

# Pembroke Dock Marine



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## Creating a marine energy powerhouse



## Port of Milford Haven

The UK has a proud maritime industrial heritage and the largest wave and tidal resource in Europe. On a worldwide scale, there are more marine energy projects being developed in the UK than any other country.

This embryonic industry has already created approximately 1,700 high skilled jobs and employment in the sector has the potential to grow to over 20,000 in the next decade.

Clustering will be key for the sector to become competitive and ensure the technology is a viable low carbon alternative to fossil fuels.

Marine energy is still comparatively expensive when compared to more established technologies. The Carbon Trust estimates the costs need to reduce by 50-75% by 2025 to be competitive.

To achieve this, significant levels of innovation and economies of scale are needed. Britain's innovation in engineering will drive the improvements needed and underpin future growth.

By enabling successful R&D projects in the UK, we will be in a strong position to export to the rest of the world. This market is estimated to be 188GW of wave power and 52GW of tidal power by 2050.

The UK's largest Energy Port offers a prime location to strategically locate this sector to the global audience.

Pembroke Dock Marine (PDM) will focus the commercialisation of wave and tidal stream technologies through the provision of infrastructure, facilities, knowledge and skills across the life-cycle of technical readiness levels.

PDM will provide the Launchpad from which the sector can:

- unlock marine energy's potential
- drive down the cost of energy
- create an export industry
- strengthen the UK energy portfolio
- create skilled employment opportunities



## What is Pembroke Dock Marine?

Pembroke Dock Marine will develop a world class centre for wave and tidal stream energy development, fabrication, testing and deployment. It will act as both catalyst and home for what is a potentially powerful global market by offering unrivalled location, knowledge, supply chain and connectivity. It will help to nurture developing technology and minimise risk for investors in a fast growing sector where there is so much to play for.

This project endeavours to unlock marine energy potential by **driving down the cost of energy, creating export potential** and **delivering long term UK energy security**.

This is not a project based on hopes. The core project partners have invested heavily at risk to date and an emergent industry has already taken hold on the site forming the nucleus from which the project will expand to realise its full potential.



Will invest in infrastructure, superstructure and facilities that the sector can use to **CONCENTRATE** their commercialisation.



Will invest to consent areas within the Milford Waterway to **Validate** equipment and methods in increasing levels of environmental exposure.



Will invest to **Collaborate** with industry, offering hands on R&D, reducing risk and supporting IP creation.



Will invest to consent, build and operate an offshore wave energy site to enable the sector to **GENERATE**.

## Who is Pembroke Dock Marine?

The Pembroke Dock Marine project is a collaboration between four key project partners.

The partners have come together to offer a seamless package that whilst unique, complements the existing UK network suite of test and demonstration centres.

Responsible to the SBCD oversight committee the partners will form the core Project Board, responsible for the development of the five case business plan that will formally define the ask.

Pembroke Dock Marine brings together four key elements and links with the Skills and Knowledge proposal to **Educate**, delivering a seamless UK offering to the marine energy sector and developer journey.

With testing and learning the over-arching themes, the initiative's driving force is to de-risk development, reduce the price of marine derived energy and make it a relevant energy option in a smart energy system.

Whilst the proposal is specifically targeting the wave and tidal stream sectors, the outputs will have thematic relevance across the blue growth economy.

## Why here and why now?

Technologies have lifecycles, and innovation support must reflect that. Offshore wind is a mature technology, with significant cashflow, which the industry can use to fund innovation. Here the innovation support process just needs to take the Industry's problems and needs to innovative SMEs and universities, stimulating solutions. A clear market (size and value) for solutions makes it easy to engage the supply chain.

The wave & tidal industry is still embryonic. It relies heavily on innovation to reduce the cost of energy but lacks that clear market pull to drive innovation. Support is needed to help technology developers and the supply chain bear the cost and risk of innovating for *future* markets.

Device developers know that there are a wide range of problems and issues they all share. They need a Champion to "own" these issues, work collaboratively to find innovative solutions, develop these innovations to commercialisation, and then demonstrate and validate them. That Champion *must* understand the needs of the supply chain in this difficult position, and that is the skillset that ORE Catapult through MEECE will bring.

Pembroke Dock Marine is in the **right place** at the **right time**, providing the **right kind of support** to develop the wave & tidal Energy industry in Wales.

## Risks & opportunities

Wave & tidal does not yet generate large cashflow, so device developers rely on equity & capital grant funding. In Wales, €100M of EU funding is targeted at Marine Energy, and the recipients will focus these resources on their proprietary technologies, almost always their particular device. However, a large part of their cost of energy comes from factors beyond the device itself. The industry and supply chain cannot afford to fund innovation in these fields, but without that innovation, there is a significant risk the industry will stagnate and the emerging cluster around Pembroke Dock will ultimately stall.

