Economic Impact of Low Carbon Energy on Welsh Ports

Economic Research Unit
Welsh Government

Final Report

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Executive Summary

DTZ was appointed by the Welsh Assembly Government's (now Welsh Government) Economic Research Unit in August 2010 to assess the economic impact of low carbon energy developments on Welsh ports. The objectives of this study are to:

- Produce a baseline assessment of the economic impact of ports in Wales
- Identify and review likely low carbon energy developments which may impact on Welsh ports (including projects outside Wales), in particular focusing on the offshore wind, onshore wind, wave, tidal, biomass, and nuclear sectors
- Assess the potential economic implications and opportunities for Welsh Ports over the period 2010 to 2030
- Identify and review barriers which may inhibit the realisation of economic benefits

There is a strong policy commitment to low carbon energy generation in Wales, and the low carbon energy sector has been identified as a core sector of increasing importance to Wales. A House of Commons Welsh Affairs Committee Inquiry into Ports in Wales (2009) identified Welsh ports as an 'underexploited resource' which could play a greater role in economic development, particularly through their potential role in relation to low carbon energy.

Baseline Review of Ports in Wales

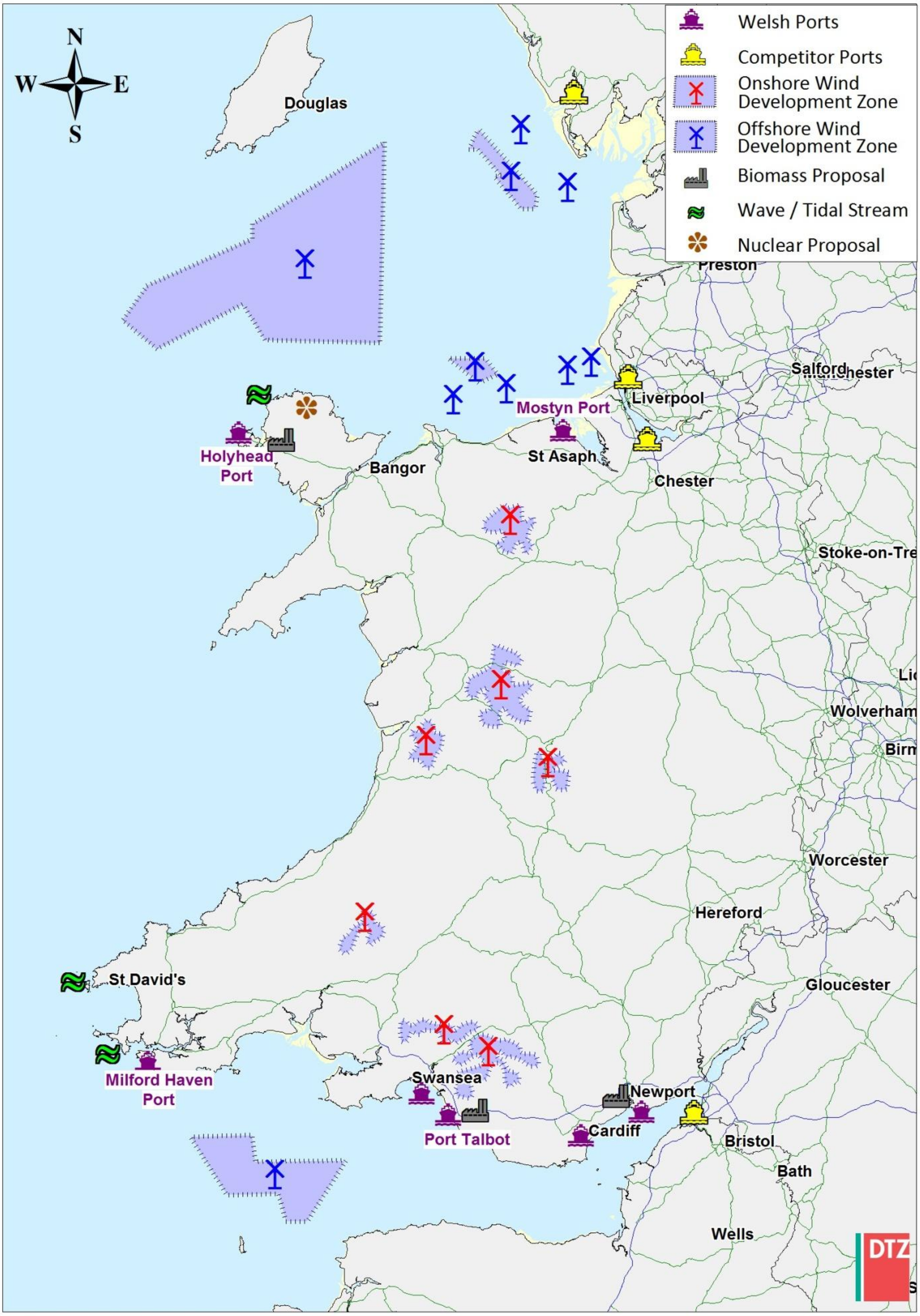
There are a total of **14 ports in Wales** which currently handle commercial traffic. Collectively they handled a total of **54 million tonnes** of cargo in 2009, which amounted to 11% of all port traffic in Great Britain. The throughput of Welsh ports has fluctuated between 50-60 million tonnes per annum for the last decade. Milford Haven accounts for nearly three-quarters (74%) of all traffic, followed by Port Talbot (10%), Holyhead (5%), Newport (5%), and Cardiff (4%). Port traffic forecasts show that **overall traffic volumes in 2030 are expected to be in line with 2009, with zero growth overall in this period.**

Despite difficulties in assessing the economic contribution of ports, a range of estimates have been made for the total employment and economic benefit they generate. For example Oxford Economics (2009) suggest that UK ports directly support 132,000 jobs. In the absence of any corresponding assessment for ports in Wales, DTZ has estimated that **Welsh ports currently support at total of 18,400 jobs** (based on an existing study of ABP ports in South Wales, plus supplementary data in respect of remaining Welsh ports), which equates to around 14% of the total employment supported by UK ports.

The engagement of Welsh ports in the low carbon energy sector to date has been focused on a small number of ports (Mostyn, Port Talbot & Swansea). There is limited secondary information available to estimate the current level of economic impact which this activity generates, however DTZ has consulted with ports and low carbon energy project developers, and modelled economic impacts. The primary impact to date relates to the construction and operation of offshore wind projects out of the Port of Mostyn, which currently supports around 350 FTE jobs.

The following summary map identifies the key commercial ports which we assess are likely to have a role in the low carbon energy sector, plus major renewable energy projects (including future developments) reviewed as part of this study.

DTZ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W
E
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Welsh Ports
Competitor Ports
Onshore Wind Development Zone
Offshore Wind Development Zone
Biomass Proposal
Wave / Tidal Stream
Nuclear Proposal
Douglas
Preston
Salford
Liverpool
Mostyn Port
Holyhead Port
St Asaph
Bangor
Chester
Worcester
Hereford
St David's
Gloucester
Milford Haven Port
Swansea
Newport
Port Talbot
Cardiff
Bristol
Bath
Wells
DTZ

Port Infrastructure Assessment

Low carbon energy projects often have significant port infrastructure requirements, hence port infrastructure will be fundamental to Welsh ports unlocking economic opportunities in this sector. The key criteria used to assess the suitability of ports for servicing the low carbon energy sector includes: marine access, navigation, port facilities, maximum ship size, road/rail transport links and land holdings.

DTZ has assessed all commercial ports in Wales, based on their current and planned infrastructure relative to the port infrastructure requirements for low carbon sectors. The following ports appear to have the greatest competitive advantage in exploiting the opportunities from low carbon energy sectors, although this does not preclude niche roles for other ports in Wales, for example in supporting the operations and maintenance (O&M) activities for offshore wind projects.

- **North Wales** - Holyhead and Mostyn
- **South Wales** - Milford Haven (including Pembroke Dock), Port Talbot, Newport, and Swansea

Our analysis highlights that there are several key competitor ports located in the geographical catchment of Wales relevant to the low carbon energy sector. All of these ports must be considered very serious competitors given their location, port specification, facilities and competitive intent to secure emerging opportunities from the low carbon energy sector:

- **Irish Sea & Morecombe Bay** - Belfast, Barrow-in-Furness, Liverpool, Birkenhead and Ellesmere Port
- **Severn Estuary** – Bristol and potentially North Devon ports

A clear spatial pattern is evident with different levels of competition in North and South Wales. For example, if one focuses on the offshore wind sector the following competitor analysis is informative:

- **North** – for the major offshore wind opportunities in the Irish Sea, there are only two ports on the North coast of Wales that are competitively placed to target this opportunity, with five serious competitors outside Wales.
- **South** – for the Atlantic Array there are four Welsh ports – all of which are better located than the main competitor port Bristol, and larger than other smaller competitors such as minor ports in North Devon.

Economic Impact of Low Carbon Energy

DTZ has reviewed the potential economic impact of low carbon energy projects on Welsh ports in the short term (2010-2015), medium term (2015-2020) and long term (2020-2030). DTZ constructed three scenarios (Optimistic, Moderate and Pessimistic) for the likely level of impact. It should be noted that the assessment considers only the impacts associated with Welsh ports, and not the wider low carbon sector in Wales.

As shown in the following figures, the number of jobs supported by low carbon energy in Welsh ports is forecast to increase from the current figure of around 350 jobs to between **1,000 – 3,000 jobs by 2020**. On this basis, low carbon energy could support up to **14% of port employment by 2020**. The average employment in ports over the period 2010-2020 supported by the low carbon sector is forecast to be between 1,000 and 2,500 jobs. In all scenarios, there will be a **rapid increase in the number of jobs by 2012** (to between 1,640 and 2,450 jobs) due to the expected construction of major biomass plants at Port Talbot and Anglesey, the sizeable Gwynt Y Mor offshore wind project, and the Skerries tidal stream project.

Figure 1: Total Employment Impact in Welsh Ports – All Low Carbon Energy Technologies

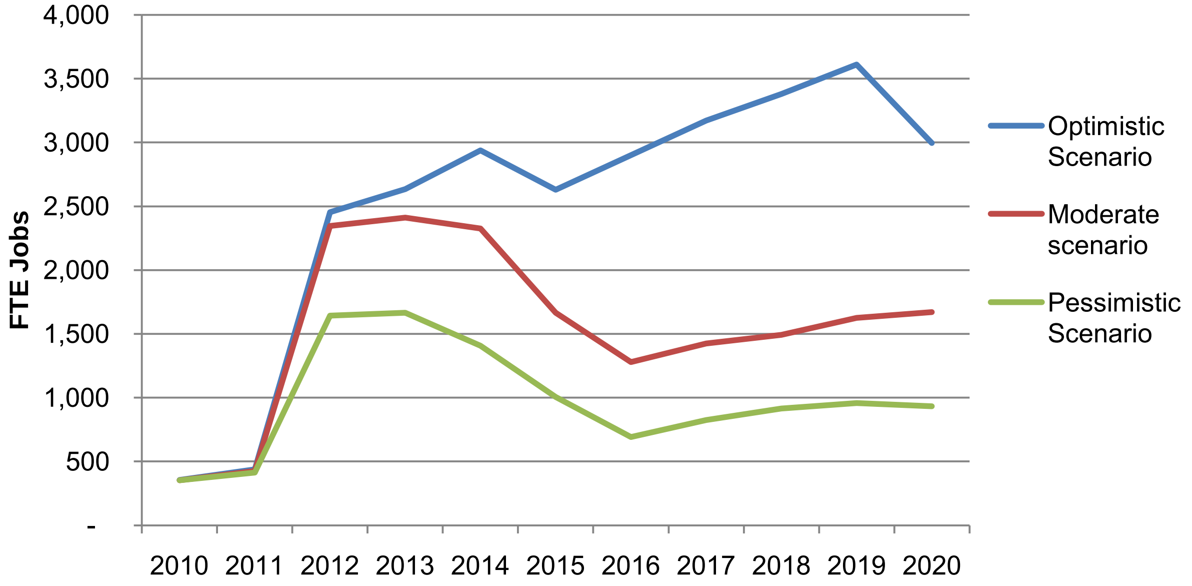
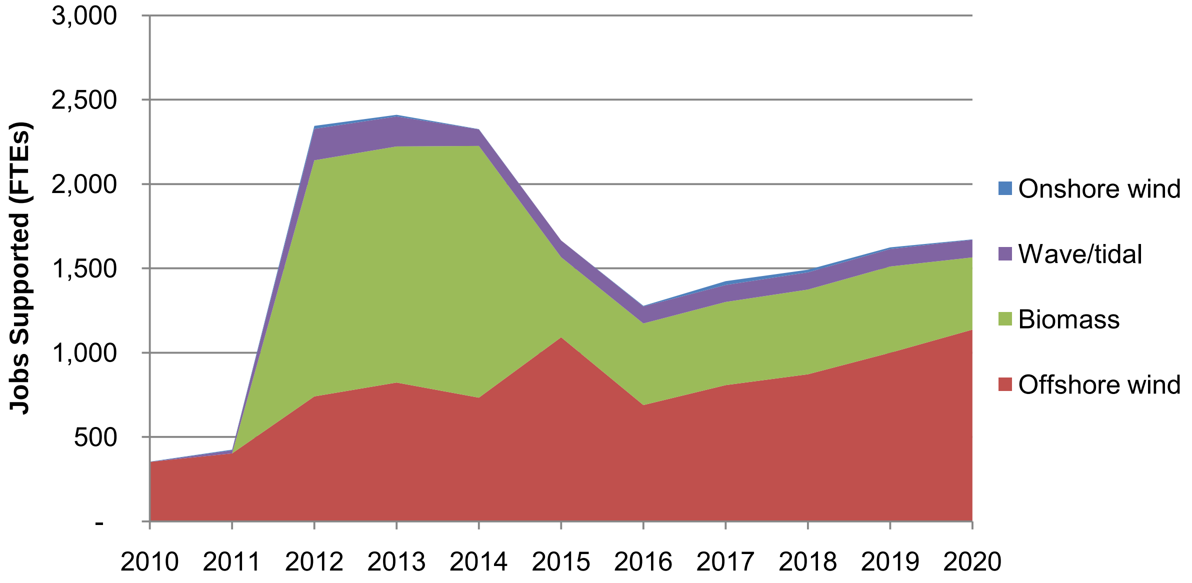


Figure 2: Total Employment Impact in Welsh Ports by technology (Moderate Scenario)



In all scenarios, the majority of the impact to 2020 will be related to the **Offshore Wind and Biomass sectors, which together account for 90%+ of the total employment** impact across all low carbon sectors. The Onshore wind sector will support a very small number of jobs in ports (notwithstanding that there will be significant impacts at onshore wind development sites). In terms of the Wave/Tidal sector, the impact will be modest in the short to medium term, but is likely to increase in importance significantly in the longer term. Regional analysis suggests that around three quarters of the total impact related to offshore wind will be in North Wales, whilst two-thirds of the total impact related to Biomass will be in South Wales.

