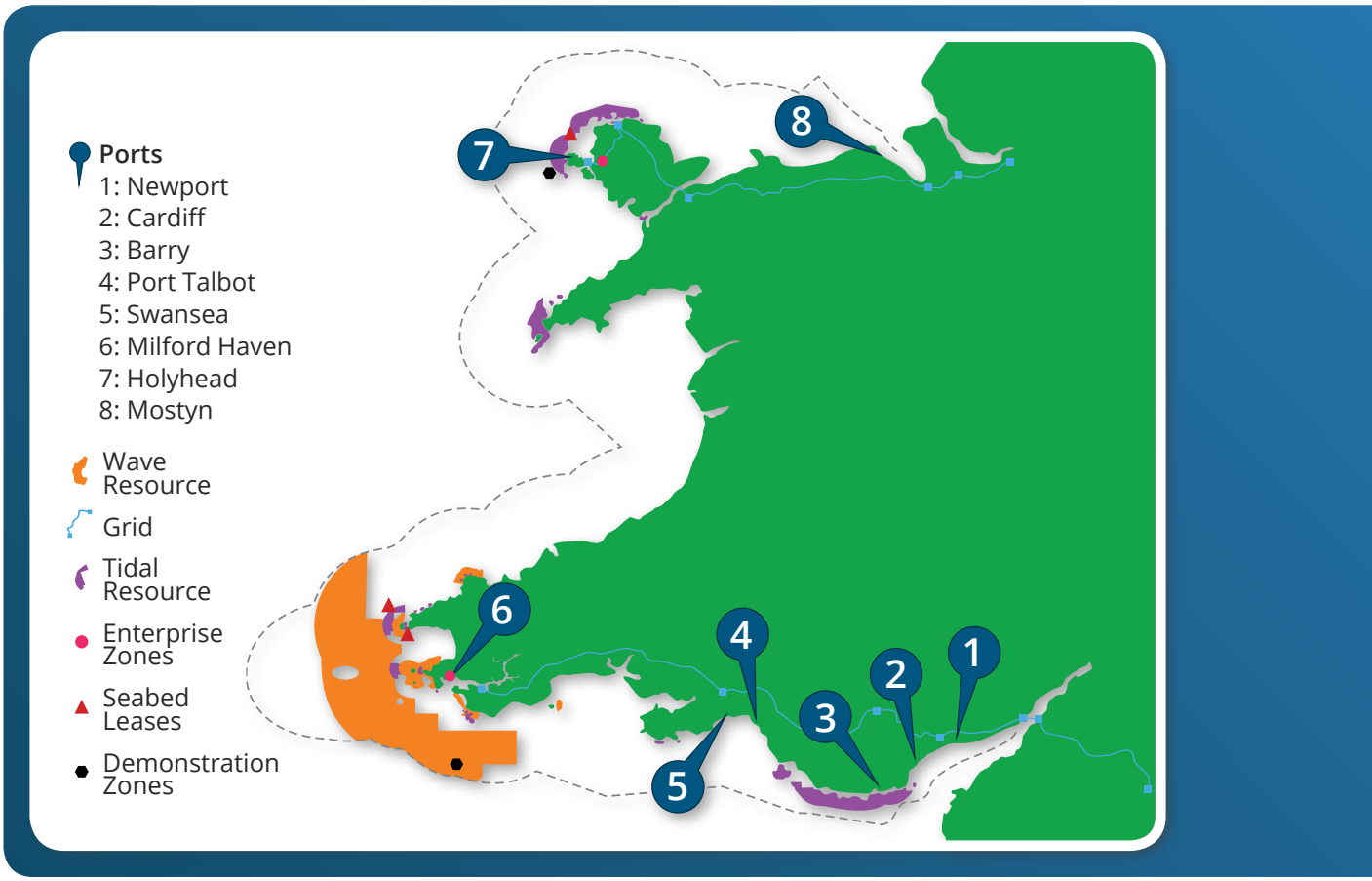
Upcoming Development Plans

Alongside current activity there are a number of plans making progress in Wales to support development across the TRL scale from 1-9. The Marine Energy Test Areas (META) project is creating pre-consented test areas within the relative shelter of the Milford Haven Waterway, in close proximity to an energy sector supply chain that supports 30% of the UK gas and petrochemical activity. This will allow developers to test components, deployment techniques and O&M within tidal stream, range, deep water and wave energy resource.

Plans for a UK Catapult Marine Energy Engineering Centre of Excellence (MEECE) are being progressed. Using the deep water areas within META, MEECE will carry out accelerated life testing of components and sub-assemblies. MEECE will also provide a focus for a coordinated, joint-industry approach, disseminating lessons learned for future projects and improving industry effectiveness.

MARINE ENERGY WALES

For more information
www.marineenergywales.co.uk



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Port of Milford Haven

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