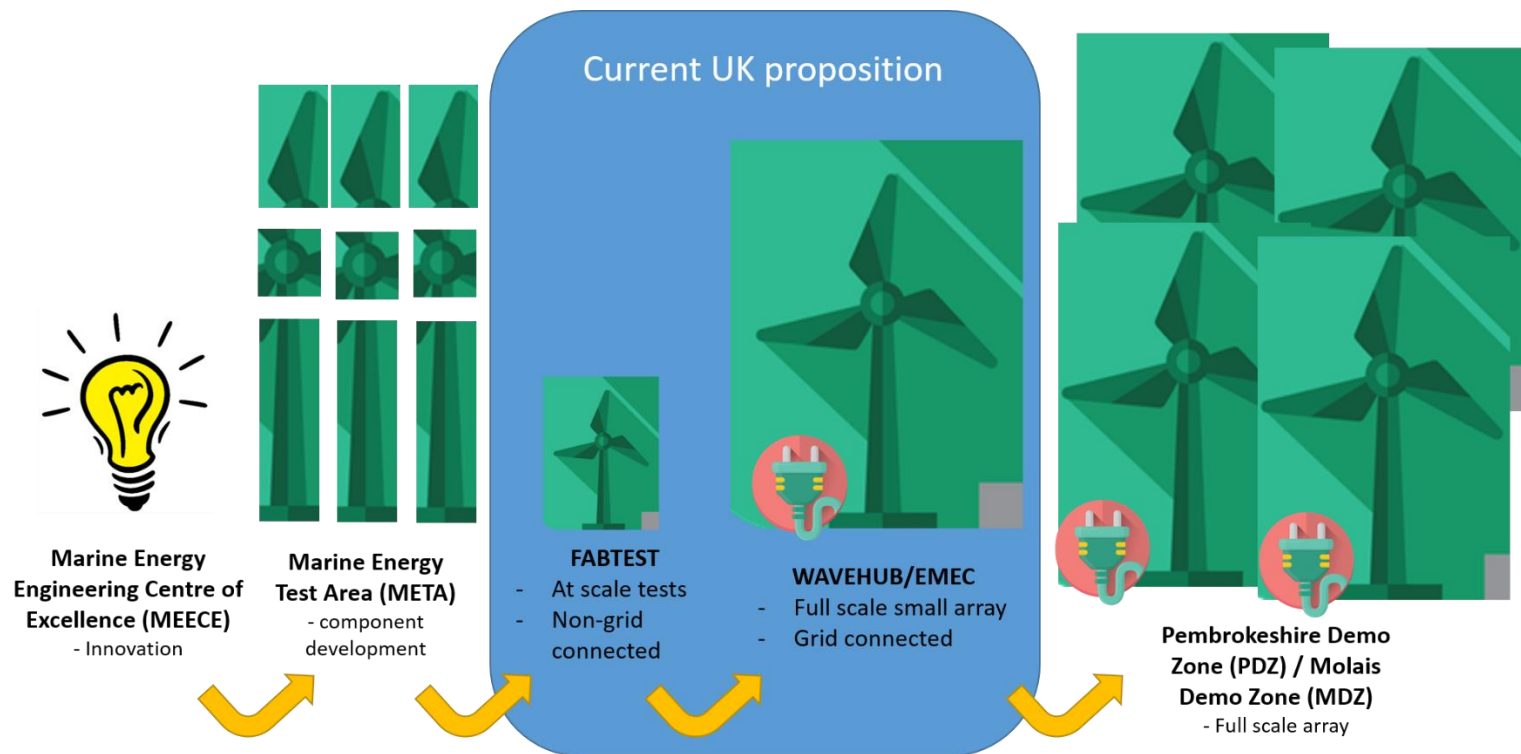
This risk, however, comes with opportunities. Sources of Innovation will be UK-wide, but Pembroke Dock Marine will be ideally placed to support, demonstrate and validate those innovations. The innovators will establish themselves as pioneers in their fields, opening up export markets. Building early relationships with these innovators and the industry will allow Pembroke Dock Marine to capture and embed expertise and capabilities in Wales.

## How does the project deliver?

Marine energy development is complex with key stages ranging from concept development through to operations and maintenance (and eventual decommissioning). An ideal developer journey is shown below in the context of the current UK offering. The 'test' phases are typically the most complex and expensive with significant risks attached, and will be a barrier to success unless lessons are shared for the benefit of all parties.

Pembroke Dock Marine provides the opportunity to wrap additional support around the existing test centres (EMEC, FaBTest, Wave Hub) that make up the current UK 'development' proposition. As the diagram below shows, three additional phases (Marine Energy Engineering Centre of Excellence – MEECE, Marine Energy Test Area (META), and Array Demonstration Zones for Wave and Tidal) would fully round out our proposition. Pembroke Dock Marine provides UK PLC and Wales with the means to offer a comprehensive early stage test and development platform to industry which maximises process efficiency, with a launchpad that will accompany the developer throughout device refinement.