In the medium term (2015-2020), the scenarios diverge considerably. In the Optimistic Scenario, it is estimated that Low Carbon sectors could support an average of over 3,100 FTEs in the period 2015-2020, as it is assumed that Welsh ports continue to be utilised for major offshore wind projects, and there is a continuing stream of new biomass projects. By contrast, in the Moderate Scenario, low carbon energy projects would support 1,500 FTEs on average over the period 2015-2020, whilst in the pessimistic scenario this would be further reduced to 900 FTEs.

The scenario analysis demonstrates that the economic outcomes could vary significantly depending on the following factors:

- The extent to which **limitations and barriers** (such as planning/environmental issues, financing, logistics, supply chain, capacity etc) cause development projects to be delayed, scaled back or even cancelled.
- The **choice of port** for construction and operations and maintenance activities (Offshore Wind and Wave/Tidal) and the location of biomass projects.

In the longer term (2020-2030), there is considerable uncertainty around the level of employment which could be supported by low carbon energy projects, but this assessment has highlighted the following key trends:

- **Offshore Wind** will continue to support jobs associated with operations and maintenance activities on current and future projects (540-1,200 FTEs depending on the scenario chosen). There may also be some further construction activity in the long term associated with known projects (if they are delayed beyond 2020), and potentially additional projects beyond the current Crown Estate Round 3 licensing process.
- **Wave / Tidal** - It is expected that the roll-out of commercial scale wave and tidal stream devices would take place from 2020 onwards – although there is uncertainty around the likely level of deployment. Welsh ports will be well-placed to capture economic activity related to deployment, operations and maintenance, and potentially also the manufacture of marine energy devices. If Wales can capture a significant share of manufacturing activity related to marine energy, then this could potentially support several thousand jobs at port sites in Wales; however there is significant uncertainty around this.
- **Biomass** – in the long term, there will be a requirement to operate biomass plants and import biomass materials through Welsh ports. Depending on the level of deployment to 2020, this could support between 230 and 440 FTEs. It is also possible that there will be further deployment of biomass capacity at port sites in the long term, which would support additional construction and operational jobs.
- **Onshore Wind** – It is expected that much of the onshore wind capacity in Wales would be deployed by 2020. Hence the impact of onshore wind on ports post 2020 would be very small.

In addition to the quantitative impacts identified above, the assessment also highlighted the following qualitative and wider economic impacts:

Impact	Description
Supply Chain	Low carbon energy projects are anticipated to generate significant opportunities for Welsh suppliers (including companies at port sites and elsewhere). The range of supply chain opportunities is extremely diverse. This assessment has highlighted that Welsh firms are well-placed to engage in this market – with 100 firms across Wales expressing an interest in offshore wind supply chain opportunities.
Skills	There is expected to be significant growth in the number of low carbon jobs in Wales (at port sites and elsewhere), which will create demand for workers with a range of particular skills. Given that this is an emerging industry, these skills may not be in sufficient supply, potentially creating skills gaps and upward wage pressure within low carbon sectors; although it is possible that increased demand could be met through the transfer of skills from other sectors and/or retraining. Welsh staff already engaged in low carbon industries are becoming more skilled over time, moving up the value chain of activities, and exporting their services to the rest of the UK.
Other sectors	Ports tend to be space constrained, and have a defined maximum capacity at any point in time; and low carbon energy uses such as offshore wind construction and biomass plants can occupy a significant amount of space. However, it is not always the case that low carbon energy activities come at the expense of other activities. The levels of traffic in Welsh ports (particularly dry bulk traffic) have been static or in decline in recent years, therefore low carbon activity could provide a much needed new source of business rather than displacing other activity.
Research and Development	R&D impacts could arise as a result of the location of low carbon energy developments at port sites, and knowledge exchange between ports, project developers and Universities. This is most likely to occur in sectors where the technology is less well developed, such as marine energy. There are already a number of R&D centres in low carbon sectors in Wales, the largest of which is the **Low Carbon Research Institute** – led by the Welsh School of Architecture at Cardiff University.
Inward Investment	The development of a low carbon sector in Wales could potentially boost the profile of Wales and encourage inward investment from foreign firms to service this growing market.
Social	Possible impacts include: • Impacts on tourism and leisure • Noise (particularly during construction) • Congestion (both onshore road traffic, and offshore shipping traffic)
Environmental	Possible impacts include: • Marine ecology, ornithology, and seabed habitats • Onshore ecology and environment • Landscape/seascape and visual environment • Physical environment – effects on sediment transport, water quality, waves and tides, scour effects, hydrology, and flood risk

Barriers and Mitigation Options

The following table sets out the factors which could act as potential barriers to the realisation of economic benefits from low carbon energy – identified through consultation with ports, renewable energy developers and other stakeholders as part of this study. Based on these identified barriers, DTZ has suggested a selection of possible mitigation options available to the public sector in Wales, and a possible prioritisation in terms of potential impact. However, further work will be required to assess the suitability of any such policies.

Potential Barriers	Potential Public Sector Response / Mitigation Options	Priority / Potential Impact
Barriers related to ports		
Market Awareness and Engagement of Welsh Ports	High engagement amongst larger ports. Need to engage smaller ports more fully to ensure they understand opportunities	Medium
Port Infrastructure and Capacity Constraints	Targeted support to ports to invest in the necessary infrastructure to compete in low carbon markets.	High
Uncertainty of which ports will be used	Requires ongoing engagement with developers of major projects.	Medium
Planning Restrictions and Environmental Issues	Complete SEA and leasing round for Marine renewables. Work with project developers to ensure that environmental impacts are mitigated as far as possible.	High
Barriers related to low carbon sectors more generally		
Availability of Skills / risk of skills gaps	Further research required to identify specific skills demand, skills gaps, and education provision inside/outside Wales.	Medium
Financing and Viability of Low Carbon Energy Projects	Work with developers to better understand the risks to major development projects.	Medium
	Targeted investment in R&D on technologies which can improve the viability of low carbon projects.	High
Power Network Infrastructure and Capacity Constraints	National Grid already working to ensure sufficient network infrastructure and capacity. Project developers must engage with National Grid at the earliest opportunity to ensure that capacity will be available.	High
Land-side infrastructure requirements	Targeted investment to increase the usage of Welsh ports by onshore wind sector (overall impact on Welsh jobs would however be minimal).	Low
Supply Chain Bottlenecks (particularly offshore wind)	Support to major project developers and supply chain firms Mapping of supply chain capabilities? (as has been done in SW) Use of the Sell2Wales system as a meeting-point for project developers and suppliers?	Medium

Overall, our analysis demonstrates that there is a need for a holistic approach to the low carbon energy sector in Wales to ensure that economic benefits are maximised. Most importantly, this needs suitable dialogue between project developers, ports, supply chain companies, and R&D providers on an ongoing basis. Public sector support (Welsh Government, Local Authorities and other relevant parties) integrated across the following domains, is also of importance:

- Ports
- Planning (e.g. Including SEA)
- Land-based infrastructure (transport, grid connectivity, sites)
- Skills
- Supply chain
- Financial support
- Inward Investment
- R&D and demonstration projects

1. Introduction

Background

DTZ was appointed by the Welsh Assembly Government's (now Welsh Government) Economic Research Unit in August 2010 to assess the economic impact of low carbon energy developments on Welsh ports. DTZ completed this study together with sub-consultants MDS Transmodal and BVG Associates. This is the final report from the project.

Policy Context

As context to this study, it is relevant to consider the policy framework with regard to economic development, ports, and low carbon energy in Wales, as follows.

The Welsh Assembly Government (WAG) sets out in **'*One Wales*'** (2007) a strong commitment to tackling climate change and achieving sustainable energy production and consumption. Wales is looking to achieve annual 3% reductions in greenhouse gas emissions from 2011 onwards in areas of devolved administration. *One Wales* sets out the Welsh Assembly Government's plans to increase production of sustainable energy and supporting research and development into renewable technologies and their application on-shore and off-shore. One Wales also made a commitment to the production of an **Energy Strategy and Energy Route Map.**

The ***Renewable Energy Route Map for Wales*** (2008) sets out proposals for moving Wales towards self-sufficiency in renewable energy. It highlights the significant potential for Wales in Marine, Onshore and Offshore Wind, Biomass, Hydro, and Micro-generation; identifying a possible generation capacity of 15.8GW by 2025. The document also emphasises the need for public consultation and stakeholder participation to ensure that environmental concerns are appropriately considered in relation to future development. The document states that the Welsh Assembly Government will ensure that the future framework for marine planning enables consideration of the role of offshore renewable – to optimise the way in which the sea is used and to reduce conflicts between uses and users.

The Welsh Assembly Government's ***Energy Policy Statement*** (2010) reiterates the ambition for low carbon energy in Wales. It highlights that Wales has an abundance of renewable energy resources that will give Wales an advantage in moving to a low carbon economy. The report notes Wales' long coastline and deep water ports are also suited to the development of large low carbon power plants that are likely to form part of the UK's overall energy mix in the future. The Statement identifies a sustainable energy potential to 2020/25 of 22.5GW.

The need to respond to climate change by improving resource productivity and decarbonising energy supply is also noted in '***Economic Renewal: A New Direction'***, which sets out the Department for Economy and Transport's (DE&T) approach to economic development in the wake of the global recession. In addition to the environmental importance of renewable energy, "energy and the pursuit of clean and renewable energy generation and supply" has been identified by the DE&T Ministerial Advisory Group as being a core sector of significant and increasing importance to the Welsh economy. The Low Carbon Economy has been identified as a R&D priority area in which Welsh Universities have the best opportunity to maximise their research performance and economic impact.

Although **ports policy in Wales** is not devolved (other than in respect of small fishery harbours), the UK Government works closely with the Welsh Government on ports issues. The role of ports as part of the economic and transport infrastructure of Wales is reflected in the Welsh Assembly Government's Wales Transport Strategy and the related Wales Freight Strategy.

The DfT undertook a Ports Policy Review in 2007, which set the direction for Ports Policy for England and Wales. The focus of the review was on how best to support the growth of the ports sector, and the contribution to the UK economy; whilst ensuring the industry takes account of its impact – particularly on the environment. The DfT commissioned port traffic forecasts in 2006/07 (which were completed by MDS Transmodal – who produced updated forecasts for the purposes of this study). The DfT has also produced guidance on Port Master Plans, and a Project Appraisal Framework for Ports; to ensure that environmental issues are adequately considered in relation to development plans. The DfT commissioned a report from PwC on the efficiency of current port ownership structures – particularly focusing on the largest commercial trust ports. The study concluded that *'the trust model retains a legitimate role within a mixed ports sector but that, in the absence of shareholders, trust ports should do more to identify, and account for, the use of their overall returns.'* A National Policy Statement for Ports is expected to be put before parliament in autumn 2011.[1]

The House of Commons Welsh Affairs Committee completed an inquiry into Ports in Wales (2009), which stated that Welsh ports are 'underexploited resources that could play a much greater role in Wales' economic development'. The committee put forward a number of recommendations which included:

- The need for a coherent ports strategy given the differing approaches to port development by the Department of Transport (responsible for ports policy) and the Welsh Government (responsible for factors affecting port operations e.g. transport, economic development and land use planning)
- The potential to capitalise on the leisure and tourism cruise market
- Investigating the possibility of developing short-sea shipping or feedering services (transferring goods by sea from major hub ports rather than by road)
- Exploring the opportunities for ports arising from the growth in the renewable energy sector e.g. locations for energy generation installations and in terms of the supply and distribution of fuels and equipment.
- Improving cross-border connectivity e.g. inland road and rail links

At a UK level, it is worth noting that the government has allocated a £60 million fund to upgrade port facilities to attract offshore wind manufacturing activities to the UK. However, the Department of Energy and Climate Change has since clarified that this fund is for assisted areas in England only, and that upgrades to port facilities in Wales will need to be funded by the Welsh Government.

Study Objectives and Definitions

The study objectives have been defined as follows:

- Undertake a baseline assessment of the economic impact of ports in Wales to inform a 'business as usual' scenario(s), including consideration of the direct and indirect impact of port operations
- Identify and review likely low carbon energy developments which may impact on Welsh ports, including current proposals and likely developments in the medium-long term

[1] Source: DfT

- Assess the potential economic implications and opportunities for Welsh Ports. Given the level of uncertainty concerning low carbon energy developments, scenarios will be used to model variations in the roll-out of low carbon energy for Wales and the impact this has on Welsh Ports
- Identify and review barriers which may inhibit the realisation of economic benefits, such as competition, availability of skills, accessibility, infrastructure etc; and proposing steps which could be taken to overcome such barriers.

For the purpose of this study, DTZ and the WAG have agreed a definition of 'low carbon energy' to include all major renewable energy technologies (offshore wind, onshore wind, wave, tidal, biomass), nuclear, and CCS (carbon capture and storage). Micro-renewables and conventional power generation (e.g. coal, gas) have not been included within the assessment.

The geographical scope of the study has been limited to low carbon energy projects which are of relevance to Welsh ports. This includes low carbon energy projects at or adjacent to ports, or within such a distance, that one or more Welsh ports have a real opportunity of winning business related to the project. The catchment area considered varies depending on the technology and phase of development (further details of the projects considered are provided in Section 4).

DTZ and WAG have also agreed the following definitions in terms of timescales. Impacts have been considered for the period from 2010 to 2030, as follows:

- Short term – 2010-2015
- Medium term – 2015-2020
- Long term – 2020-2030

The study considers port-based economic impacts only – this includes the impact on Welsh port companies, tenants on port sites, and vessels operating out of Welsh ports. It does not quantify or consider in detail the impact on the wider low carbon energy supply chain, although supply chain impacts are briefly described in Section 5 of the report.

Approach

The study approach can be summarised into the following three stages of work:

Stage 1: Establishing the baseline: demand and supply analysis to identify likely low carbon energy developments, the port requirements of the low carbon energy industry, the capacity of Welsh ports to meet these requirements, and the resultant economic opportunities for Wales. This includes both desk research and initial consultations.

Stage 2: Estimating the impact: detailed consultations and modelling to establish the current economic impact of Welsh ports, and their potential economic impact under a range of future low carbon energy scenarios.

Stage 3: Maximising the benefits: identification of barriers and mitigation measures to maximise the impact of low carbon energy on Welsh ports.

A list of organisations contacted during the course of the study is shown in Appendix 5.

It should be noted that one of the issues in undertaking this study was the extent to which port companies and low carbon energy developers were willing and able to disclose information and data, due to **commercial confidentiality issues**. DTZ have been able to access some of the required information, and have made assumptions based on industry benchmarks and experience where information could not be made available.

It should also be borne in mind when reading the quantitative elements of this report, that the impacts reported relate to Gross impacts rather than Net impacts. Section 4.8 provides discussion of additionality factors and the likely impact on Net outcomes.

Report Structure

The remainder of this report is structured as follows:

- Section 2 provides a baseline summary of port activity in Wales to date
- Section 3 sets out a review of port infrastructure in Wales
- Section 4 provides a review of the economic impact of low carbon technologies on Welsh ports in the short, medium and long term
- Section 5 considers the wider impact of low carbon energy projects
- Section 6 identifies potential barriers to the realisation of economic benefits and possible mitigation options

The appendices to this document contain additional information relating to each of the above Sections.

2. Baseline Review of Ports in Wales

The purpose of this section is to provide a context in terms of the ports in Wales, port traffic trends, and the economic activity in Welsh ports. Section three provides a detailed assessment of port infrastructure.

2.1 Overview of Welsh Ports

There are a total of **14 ports in Wales** which currently handle commercial traffic. In Government statistics, ports are classified as 'major' and 'minor' ports according to their throughput. Welsh 'major' ports include the ports of **Cardiff, Fishguard, Holyhead, Milford Haven[2], Newport, Port Talbot and Swansea**. The 'minor' ports include Barry, Burry, Mostyn, Neath, Anglesey, Llandulas and Port Penrhyn. Other port facilities exist at Aberdovey, Caernarfon, Conwy, Menai Bridge, Porthmadog and Shotton Wharf, but have either ceased commercial operations or have not handled commercial traffic for some time and are now mainly used for marine leisure, fishing and recreational purposes. A **context map** of ports in Wales and competitor ports is shown in **Figure 2.1,** overleaf.

In 2009, Welsh ports handled a total of **54 million tonnes** of cargo, consisting of inward traffic of **34 million tonnes** and outward traffic of **19 million tonnes**. This overall volume accounts for **11% of all port traffic in Great Britain**. As shown by Figure 2.2, total Welsh ports' throughput reached a peak of 63 million tonnes in 1996, and since then the volume has fluctuated between 50-60 million tonnes, affected by:

- Fluctuations in liquid bulks attributable to Milford Haven (which make up a significant share of overall tonnages)
- Changes in the import and export requirements of the South Wales steel and coal industries
- The increase in unitised trade with Northern Ireland
- The relative success of Welsh ports in developing new markets.

There have been significant changes in the volumes of traffic handled by individual ports (see Figure 2.3a/2.3b). This is a result of ports having developed different specialities; often a reflection of their unique geography and industrial hinterlands, and the business strategies that have been pursued over time. The cornerstones of the Welsh ports industry lie in the legacy of the South Wales steelmaking industry, the Pembrokeshire oil and gas industry, the UK's trading links with Ireland and its strengthening trade with the rest of the EU. However, the situation is dynamic, and the emphasis on sustainability and sustainable transport strategies may offer new opportunities to the ports, particularly relating to renewable energy, waste handling and port-centric logistics. The cruise market in Great Britain has also seen a surge in growth in recent years, even despite the recession, and this is already providing some opportunities for Milford Haven and Holyhead.

Milford Haven's traffic dominates the statistics and accounted for nearly three quarters of total Welsh port throughput in 2009, as shown by **Figure 2.4.** This is because of the movement of crude oil and refined oil products in and out of the port, accounting for some **35 million tonnes per year**, while in the last two years traffic volumes have been boosted by imports of liquefied natural gas (LNG) following the development of two re-gasification terminals in Milford Haven's tidal harbour. The other main change in traffic flows has been the decline, withdrawal, and subsequent reintroduction of ferry services from Swansea.

[2] For the purposes of this study, where Milford Haven has been mentioned this refers to all facilities operated by Milford Haven Port Authority including Pembroke Dock.

Figure 2.1: Context map of Ports in Wales

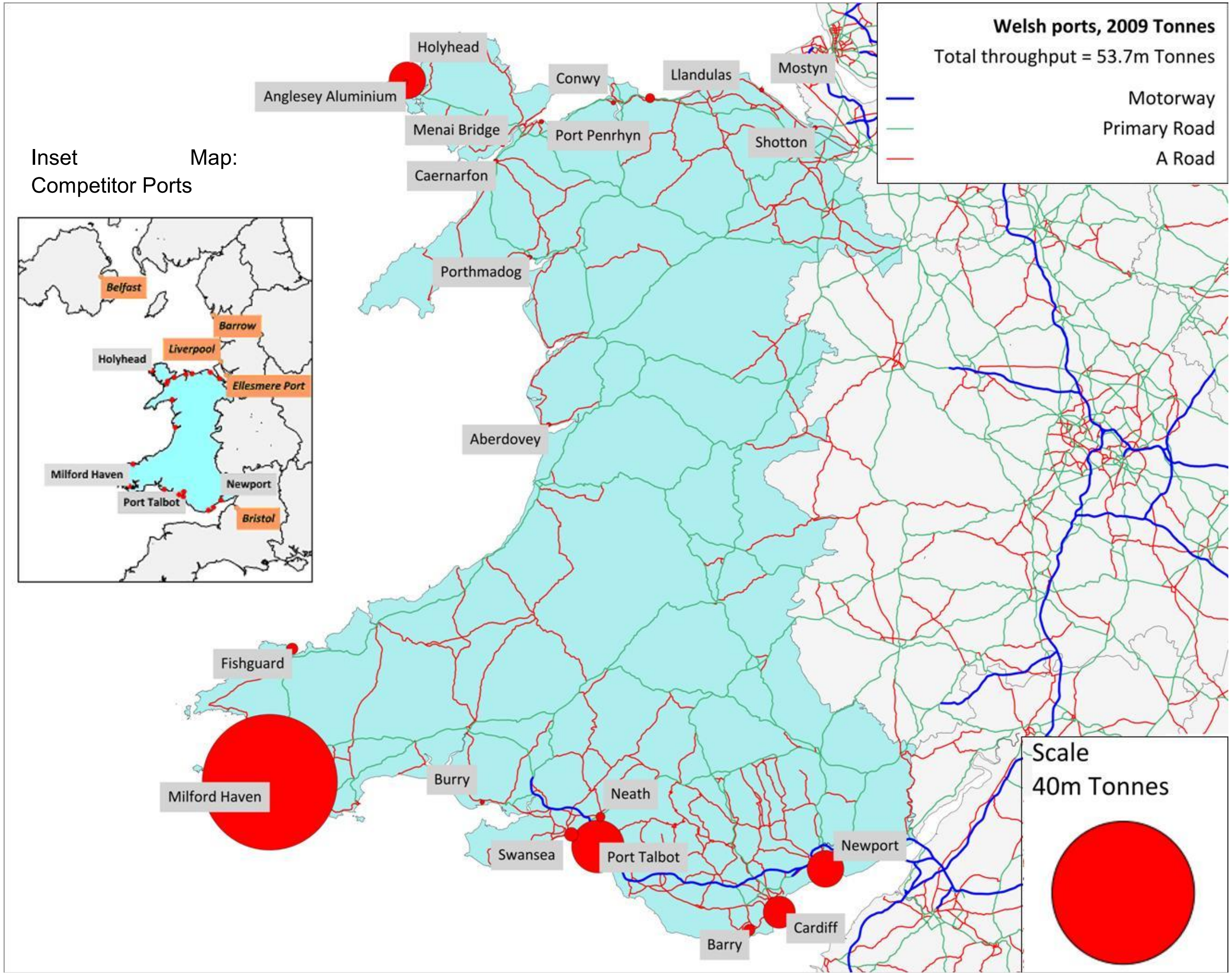
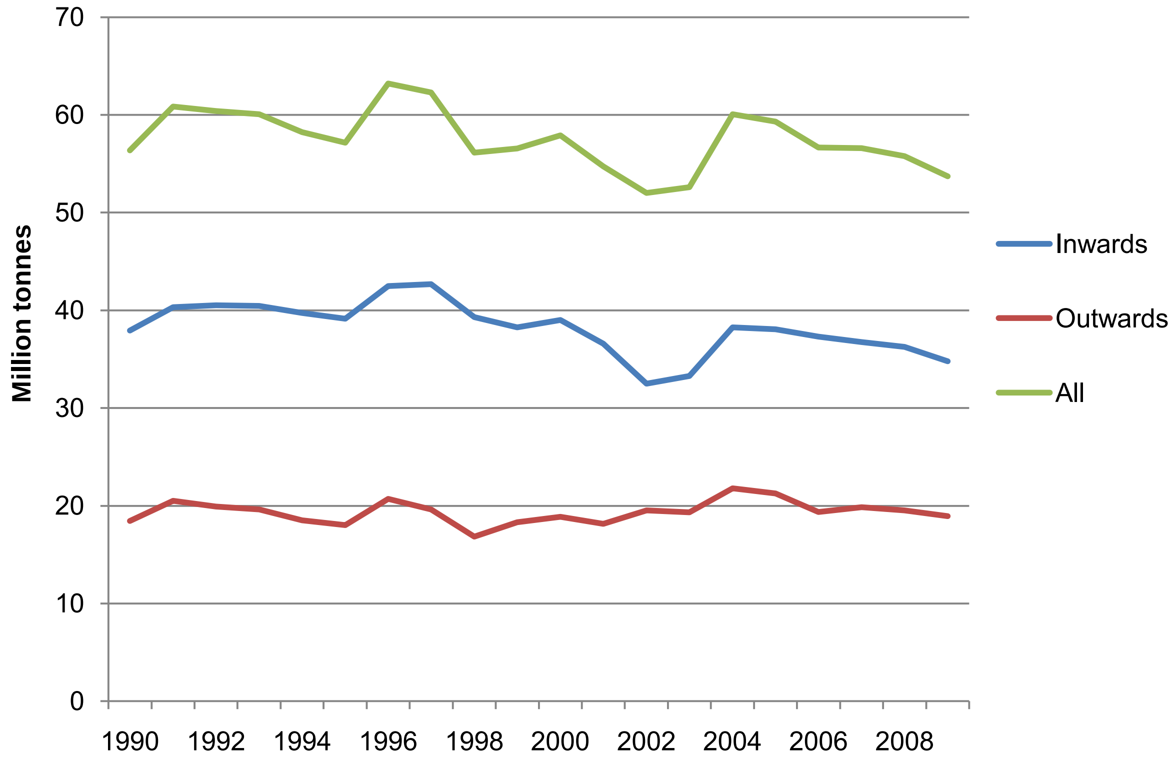
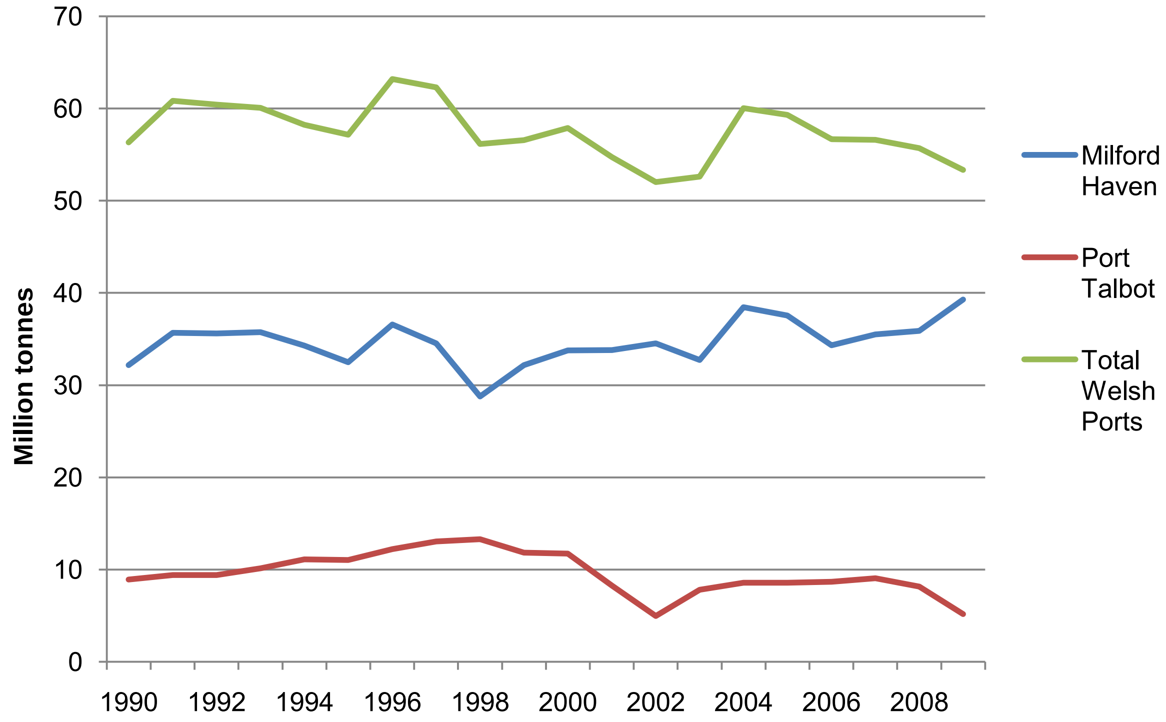