### Developer Journey



## Core project structure

Project Board Member	<b>Pembroke Dock Marine</b> Located on the Milford Haven Waterway with proximity to resource, infrastructure and skills.				<b>Skills &amp; Knowledge</b>  Regional Learning Partnership / Swansea University/ Pembroke College
	ORE Catapult	Port of Milford Haven	Marine Energy Pembrokeshire	Wave Hub Limited	
Responsible For	Marine Energy Engineering Centre of Excellence (MEECE)	Pembroke Port	Marine Energy Test Area (META)	Pembrokeshire Demonstration Zone (PDZ)	Training & Education
Core deliverables	<p>Creation of a knowledge centre with on-site practical test and learn opportunities.</p> <p>MEECE will be a resource for developers helping them identify solutions that maximise efficiency and reduce costs whether still at design stage or during the multiple test phases.</p>	<p>Redevelopment of existing space to incorporate:</p> <ul style="list-style-type: none"> <li>Increased deep water access</li> <li>Internal and external heavy fabrication areas</li> <li>Construction of MEECE and Education /Skills Facility</li> <li>Construction of a heavy lift facility</li> </ul>	<p>Creation of consented areas of waterway, close to operational base complete with licences and enabling infrastructure.</p> <p>META will allow device developers to quickly and cheaply perform tests on components, sub-assemblies and complete devices, and practice installation and O&amp;M methodologies.</p>	<p>Development of the 90km<sup>2</sup> leased site for commercial deployment of 100 megawatt capacity of full scale wave energy arrays.</p> <p>Provision of connection to UK energy system and onshore works.</p>	<p>Working as a core partner to ensure a precision workforce is established and benefits from continual development.</p>

# **Benefits to UK & Wales PLC**

## **Policy Alignment and Low Carbon targets**

Wave and tidal stream energy has the potential to meet up to 20% of the UK's current electricity demand, representing a 30-50 gigawatt (GW) installed capacity. It could play a key role in helping Welsh Government reach their 22.5GW 2020/5 low carbon targets (potentially between 1.5GW and 6.4GW of installed capacity).

## **UK Energy Security**

There is a growing need for national energy security. As an island nation we have access to abundant natural marine resources and, with one of the highest tidal ranges on the planet, tidal technology has the potential to make a significant contribution to our energy mix.

## **Economic contribution**

Research<sup>1</sup> indicates an installed capacity of 60MW, 300MW and 1GW would return £72m, 303M and 840m of GVA. To put this into context of the work being undertaken currently, delivering on the two Crown Estate leased wave and tidal demonstration zones, would contribute 15% of the City Deal Target of £1.3bn of GVA, rising to 65% if the City Deal Intervention were to result in 1GW of installed capacity in the water.

## **Export market**

The International Energy Association estimates that total global installed capacity could be as high as 210 GW by 2050. By creating an intelligence and delivery hub in the UK, we are at the forefront of this emergent sector.

## **Employment**

60MW, 300MW and 1GW of installed capacity is expected to create, 2,030, 8,510 and 23,760 person years of employment respectively across the manufacturing & energy, construction & maintenance, distribution, transport & communications and professional & public services sector.

## **A legacy**

Improved facilities at Pembroke Dock will make it a hub for installation and operations & maintenance activities for marine energy projects. MEECE could have a permanent presence in Wales, extending its innovation support to other sectors. The test facilities of META and PDZ will be assets for Wales over the next 50 years.

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<sup>1</sup> <http://www.marineenergypembrokeshire.co.uk/wp-content/uploads/2010/03/economic-impact-of-developing-marine-energy-en.pdf>

## Financial Summary

Total project delivery costs will be **£76.3m** with costs split between City Deal input (£28m), Private Sector (£24.2m), and Other Public (£24.1m).

Individual elements are shown below with the cost split in the same order. To provide the facilities and infrastructure necessary, the project delivery costs have been front loaded in the first 5 years.

The economic benefit will be realised over a longer period as the sector matures towards commercialisation and successfully builds, connects and commissions devices in the water. The financial appraisal given in the SBCD template and summary targets the 60MW scenario. Given that Wales has two demonstration zones in development, both for 100MW each, this could be considered conservative. When fully populated, Morlais, the 100MW North Wales Tidal Stream Demonstration Zone will attract £500m of turbine developer interest and the focus is on Pembroke Dock as a key delivery partner.<sup>2</sup>

## Written Confirmation of Support



<sup>2</sup> <http://www.marineenergypembrokeshire.co.uk/eight-tidal-players-sign-berth-agreements-for-the-west-anglesey-tidal-zone/>