Figure 2.2: Welsh ports market trends, 1990-2009



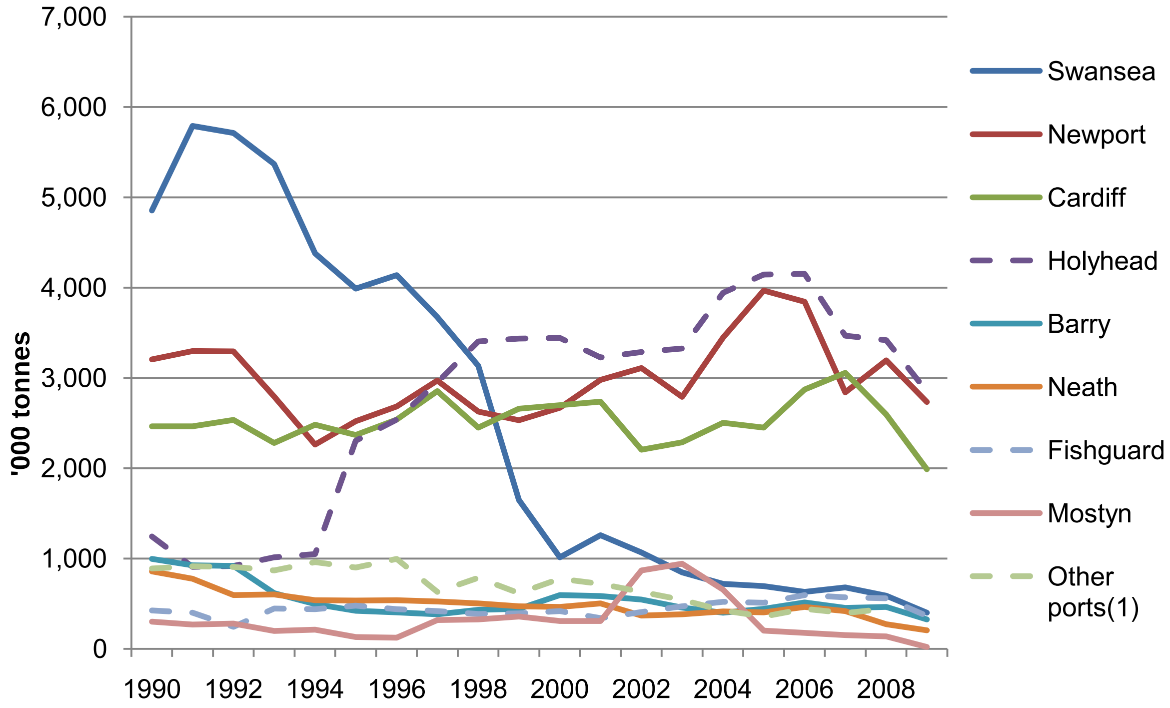
Source: DfT Maritime Statistics

Figure 2.3a: Major Port traffic trends, 1990-2009



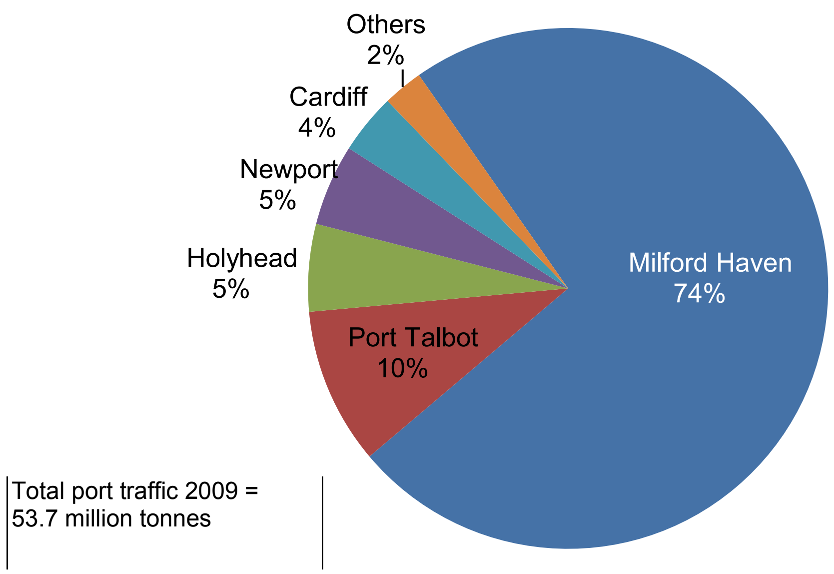
Source: DfT Maritime Statistics

Figure 2.3b: Major Port traffic trends, 1990-2009



Note: 'Other ports' include Burry, Caernarfon, Llandulas, Conwy, Port Penrhyn

Figure 2.4: Welsh port market shares, 2009



Source: DfT Maritime Statistics

Ferry routes from Wales across the Irish Sea to Ireland carry almost **3 million passengers a year**, the majority moving on the two routes from Holyhead to Dublin and Dun Loaghaire. In the late 1990s the volume of passengers was closer to 4 million a year, but this has since been subject to fierce competition from low-cost airlines and the withdrawal of services from Swansea, resulting in a decline in numbers on all routes except Holyhead to Dublin. Further details of Welsh ports and the markets they serve are contained in **Appendix 3.**

2.2 Welsh Port Traffic Analysis

Historic traffic trends: 1999 - 2009

Table 2.1 indicates growth trends in the key markets of Welsh ports over the last ten years. Most markets, with the exception of liquid bulks such as LNG, have registered declines over this period; largely as a result of the contraction of the coal and steel industry, and exacerbated by the recession in 2009. **Overall, traffic volumes have been relatively constant, with a 1.8% increase in port traffic over the period 1999-2009** (average increase of 0.2% per annum).

Table 2.1: Welsh Major port traffic growth 1999-2009

All foreign and domestic traffic	Total traffic (000 tonnes)				% change
	1999	2007	2008	2009	1999-09
Liquid bulk	32,784	35,631	36,053	39,593	20.9%
Dry bulk	14,078	11,112	11,257	8,048	-42.8%
All bulks	46,862	46,743	47,310	47,641	1.7%
Other general cargo	587	2,974	2,091	1,131	92.7%
Containers & Roll-on/roll-off	4,562	4,337	4,820	4,189	-8.2%
All Major Welsh Port traffic	52,011	54,054	54,221	52,961	1.8%

Source: DfT Maritime Statistics, analysis by MDS Transmodal. Detailed breakdown provided in Appendix 2.

The principal market sectors that are relevant to Welsh ports are summarised in **Table 2.2**. By far the largest sector in volume terms is the crude oil and LNG traffic into Milford Haven.

Table 2.2: Principal Market Sectors by Ports

Sector	Sub sector	Port
Liquid bulk	Crude oil Liquefied gas Oil products	Milford Haven Milford Haven Cardiff
Dry bulk	Iron ore Coal, coke Other	Port Talbot, Newport Port Talbot, Newport, Swansea Port Talbot, Cardiff, Newport, Swansea
General cargo	Iron and steel	Newport, Cardiff
Unitised	Containers RoRo	Cardiff Holyhead, Fishguard, Milford Haven

Source: MDS Transmodal

Projected Traffic Trends: 2009 - 2030

MDST has produced UK port forecasts to 2030 taking into account recent trends and developments, as summarised in **Table 2.3** (Note that the forecasts related to traffic volumes rather than values; and are only available at a UK level, not a Wales level). The forecast show a slight increase in port traffic over the period to 2015, which is then offset by a decline in traffic to 2020. **Overall traffic volumes in 2030 are expected to be in line with 2009.**[3]

Table 2.3: National port traffic forecast growth rates by market sector, 2009-2030

		Compound Annual Growth Rate (CAGR)			
Sector		**2009-2015**	**2015-2020**	**2020-2030**	**2009-2030**
Crude Oil	Imports	-0.9%	3.4%	2.0%	1.5%
	Exports	-13.6%	-5.8%	-4.0%	-7.3%
Liquid Gas	Imports	-1.0%	-3.5%	3.1%	0.3%
	Exports	0.0%	0.0%	0.0%	0.0%
Oil Products	Imports	-1.4%	-4.0%	0.0%	-1.4%
	Exports	1.6%	0.0%	0.0%	0.5%
Other Liquid Bulk	Imports	0.0%	0.0%	0.0%	0.0%
	Exports	0.0%	0.0%	0.0%	0.0%
Ores	Imports	7.2%	0.1%	0.2%	2.1%
	Exports	0.0%	0.0%	0.0%	0.0%
Other Dry Bulks (1)	Imports	9.3%	0.1%	0.7%	2.9%
	Exports	6.7%	0.0%	0.0%	1.9%
Coal	Imports	1.8%	-3.3%	-2.4%	-1.5%
	Exports	0.0%	0.0%	0.0%	0.0%
Agricultural Bulks	Imports	-0.8%	1.5%	0.8%	0.5%
	Exports	0.0%	0.0%	0.0%	0.0%
Iron & steel	Imports	12.8%	0.1%	0.2%	3.6%
	Exports	1.3%	0.1%	0.2%	0.5%
Forest products	Imports	12.9%	1.5%	0.2%	4.0%
	Exports	20.4%	1.5%	0.2%	5.9%
General cargo	Imports	0.0%	0.0%	0.0%	0.0%
	Exports	0.0%	0.0%	0.0%	0.0%
Total traffic		0.4%	-0.7%	0.1%	0.0%

(1) Includes biomass

Source: MDS Transmodal

2.3 Baseline Economic Assessment

The economic contribution and importance of ports to regional economies has been stressed in a number of research papers (including Bryan et al, 2006; WERU, 2009; HOC, 2009). The role of ports can be summarised as follows:

- Freight, Supply Chain and Logistics Processes
- Inter-modal transport networks (sea, road, rail)

[3] Note: we recognise that any forecasts are subject to risk, and that there may be some volatility in future traffic volumes in Wales as port traffic is subject to the decisions of a small number of key players (e.g. particularly oil and gas companies based at Milford Haven).

- Passenger transportation links
- Support to industries dependent on port access
- Tourism and leisure
- Inward investment and marketing

Attempts have been made to quantify the total economic impact of ports in the UK and Wales. DfT (2005)[4] estimated that there are a total of 74,000 people (range 58,000-90,000) directly employed in port related activities across the UK – including 54,000 employees on port sites, and a further 20,000 outwith port sites. In addition to this there are 17,500 employees on port sites in businesses either partially or wholly unrelated to the port. Estimates of indirect employment supported through supplier spending and income (induced) effects are in the range 27,000 to 90,000. Therefore the total impact of port operations (including indirect impacts, and employment both on-site and off-site) is in the range 97,500 to 200,700.

An alternative estimate is provided in a report by Oxford Economics (2009) on the Economic Impact of Ports in the UK. This study estimates that UK ports **directly employ 132,000 workers**, and support a further 230,000 jobs through supply chain and income impacts. The study demonstrates that the direct impact of ports grew slightly over the period 2003-2007 from around 120,000 workers to the current estimate of 132,000. It is worth noting that the coverage of industrial sectors included in ports assessments can make a significant difference to the estimates of economic impact.

DTZ have not been able to identify an existing economic impact study which separately identified the impact of ports in Wales. However, WERU (2009) produced a report on the economic impact of **ABP operations in South Wales** - which includes several of the main ports in Wales (Swansea, Port Talbot, Barry, Cardiff and Newport). ABP directly employs 201 full-time staff in Wales, and as can be seen from Table 2.4 the employment and output supported by ABP ports has been largely static since 2003.

Table 2.4: ABP South Wales Operations (Source: WERU, 2009)[5]

	2003	2007
ABP estimated output (sales)	£42.3m	£43.4m
Employment (excluding UK Dredging)	212	201
Gross payroll costs	£7.54m	£8.19m
Capital spending	£12.10m	£6.60m
Operational spending (nonwage)	£16.40m	£16.65m

In addition to direct employment, these ports support additional employment in on-site tenant companies – the majority of which are heavily dependent on the port for their operations. In 2007, ABP had a total of 348 tenants, the majority of which were in Barry (103), Cardiff (101), and Newport (78). The WERU report estimates that gross employment in tenant companies totals **9,711 FTEs, amounting to a gross output figure of £1.51 billion and a GVA of £412 million**. The report goes on to show that the output directly generated by tenant firms supports a further £1.27 billion of output in Wales through supply chain linkages and income effects. Therefore the total output supported directly or indirectly by tenant firms' amounts to **£2.78 billion**, as summarised by Table 2.5.

[4] DfT (2005) Transport Statistics Bulletin: Port Employment and Accident Rates
[5] Welsh Economic Research Unit (2009) Associated British Ports: South Wales Economic Impact Assessment

Table 2.5 ABP South Wales Ports - Summary of Impact (Source: WERU, 2009)[6]

	Employment	Output £ million	GVA £ million
ABP Operations – Direct Impact	**201**	**43.4**	
ABP Operations – Indirect Impact	641	36.4	
ABP Operations – Total Impact	842	79.8	34.2
ABP Tenants – Direct Impact	**9,711**	**1,511.8**	**412.1**
ABP Tenants – Indirect Impact	15,700	1,268.8	490.4
ABP Tenants – Total Impact	25,411	2,780.6	902.5

The above report provides detailed analysis of port impacts, but only for ABP ports. Data on the economic impact of other commercial ports in Wales has not been developed to the same extent as the WERU study; however DTZ has assembled the following data from a number of sources. It should be noted that these figures represent **direct employment in port companies and tenant companies** (including adjacent sites reliant on the port), but not indirect impacts in the rest of Wales:

Figure 2.6: Welsh Port Employment (Direct employment on port and adjacent sites)

Port	Total Employment	Source:
ABP ports	201 (ABP operations) 9,711 (tenants)	WERU (2009 report, 2007 data)
Holyhead	1,125+ (direct)	House of Commons report, 2009[7]
Milford Haven	210 (direct) 1500 (tenant companies) 3,000 (Oil/LNG terminals)	Milford Haven Port Authority consultation (current figures)
Mostyn	400	Port of Mostyn consultation (current figures)
Barry	1,010	DTZ analysis of Annual Business Inquiry data (2009) for port sites, using the same industrial classification as in the WERU (2009) study.[8] Note that there may be some issues with the reliability of ABI data at a very detailed geographical and sectoral level.
Fishguard	390	
Llandulas	130	
Port Penrhyn	680	
Total	**18,357**	

Sources: WERU, MHPA, Port of Mostyn, ABI data and DTZ estimates

Note: The following smaller ports have been excluded from the analysis as they no longer handle significant commercial traffic, focusing now on leisure and fishing activities: Aberdovey, Burry, Caernarfon, Conwy, Menai Bridge and Portmadog.

Overall, the analysis shows that there are currently **approximately 18,400 employees supported directly by Welsh ports**. As a further check on these figures, it is worth noting that this would equate to around 14% of the total employment supported directly by UK ports (the Oxford Economics report quoted above gives a total UK figure of 132,000), which is roughly comparable to the fact that Welsh ports handle around 11% of total UK port traffic. On this basis, the figure of 18,400 jobs supported directly by Welsh ports appears reasonable.

[6] Ibid

[7] House of Commons, Welsh Affairs Committee (2009) Ports in Wales

[8] Core port activities were classified as the following SIC codes: 51, 60, 61, 62, 63 and 64. Associated port activities include the following codes: 14, 15, 20 – 37 and 45.

Low Carbon Energy Activity in Ports

The engagement of Welsh ports in the low carbon energy sector to date has been focused on a small number of ports (Mostyn, Port Talbot & Swansea). There is limited secondary information available to estimate the current level of economic impact which this activity generates, however DTZ has consulted with ports and low carbon energy project developers, and modelled economic impacts (see Section 4 for detailed modelling assumptions). The impacts to date can be summarised as follows:

Onshore Wind – Port Talbot, Swansea and Mostyn have all been used for the import of wind turbines to supply the onshore wind turbine sector, although not to a significant extent as Welsh ports face competition from Ellesmere Port and the Port of Bristol. Welsh ports were able to levy port charges for the import of turbines (the exact values could not be made available due to commercial sensitivity). Welsh ports report that the *employment* impact associated with their involvement in the import of turbines was either negligible or zero, as cargo handling was undertaken by existing port staff. Whilst this may not create additional employment, such business helps the sustainability of ports and contributes to the safeguarding of jobs, albeit to a modest extent.

Offshore Wind - the Port of Mostyn has been involved in the construction of 5 existing offshore wind farms since the North Hoyle project in 2002 – the first commercial scale offshore wind project in the UK. The total capacity deployed out of Mostyn to date is more than 600MW as summarised in Figure 2.7 (including the ongoing Walney 1 project).

DTZ has consulted with the Port of Mostyn and the relevant project developers to establish actual employment levels; and these results are consistent with the methodology and modelled results for offshore wind projects discussed in Section 3. Mostyn is currently involved in the deployment of the Walney project – the first phase of which will be completed in 2011 Q1, and the second phase will be completed in 2011 Q4 (each phase being 183.6 MW). Mostyn report that the Walney project is directly supporting peak employment of 300+ people. Within this total, there is an important distinction to be drawn between jobs which are based on land at the port site, and jobs at the wind farm site aboard installations vessels:

- Industry experience to date suggests that the crews of installation vessels remain with their vessel from project to project. Given long term activity in one particular region, crew may be recruited and live locally but, with the widespread demand on vessels, it is likely that they will follow work around Europe. Crews will therefore come to the region with their vessel during the installation period and leave once the job is completed.
- Because most installation vessels remain at the wind farm site for relatively long periods at a time, they can have more than one shift so teams can be rotated for shore leave.
- It should be noted that installation activity is weather dependent and activity is unlikely to be constant all year round but instead have a peak of activity in the summer and a lull in winter.
- In contrast, the staff at a construction port will typically live locally and remain in the port as projects are completed. Roles directly employed in preparing turbines for installation will include fitting, wiring and composites technicians and paint sprayers. Other jobs indirectly involved will include stores and material handling, administration and management. The management at the port of Mostyn reports that the 15 staff they employ directly are also involved in other projects around the UK.
- For these reasons, it should be borne in mind when considering the calculations of full time equivalent (FTE) job numbers that one ‘job’ may represent a number of employees working on double-shift rotations and only during the summer months.

On this basis, DTZ estimate the Walney project is supporting around **210 FTE jobs** (for a full description of the methodology for calculating impact, see Section 4.2). The scale of the Walney project is significantly larger than previous construction projects such as North Hoyle, Burbo Bank, Robin Rigg, and Rhyl Flats.

Table 2.7: Offshore Wind Projects Constructed to Date

	Installation date	Capacity (MW)	Turbines	Total CAPEX (£ millions)	Role of Mostyn port	Employment Supported (FTEs)
North Hoyle	2002	60.0	30	£80	All works	110
Burbo Bank	2006	90.0	25	£180	All works	170
Robin Rigg	2007-08	180.0	60	£360	Mostyn one of 4 ports involved – completed 75% of foundation works	50
Rhyl Flats	2007-2009	90.0	25	£198	All works	60
Walney 1	2010-2011 (ongoing)	183.6	51	£569	Barrow (cabling & foundations) & Mostyn (turbines)	210
Total		**603.6**	**191**	**£1,387**		

Sources: Port of Mostyn and DTZ estimates

Mostyn has retained involvement in **Operations and Maintenance (O&M) activities** for the North Hoyle and Rhyl Flats projects. Mostyn report that there is an O&M team of approximately **20 local staff for each project.** In addition to this, Dong Energy and Siemens have operational bases at Mostyn employing around 80 people combined – involved in current projects and development of future projects. Therefore, at present there are over **350 FTE jobs at Mostyn supported by offshore wind.** For the remaining projects listed above, O&M activities are being undertaken by other ports – e.g. Liverpool for Burbo Bank, Workington for Robin Rigg, and Barrow for Walney.

The figures for employment in Welsh ports related to low carbon energy can be summarised as follows:

Table 2.8: Summary of Port Employment in Low Carbon Energy Sectors

Sector / Project	**2007**	**2010**
Offshore wind – survey		20
Offshore wind - construction	110 (Robin Rigg & Rhyl Flats)	210 (Walney 1)
Offshore wind – O&M	20 (North Hoyle)	40 (North Hoyle & Rhyl Flats)
Dong Energy & Siemens development teams	80	80
Onshore wind		<10
Total	210	350

Sources: Port of Mostyn and DTZ estimates

2.4 Summary

The key findings from the market context and outlook for Welsh ports are:

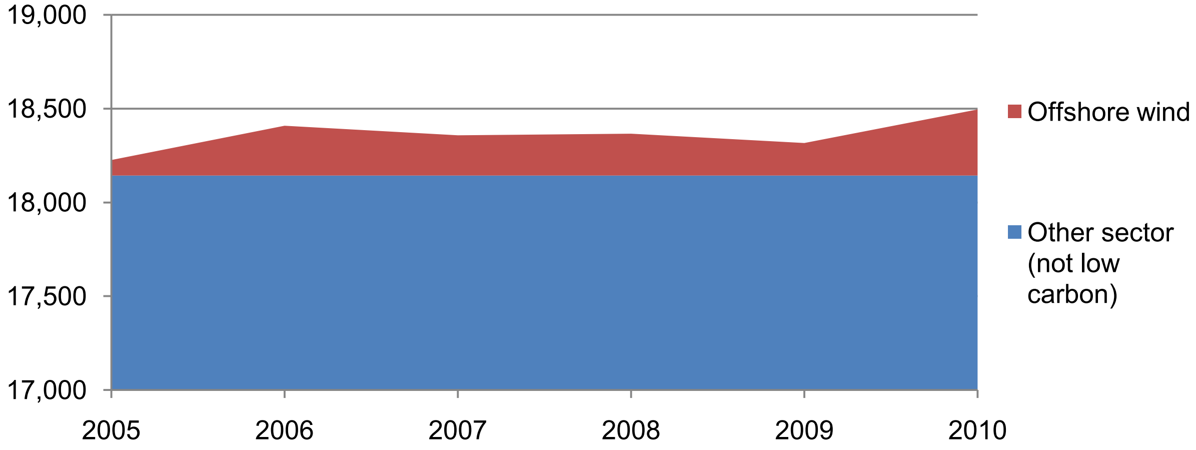
- Welsh port traffic has been relatively constant over the period 1990 – 2009, ranging from around 50 – 60 million tonnes p.a.
- In 2009, Welsh ports handled 54 million tonnes (34m inward and 19m outward). This represents 11% of all GB port traffic, which demonstrates the important contribution which the Welsh ports' sector plays.
- In tonnage terms Milford Haven dominates the Welsh ports, accounting for 39m tonnes or 73% of total Welsh tonnage. Liquefied gas and oil products processed at the Milford Haven oil terminal account for a large proportion of this high tonnage figure.
- Traffic volumes have been relatively constant over the last decade (1.8% growth over 10 years), and forecast traffic through Welsh ports is projected to remain constant over the period 2009 – 2030.

Total employment supported by the Welsh ports' sector (including direct, indirect and induced effects) was estimated to be circa **18,400 in 2007**. Our analysis shows that the only port currently supporting a significant number of jobs related to low carbon energy is the **Port of Mostyn**, which supported circa **200 FTE jobs in 2007**. This implies that the baseline level of employment in other sectors (i.e. not Low Carbon Energy) was **18,200 FTEs in 2007**. On this basis, the low carbon sector supports just over 1% of jobs in Welsh ports.

Given the flat trend in projected traffic volumes (as shown in Table 2.3), we have assumed that the 'business as usual' scenario for employment in other sectors will be **static employment levels at the 2007 level of 18,200 FTEs in the short, medium and long term.**[9]

The purpose of this report is to quantify the level of growth above the 'business as usual' level which could be supported by the low carbon energy sector. As can be seen from Figure 2.5, the level of employment in offshore wind has **grown from 210 employees in 2007 to 340 employees in 2010.** This is due to the construction activity at Mostyn related to the Walney offshore wind project currently underway.

Figure 2.5: Baseline Employment Summary (direct employment in ports and tenant companies)



[9] Note: we recognise that there are risks (positive and negative) concerning future levels of employment at Welsh ports – particularly as employment is driven by a small number of globalised companies. However, it has not been possible to generate forecasts with any greater level of precision.

3. Port Infrastructure Assessment

This section of the report provides a review of port facilities in Wales, including facilities related to low carbon energy. An overview map of ports in Wales is provided in Section 2 of this report. This section also sets out the competitive position relative to competitor ports in the UK and Ireland. Detailed port profiles of the larger and more significant ports in Wales are presented in Appendix 3, together with a discussion of the port requirements for each low carbon energy sector.

3.1 Port infrastructure assessment

Table 3.1 provides a summary of ports in Wales, highlighting available infrastructure and port specifications. The data has been sourced through a review of secondary information such as port directories, port handbooks, port websites, and through consultation with port companies. The information covers all ports which currently handle commercial traffic. In addition to this, there are a number of smaller ports[10] which no longer handle significant commercial traffic – the information on these ports is provided in Appendix 3, but they have not been considered further within this study.

[10] Aberdovey, Burry, Caernarfon, Conwy, Menai Bridge, Porthmadog

Table 3.1: Summary of Welsh Port Infrastructure

Port	Status/ owner	Usage	Cargo volume 2008 (000 tonnes)	Marine Access/ navigation	Port facilities	Max ship dimensions				Transport links.		Area available for development
						dwt	draft (m)	Total berth length (m)	Width restrict-tions (m)	Road	Rail Berths connected/ (loading gauge)	
Barry	Private/ ABP	Commercial cargo	465	Enclosed dock system. Width restricted by locks	3 dock basins. Commercial cargo berths located in No.2 dock	23,000	9.0	178	23.8	A4055	Yes (W8)	Significant land areas around No.2 dock.
Cardiff	Private/ ABP	Commercial cargo	2,596	Enclosed dock system; 3 dock basins, width restricted by locks	Queen Alexandra Roath Dock Roath basin (not commercial traffic)	35,000 35,000 10,000	10.0 10.0 8.0	198 198 158	27.0 26.0 21.3	A469 (single) A48(M) M4	Yes (W8)	Development area behind King's Wharf, QA Dock 120,000m2
Fishguard	Private/ Stena Line	Commercial Cargo/ferry	560	River/Tidal berths 4 ferries per day to Rosslare. Limited use of conventional berth.	Ro-ro terminal Conventional berth		6.5 6.8	150 200		A487	(W6a) no freight traffic in last 5 years	Ro-ro Terminal has 40ha. Harbour earmarked for marina development
Holyhead	Private/ Stena Line	Commercial Cargo/ferry	3,419	Ro-ro berths accessible at all states of the tide	Ro-ro terminal 5 ro-ro berths Conventional berth		7.0 3.4	210 90		A55 dual	Yes (W7) No freight traffic in last 5 years	Stena reports large portfolio of land available for port-related use. Feasibility studies done on further reclamation of Salt island and construction of a new 100m berth possibly increasing to 400m.
Holyhead – Anglesey Aluminium	Private/ AA Metals Ltd	Aluminium plant operation now shut down		River berth accessible at all states of the tide Berthing not possible in high winds	Deep water jetty		13.0	183		A55 dual	Yes	Negotiations ongoing on sale and future use of the site

Port	Status/ owner	Usage	Cargo volume 2008 (000 tonnes)	Marine Access/ navigation	Port facilities	Max ship dimensions				Transport links.		Area available for development
						dwt	draft (m)	Total berth length (m)	Width restrict-tions (m)	Road	Rail Berths connected/ (loading gauge)	
Llandulas	Private/ Cemex	Commercial cargo	380	River/Tidal berths. 2 bulk jetties. Dries at LW. 4hr tidal window. Exposed to high winds jetties cannot be worked at wind speeds over force 5.	Raynes bulk jetty operated by Cemex, Bulk conveyors rated at 1000t/hr	4,000	5.9	92		A547 dual	No	Open storage 0.7ha
					Llysfaen jetty2nd jetty (Hansons) redundant.	4,000	5.9	100				
Milford Haven (inc Pembroke Dock)	Trust	Commercial cargo/ferry	35,875	Pembroke Dock	Quay 1 Quay 2 Ro-ro jetty Carr jetty (Two arms)		7.0 8.3 6.8 9.7	150 120 185 151	33	A477 M4	Yes (W7)	5 ha available for laydown at Pembroke port
				Milford Docks Enclosed dock system	Marina and fish market, general cargoes		7.5	130	19.0			
Mostyn	Private/ Port of Mostyn Ltd	Commercial cargo	139	River/Tidal berths. Navigation restricted for larger vessels on neap tides.	I river berth of 310m. Quay strengthened to lift up to 1300t I ro-ro berth	10,000	5.6 (9m poten-tial)	150m (500m by 2011)		A458 dual and single.	Rail connected to shunting weigh bridge (W7)	30 ha of development land. Consent to dredge to 9m draft
Neath	Trust	Commercial cargo/leisure	274	River/Tidal berths. Tidal range 4.4-8.3m. Several road bridges. Wind direction affects depth of navigation.	7 wharfs all privately owned/ operated Stevedoring provided by private operators' cranes	3,000	5.8	92/ 734m over 7 separat e wharfs.		A465 M4	No	Quay side only

Port	Status/ owner	Usage	Cargo volume 2008 (000 tonnes)	Marine Access/ navigation	Port facilities	Max ship dimensions				Transport links.		Area available for development
						dwt	draft (m)	Total berth length (m)	Width restrict-tions (m)	Road	Rail Berths connected/ (loading gauge)	
Newport	Private/ ABP	Commercial cargo	3,195	Enclosed dock system. 2 dock basins	North Dock South Dock	8,000 40,000	7.6 10.4	122 244	17.0 30.1	A48 dual M4	Yes (W8)	South Dock development area: 80,000m^2
Port Penrhyn	Private/ Port Penrhyn Plant Ltd	Leisure/ Commercial cargo	65	River/Tidal berths. Approach to port dries 2h either side of LW. Port workable 2h each side of HW. Easterly winds can cause reduction in depth at HW.	Stevedoring provided by private operators'. Mobile cranes. Ro-ro berth ramp takes up to 300t	2,500	5.2 MHWS ; 3.7 MHWN	150/300	18.0	A55 dual	No	Open storage 0.3ha
Port Talbot	Private/ ABP	Commercial cargo	8,147		Tidal harbour Inner docks	180,000 8,000	18.2+ 7.7	290 137	No restrictio n 18.3	A48 dual M4	Yes (W8)	Designs exist for a land reclamation project entailing construction of up to 28ha (60 acres) in the southern corner of the tidal harbour, providing 24-hour deep-water access. Plans to develop a 350MW biomass plant on an 'Energy Development Site' adjacent to Port Talbot docks basin
Swansea	Private/ ABP	Commercial cargo	589	Enclosed dock system; 3 Dock basins, 2 used for commercial vessels, ro-ro terminal has 20ha	King's Dock Queen's Dock River Ro-ro berth	30,000 30,000	9.9 9.9 5.7	200 200	26.2 26.2	A48 dual M4	Yes (W8)	Up to 16 ha (40 acres) with quay extension available, plus land on the outer wall of Queen's Dock

3.2 Involvement in Low Carbon Energy Projects

The following summarises the current involvement of Welsh Ports in low carbon energy projects, and associated infrastructure available (based on a review of secondary information and consultation with ports):

- **Mostyn** – Mostyn has served as the construction port for five wind farms: North Hoyle, Burbo Bank, Rhyl Flats, Robin Rigg, and the ongoing Walney project. Mostyn provided pre-assembly and lay-down space – with over 16 hectares of laydown currently available, and an additional 30 ha of space available if required. There is also 6,000 sq m (28,000 sq ft) of fabrication and workshop space for electrical component storage. Mostyn has a long river berth, and a ro-ro berth which is currently being converted to be suitable for offshore wind construction. Mostyn has permission to dredge to accommodate vessels of up to 9m draft. Developers plan to use the port for future projects Walney Phase 2 and Gwynt Y Mor, and there are potentially opportunities beyond this for the port to be involved in the Burbo Bank extension, Walney Phase 3, and Irish Sea zone projects. A number of companies in or related to the renewable energy sector are located at Mostyn, including Siemens, Dong Energy, and a number of smaller supply chain companies.
- **Holyhead** – A number of low carbon energy projects have been put forward for the Anglesey Aluminium smelter site and are currently being considered, including projects related to biomass, offshore wind, and nuclear. One such proposal for a 299MW biomass power plant (currently in planning process) would require a 245m extension to the jetty.
- **Milford Haven** – There is a current proposal to reclaim and develop 57ha (and up to 146ha) at the Blackbridge site on the north side of the estuary to support wind farm construction and renewable energy projects more generally. There have been various proposals to develop biomass or bio-oil power plants at Milford Haven, but there are no firm plans at this stage. MHPA have also been approached by a number of wave/tidal power companies about opportunities to locate prototype manufacturing at the port.
- **Port Talbot** - ABP is promoting a solution to combine facilities at Port Talbot and Swansea to support offshore wind construction and O&M activities. Port Talbot could provide a deepwater facility (16m draft) with 28 hectares of laydown space – suitable for use as an offshore wind construction port. Permission has been granted for the 350MW Prenergy biomass plant at Port Talbot, which once constructed would import 2.5-3.0 million tonnes of wood chip per annum. Port Talbot benefits from being able to accommodate Panamax vessels – which are likely to be used for the import of biomass materials on such a large project.
- **Swansea** - Swansea benefits from proximity to the Atlantic Array offshore wind project site, and could provide a 16 hectare site suitable for use as an O&M base. Swansea is already being used by some of the survey vessels for the Atlantic Array project. A 50MW biomass power plant was proposed for Swansea Docks, but was refused planning permission.
- **Newport –** Planning permission has been granted for a 50MW biomass project at Newport docks by developer Dragon Generation.

3.3 Port Infrastructure Requirements

The following table provides a summary of the port requirements for each of the low carbon energy sectors being considered within this study. Further details of port requirements and assumptions are provided in Appendix 4. As can be seen, there are significant port requirements associated with offshore technologies (wind, wave and tidal), particularly in terms of manufacture, but also in terms of installation/deployment.

Table 3.2: Summary of Port Infrastructure Requirements (Source: Various including industry information from BVG Associates)

Key Parameters	Offshore Wind	Wave	Tidal Stream	Onshore Wind	Biomass
Manufacture				Not relevant –manufactured outside UK	
Factory and storage area	25-30ha[11]	0.5-4 ha (for 50MW)	0.5-2.5 ha (for 50 MW)		
Quayside length	130m	50-300m	50-300m		
Draft	7-8m				
Assembly & Deployment					
Laydown and Assembly space	15ha site can deploy 300MW p.a.	3ha for 50MW	2ha for 50MW	1.5ha for medium sized projects	
Quayside length	300m	150-300m	150m	70-80m	
Vessel Length	110-140m	50-140m	110-140m		
Water depth	7-11m	4-11m	7-11m		
Tidal Gate Restrictions (width)	30-55m	30-50m	30-55m		
Operations & Maintenance					
Quayside length / vessel specification	8x 22m berths	2x 22m berths	8x 22m berths		Panamax vessel likely for large projects – 80,000 dwt, 12m draft, 34m min width
Space for office, storage, servicing	5ha	2ha	5ha		
Access	Uninterrupted access	Uninterrupted access	Uninterrupted access		

3.4 Classification of Welsh Ports

An assessment of all ports in Wales has been made by DTZ, based on the above assessment of current and planned port infrastructure in Wales and comparison with the port infrastructure requirements for low carbon sectors outlined above. Based on this assessment, the following ports appear to have the greatest competitive advantage in exploiting the opportunities from low carbon energy sectors, although this does not preclude niche roles for other ports in Wales, for example in supporting the O&M of offshore wind projects.

<table>
<tr>
<td>North Coast Ports
Holyhead / Anglesey Aluminium wharf
Mostyn</td>
<td>South Coast ports
Milford Haven
Swansea
Port Talbot
Newport
Note: Whilst Cardiff and Barry could have a limited role in respect of low carbon energy, this is not being actively targeted by operators ABP (ABP are promoting Port Talbot and Swansea for low carbon projects)</td>
</tr>
</table>

[11] Note: assumes tower or blade facility

3.5 Analysis of Competitor Ports

Table 3.3 summarises the infrastructure available at a number of ports which are likely to compete with Welsh ports in relation to low carbon energy projects: - namely Belfast, Barrow in Furness, Bristol, Liverpool, Birkenhead, and Ince.

As can be seen from the table, there are several strong competitors with infrastructure to rival that available in Wales. Of particular relevance to this study, Belfast and Barrow have both been involved in offshore wind projects, whilst Liverpool/Birkenhead is being promoted as a location for offshore wind.

Table 3.3: Competitor Ports: Infrastructure Assessment

Port	Status/ owner	Usage	Cargo volume 2009 (000 tonnes)	Marine Access/ Navigation	Port facilities	**Max ship dimensions**				Transport links.		Area available for development/ Comments
						dwt	draft (m)	Total berth length (m)	Width (m)	Road	Rail **Berths rail connected**	
Belfast	Trust	The major port of Northern Ireland. Handling facilities for all types of cargo and extensive repair facilities. Logistics and pre-assembly port in construction of Robin Rigg and Barrow offshore wind farms.	12,050	Tidal deep-water harbour. Tidal range: 3.1m springs; 1.9m neaps. 24hr berthing	40 berths, total quayage is over 11,000m. Three main channels: Victoria (dredged to 9m reducing to 5m); Herdman (7.4m); Musgrave (7.3m). West Stormont Wharf and H&W former shipyard are principal facilities handling offshore wind components 30,000m^2 covered storage space	220,000	10.2	580 (over 1km avail-able)		-	-	150 acres of waterfront sites available. 100,000m^2 at H&W. Recently announced £40m investment and an agreement with Dong Energy
Barrow-in-Furness	Private/ ABP	Home base for BAE systems ship-building facility. Supply base for Offshore gas industry. Construction port and service base for Barrow Offshore wind farm.	112	Enclosed dock system			10.0	210	35.0	A5087 A590		20ha of lay-down area available. Up to 80,000m^2 available for development. Potential to create river berths offering unrestricted marine access.

Port	Status/ owner	Usage	Cargo volume 2009 (000 tonnes)	Marine Access/ Navigation	Port facilities	**Max ship dimensions**				Transport links.		Area available for development/ Comments
						dwt	draft (m)	Total berth length (m)	Width (m)	Road	Rail **Berths rail connected**	
Bristol	Private/ Bristol Port company	GB's 14th largest major port, handling a wide range of trades and cargoes. Major port for imports of trade cars.	8,999	Two enclosed dock systems. 15m tidal range on spring tides	Royal Portbury Avonmouth (Most project cargo handled here)	120,000 80,000	14.5 11.0	300 210	41.0 30.1	M5 M4		Large off-dock land holdings Various applications in place to build biomass power stations at Portbury based on imported woodchip.
Liverpool	Private/ Peel Holdings	GB's 7th largest major port handling a wide range of trades and cargoes. Major port for ro-ro ferry connections to Ireland.	29,336	Enclosed dock system			12.8	293	42.0	M62 A580 (dual) A59 (dual)		Planning to develop sites at Cammell Laird shipyard and Port Ince on the Manchester ship Canal for pre-assembly and component supply chain.
Birkenhead	Private: Peel Holdings / Cammell Laird	Cammell Laird shipyard	(incl.. in Liver-pool tonnage	Four dry docks			10.0	289	42.0	M53		Being promoted as participant in Offshore wind power supply chain on Merseyside. 15,000m^2 construction hall, 14,000m^2
Ellesmere Port	Private/ Peel Holdings	Enclosed dock system on river Mersey at head of Manchester ship Canal	Incl. in MSC total tonnage	6 berths in all over 1,200 quay metres, 1 dedicated to oil products	Manisty Wharf North Wall		8.8 8.8	170/ 335 170/ 467	20.7 21.9	M53/ M56	Yes	Vessels up to 23m beam may be accepted Canalside development sites available

3.6 Summary

Port Infrastructure Assessment
The key criteria used to assess the suitability of ports for servicing the low carbon energy sector include: marine access, navigation, port facilities, maximum ship size, road/rail transport links and land holding.

Classification of Welsh Ports
There are 20 commercial ports in Wales. An assessment of all ports in Wales has been made by DTZ, based on the current and planned port infrastructure in Wales, and the port infrastructure requirements for low carbon sectors. The following ports appear to have the greatest competitive advantage in exploiting the opportunities from low carbon energy sectors, although this does not preclude niche roles for other ports in Wales, for example in supporting the O&M of offshore wind projects.

- North Wales - Holyhead and Mostyn
- South Wales - Milford Haven, Port Talbot, Newport, and Swansea

Assessment of Competitor Ports
Our analysis highlights that there are several key competitor ports located in the geographical catchment of Wales relevant to the low carbon energy sector:

- *Irish Sea & Morecombe Bay* - Belfast, Barrow-in-Furness, Liverpool, Birkenhead and Ellesmere Port
- *Severn Estuary* – Bristol (construction and O&M) and potentially North Devon ports (O&M only) in respect of the Atlantic Array project

All of these ports must be considered very serious competitors given their location, port specification, facilities and competitive intent to secure emerging opportunities from the low carbon energy sector.

Conclusion
A clear spatial pattern is evident with different levels of competition in North and South Wales. For example, if one focuses on the offshore wind sector the following competitor analysis is informative:

- **North** – for the major offshore wind opportunity (Irish Sea) there are only two ports on the North coast of Wales that are competitively placed to target this opportunity, with five serious competitors outside Wales.
- **South** – for the Atlantic Array there are four Welsh ports – all of which are better located than the main competitor port Bristol, and larger than other smaller competitors such as minor ports in North Devon.

4. Detailed Economic Impact Review (by Technology)

This section considers the quantitative economic impact of each of the low carbon energy technologies that have been considered:

- Onshore wind
- Offshore wind
- Biomass
- Wave & Tidal Stream
- Nuclear
- Other technologies (Tidal Range, CCS, and Micro-renewables)

This section presents analysis of the likely **deployment of capacity**, the resulting **demand for port services,** and the **port requirements** of each of the technologies. The economic impact has been considered for the following major stages of the project lifecycle (where relevant):

- Manufacture – e.g. whole devices or components
- Deployment – including transportation, assembly, and import of devices/components
- Operation & Maintenance

For each technology, a number of scenarios have been developed in terms of deployment and economic impact:

- **Optimistic scenario** – reflecting the upper bound of impact if all projects are realised within expected timescales, and Welsh ports take the maximum possible market share.
- **Moderate scenario –** reflecting a more realistic scenario where there is some reduction in deployment against expectations or delays, and Welsh ports take a more modest market share.
- **Pessimistic scenario** – reflecting the worst case scenario in terms of the level of deployment, market share and impact

4.1 Onshore Wind

Overview of Technology

Onshore wind is the most advanced of the renewable energy technologies in the UK in terms of deployment. As of January 2011 there were a total of 270 wind farm installations in the UK with a total capacity of 3.8GW.[12] A further 1.4GW is currently in construction, with another 3.6GW having achieved planning consent. Wales has an installed wind farm capacity of just over **400 MW representing approximately 10% of the UK total.** Wales has an excellent wind resource and a large number of suitable sites, providing an opportunity to expand onshore wind deployment much further.

However, despite the high levels of deployment of onshore wind capacity in the UK, there is almost no manufacturing capability. Manufacture of onshore wind turbines is dominated by companies in mainland Europe, most notably Germany, Spain and Denmark. Over time the scale and capacity of turbines has increased: some of the earliest large scale onshore wind developments in Wales used 0.3 MW turbine models, but the norm for recent installations is at least 1.3 MW models, with some developments using turbines as large as 2.3 MW or even 2.5 MW. As turbine size has increased, the port and transportation requirements for delivery and installation have become considerably greater.

Technical Advice Note 8 (TAN 8) is a supplementary planning document relating to the land use planning considerations of renewable energy developments. As part of this document a total of seven Strategic Search Areas (SSAs) were identified as being the most appropriate locations for large scale onshore wind farms in Wales; outside of brownfield sites. TAN 8 identifies maximum capacities for all 7 strategic search areas totalling 1700mw. "A Low Carbon Revolution"[13] identifies Wales' onshore wind potential at 2GW as a combination of capacity within the SSA areas together with that from sites outside the areas, brownfield sites, community and micro-generation sites. While Welsh Government policy identifies maximum capacities for the SSA areas, energy consents over 50mw are not devolved to the Welsh Government . Developer interest within the seven SSAs is currently estimated at **2,400 MW**.

Actual and Potential Capacity

Installed

In Wales there are 34 wind farms installed with a total generating capacity of **400MW**. Geographically there is a concentration of wind farms in mid Wales, which benefits from conditions suitable to wind farm developments. The largest installations are at Cefn Croes in Ceredigion (59MW) and Carno, Powys (50MW).

Planned Capacity

Arup undertook a study into the likely scale and timing of deployment of onshore wind in Wales[14], which DTZ has updated to the end of 2010. Our analysis has identified a total of **61 planned onshore wind farms** – which are currently either awaiting construction, or in the planning system (either at Local Authority level, or IPC applications/pre-applications depending on scale). These schemes equate to a total capacity of **2.4GW**. This includes the following major planned developments:

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[12] Renewable UK Wind Energy statistics, http://www.bwea.com/statistics/ , Retrieved 27.1.2011
[13] "A Low Carbon Revolution: Wales' Energy Policy Statement": http://wales.gov.uk/topics/environmentcountryside/energy/renewable/policy/lowcarbonrevolution/?lang=en
[14] Arup (2010) Strategic Search Areas Reassessment and Validation

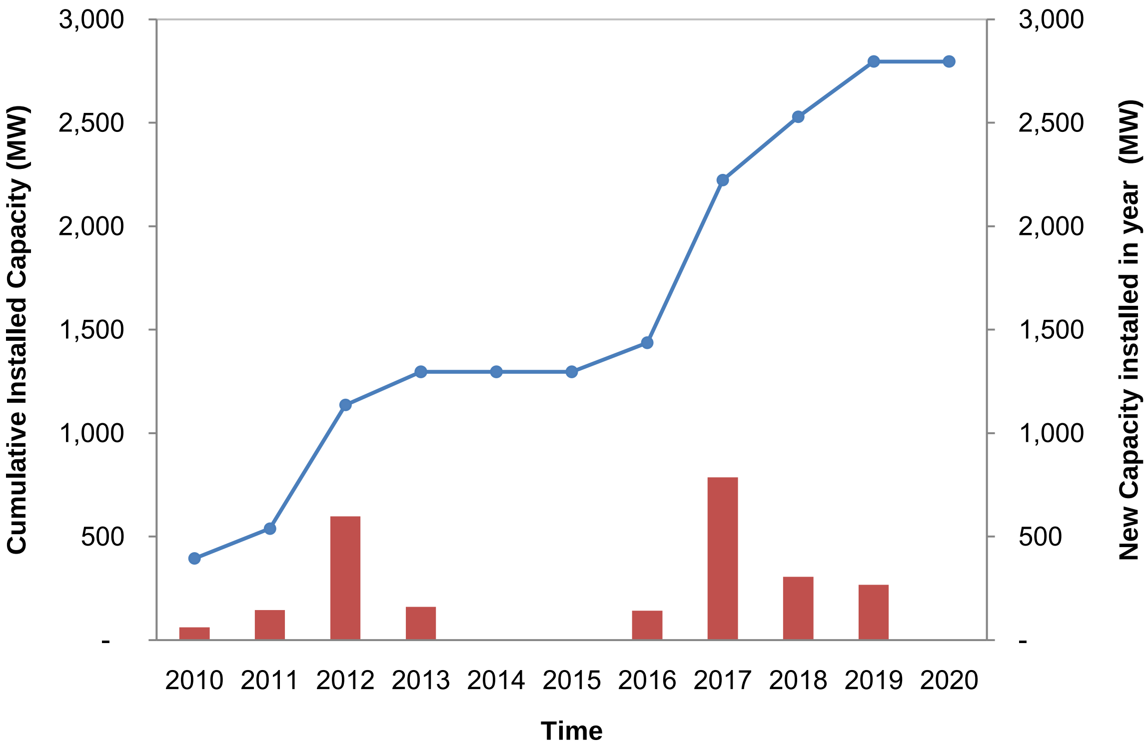
Table 4.1: Major Planned Onshore Wind Developments (Source: Arup, 2010)

Name	Local Authority	Capacity (MW)	Status
Pen Y Cymoedd	Neath Port Talbot	258	IPC Pre-application Scoping
Nant-y-Moch	Ceredigion	170	IPC Pre-application scoping
Carnedd Wen, Llanbrynmair	Powys	130	Application lodged
Llandinam Repowering	Powys	126	Application lodged
Dyfnant Forest	Powys	120	IPC Pre-application scoping
Brechfa Forest	Carmarthenshire	97.5	IPC Pre-application scoping
Llanbrynmair	Powys	88	Application Lodged
Clocaenog Forest	Conwy	85	IPC Pre-application scoping
Bryn Llewellyn	Carmarthenshire	80.5	IPC Pre-application scoping
Esgair Cwm Owen	Powys	80	Pre-Application Scoping
Other (51 schemes)	Various	1,167	Various
Total		2,401	

Timing of Deployment

The study undertaken by Arup (2010) identifies developer capacity for the deployment of onshore wind projects in and around the SSA areas. DTZ have updated their optimistic scenario to take account of recent project completions and new applications since the production of the Arup report, to provide the following indicative timetable for deployment:

Figure 4.1: Indicative Deployment Timetable (Best Case Scenario)



The above timetable assumes that all currently proposed projects are granted consent and necessary improvements to the National Grid are made in time. DTZ propose two alternate scenarios for the deployment of onshore wind in Wales, which are utilised below in calculating likely economic impacts:

- **Optimistic Scenario** – As per the chart above, assuming no failure or delay of projects. Installed capacity of 2.8 GW[15] by 2020.
- **Moderate Scenario** – Assumes a failure rate of 25%, in line with the historic norm in terms of the proportion of onshore wind projects refused planning approval.[16] We have also assumed that 25% of projects are set back by one year due to infrastructure/logistics delays. Installed capacity of 2.18GW by 2020. [17]
- **Pessimistic Scenario** – Assumes a failure rate of 50% (greater than that experienced historically) and that 50% of projects are delayed by one year. Installed capacity of 1.56 GW by 2020.

Economic Impact on Ports

DTZ have assessed the extent to which project stages will have an impact on Welsh ports as follows:

- **Manufacture** - The manufacture of onshore wind turbines is unlikely to have an impact on Welsh ports, as turbine manufacture is currently concentrated in mainland Europe (see Cowell et al, 2007), and this situation is unlikely to change.
- **Deployment** - There may be some modest economic impact at ports related to the **import of turbines** and components (this is discussed further below)
- **Operations and Maintenance** – this will largely take place at onshore wind project sites, and there is unlikely to be a significant opportunity for Welsh ports. It is possible that the replacement of existing turbines at the end of the operational lifetime (e.g. c. 25 years) could involve shipment of replacement turbines or components through ports. There are 10 wind farms which were constructed prior to the year 2000 in Wales, totalling circa 130 MW of installed capacity. Assuming a 25 year lifespan, it is possible that these installations will need replacement from 2015 onwards. However, there is no certainty around when or indeed whether these installations will be replaced, or the nature of this work.

In terms of impacts associated with the **import of turbines/components**, the main considerations are as follows:

Timing / phasing

Impact will be driven by the level of capacity deployed each year, and the requirement to import turbines and components. The level of deployment will fluctuate considerably, as shown in Figure 4.1; with likely peaks in demand in 2012 and from 2017-2020.

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[15] Note: Welsh Government policy identifies maximum capacities for the SSA areas, however energy consents over 50mw are not devolved to the Welsh Government

[16] Note: the failure rate for onshore wind may increase or decrease in the future (potentially driven by the interaction of planning decisions), therefore some variation in the failure rate has been built into the model.

[17] Source: Arup (2010) Strategic Search Areas Reassessment and Validation. The report identifies that 33% of schemes submitted over the period 2005-2009 were refused; and that a reasonable assumption would be a 25% refusal rate going forward.

Port requirements

Based on consultations with project developers and manufacturers, we have identified that a medium sized wind farm would require up to 1.5ha of open storage space at the import port to store up to 10 turbines whilst they await delivery to the development site. The exact length of quayside required would vary depending on the vessel and tidal ranges but at least 70-80m would be needed. Unloading the turbine could be done from the ship if it has its own crane, otherwise the port would need to provide the facility. On this basis, all of the major Welsh ports could potentially be involved in the import of turbines. It is worth noting that the ports of Newport, Swansea and Mostyn have already been involved in the import of turbines for Welsh onshore wind projects.

Competitive Position of Welsh Ports

The main consideration in the choice of port is the onward transportation to development sites – which can be particularly problematic in rural areas due to the dimensions of turbines components. A study has been undertaken[18] to assess the options for delivery of wind turbines to sites in mid Wales, which found that most of the proposed sites are likely to use Ellesmere Port near Liverpool as their chosen import location. The main reasons for this are:

- The overall level of accessibility in terms of the road connections from port to installation sites in mid Wales is better from Ellesmere Port than comparable ports in Wales.
- Manufacturers will typically deliver wind turbines to a large port such as Ellesmere, Avonmouth or Immingham before delivering to the installation site via road or on a barge to a port located nearer to final destination. This means that Ellesmere Port is well positioned to benefit from wind turbine import traffic related to site in the Strategic Search Areas.

The study recognises that there is also potential for ports in South Wales to handle wind turbine deliveries for sites in mid Wales as ports in South Wales benefit from good access routes around the M4/A470 route to mid Wales. It appears that this route has not been exploited much to date, but this may increase in the future due to recent trials using this route.

Although not covered by the scope of the Powys Wind Farm study, there are two further SSAs located in South Wales, just to the North of Merthyr Tydfil and Neath Port Talbot respectively. Installation of wind farms in these locations could be an opportunity for ports in South Wales, given the close proximity and good road connections. Similarly projects in SSA G in Carmarthenshire could utilise South Wales ports, and projects in SSA A (North Wales) could utilise Mostyn.

Our overall assessment is that **Welsh ports are likely to pick up approximately 50% of the business**[19] associated with the import of turbines for onshore wind projects in Wales, whilst the remainder of business will be picked up either by Ellesmere Port or Bristol. This assumption is based on DTZ's assessment of the market share which Welsh ports could take for each of the SSAs (bearing in mind historic performance), and then weighted to take account of the relative scale of development per SSA.

[18] Powys Wind Farm – Access Routes Study, Welsh Assembly Government Transport & Strategic Regeneration / MWTRA / Powys County Council, Capita Symonds, 2008

[19] This assumption has been increased to 60% in the optimistic scenario, and reduced to 40% in the pessimistic scenario.

Calculation of Economic Impact

The following assumptions have been used to estimate the total benefit to Welsh ports:

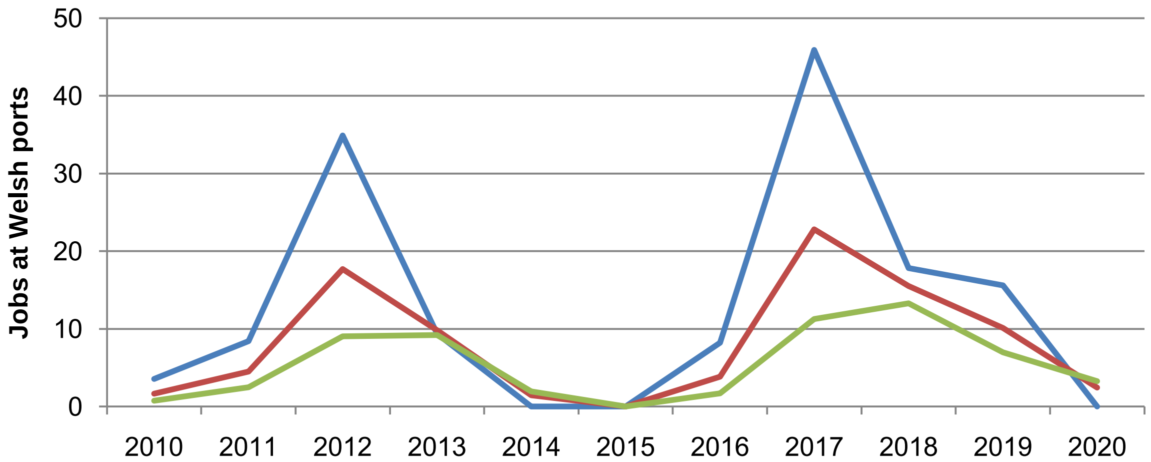
- Medium sized project (10 turbines / 20MW) requires 1.5 ha of storage for 1 year.
- Assume that the port levies charges of approximately £30,000 per acre (£74,000 per hectare) for storage space, plus an additional £100,000 in handling fees.[20]
- This equates to a cost of around £21,000 per turbine. DTZ has then modelled the impact over time to reflect the likely profile of deployment in the Optimistic, Moderate and Pessimistic scenarios.
- The employment supported by this revenue is estimated using a ratio of £108,000 per FTE worker in the Transport and Storage sector, and the GVA impact is calculated using a ratio of £47,000 per FTE in the Transport and Storage sector (source: Annual Business Inquiry, 2008)

The economic impact results for the three scenarios are shown in Table 4.2 and Figure 4.2. As shown the economic impact of onshore wind on Welsh Ports is expected to be very modest – supporting an average of only 8 FTE jobs in the Moderate scenario over the period 2010-2020 (13 FTEs in the Optimistic Scenario / 5 FTEs in the Pessimistic scenario). Note that this does not include the impacts associated with the construction and maintenance of onshore wind farms, as these impacts will occur away from ports sites and are therefore outside the scope of this study. The economic impact is likely to peak in 2017 due to the greater level of deployment at this time.

Table 4.2: Summary Economic Impact Results

	Total turnover, £m (2010-2020)	Total GVA, £m (2010-2020), undiscounted	Average employment (2010-2020)
Optimistic Scenario	£15.6	£6.8	13
Moderate Scenario	£9.8	£4.2	8
Pessimistic Scenario	£6.5	£2.8	5

Figure 4.2: Summary of Employment Impact: Onshore Wind



[20] Note: estimates based on standard port charges. Actual figures were not made available by port companies or developers due to commercial confidentiality, and in practice will vary according to the negotiations on individual projects.

The economic impact will be maximised through the Welsh Government's ongoing support to project developers and ports to identify and improve access routes to onshore wind sites in Wales. However there could be significant costs in terms of road realignments, and the economic impact at port sites will remain modest even with this support.

In the long term (2020-2030) the impact is likely to be lower than in the short to medium term; as the major projects in SSAs are likely to be completed by 2020. The analysis undertaken by Arup shows that beyond the projects already identified, the developable land in SSAs is quite limited and constrained. Arup estimate that there is the potential for only around 300MW of additional development in and around the SSAs, taking into account environmental and technical constraints. Assuming this capacity would come forward in the long term - this is a far lower level of deployment (and therefore impact) than expected in the short to medium term. It is unlikely that there would be significant development away from the SSAs, as these have been identified as the priority locations for onshore wind.

Summary - Onshore Wind

Capacity

- C. 400MW deployed to date
- 2.4 GW in development pipeline, ramping up from 2012 onwards

Economic Impact

- Opportunities for the import of turbines and components
- Most major Welsh ports have sufficient infrastructure to compete in this market
- Competition from Bristol and Ellesmere port
- Results in modest port revenues, and negligible employment impacts
- Average employment impact over the period 2010-2020 estimated at 5-13 FTEs
- Long term impact is negligible, as capacity will generally be deployed by 2020

4.2 Offshore Wind

Overview of Technology

Due to the plentiful wind resources around the coast of the UK, offshore wind has been identified as one of the renewable technologies in which the UK can take a world lead. The UK's first offshore wind farm was commissioned in December 2000 at Blyth Harbour in Northumberland. Since then, the Crown Estate has undertaken several leasing rounds for offshore wind farm development, which can be summarised as follows:

Table 4.3: Offshore Wind Development Rounds

Round	Details
Round 1 2000 onwards	R1 developments intended as demonstration projects to prove technical, economic and environmental potential. 18 companies pre-qualified for site development options. Developments limited to a maximum area of $10km^2$ with no more than 30 turbines to have a capacity of at least 20 MW. R1 locations chosen by developers on the basis of a range of factors such as grid connections, water depth and wind resource. Areas of nature conservation value were avoided. All R1 developments were within 12km of the shore and in water depths of less than 20m. Eleven of the R1 sites now completed. Of the remaining sites, one is fully consented whilst the others have been withdrawn due to difficulties with obtaining consent and resourcing issues. Sites proximate to Wales include Rhyl Flats, Burbo Bank and North Hoyle
Round 2 Dec 2003 onwards	R2 involved a more strategic approach to offshore wind developments. Strategic Environmental Assessment (SEA) was conducted for the Greater Wash, Thames Estuary, and Liverpool Bay areas. The SEA suggested that future developments should be limited to minimise impact on coastal areas. The 15 successful projects awarded consent by the Crown Estate amounted to a potential capacity of 7.2 GW. Sites proximate to Wales include the Gwynt Y Mor, West Duddon, and Walney developments in Liverpool Bay.
Scottish Territorial Waters May 2008	23 site applications / Expressions of Interest 10 projects were awarded consent with a total capacity of 6.4GW SEA completed in 2010
Extension to Rounds 1 and 2 May 2010	In May 2010 the government announced extensions to Round 1 and 2 wind farms. This will add an additional 2 GW of capacity across five different sites including Burbo Bank and Walney Extensions (both proximate to North Wales' ports).
Round 3 Jan 2010 onwards	In January 2010 the government announced 9 further zones, each with the potential to contain multiple wind farm developments. In total the scale of R3 is much greater than any previous development with a total of 32GW of capacity suggested (compared to a total of 8 GW from R1 and R2). The R3 developments closest to Wales are the Atlantic Array (in the Bristol Channel) which has a maximum capacity of 1.5 GW and a development zone in the Irish Sea which has a maximum capacity of 4.2GW.

Actual and Potential Capacity in Wales

Installed

Currently there are two operational offshore wind farm sites in Welsh waters (North Hoyle and Rhyl Flats) with a total capacity of 150MW. As described in Section 2, these projects were constructed entirely out of the Port of Mostyn, and Mostyn continues to provide O&M services to these projects.

In addition to this, Mostyn was involved in the construction of the Burbo Bank and Robin Rigg projects; but in these cases, O&M activities will be serviced by Liverpool and Workington respectively.

Table 4.4: Installed Capacity

Name	Location	Capacity (MW)	Notes
North Hoyle	North Wales Coast	60	Constructed out of Mostyn in 2002; O&M out of Mostyn
Rhyl Flats		90	Constructed out of Mostyn in 2007-09; O&M out of Mostyn
Burbo Bank	Liverpool Bay	90	Constructed out of Mostyn in 2006. O&M activities served by Liverpool
Robin Rigg East and West	Solway Firth	180	Mostyn involved in installation of foundations only (one of four ports involved). O&M activities served by Workington.
Total		420	

Planned and Potential sites

Table 4.5 summarises offshore wind developments in the development pipeline where involvement by a Welsh port is either already confirmed or potentially possible.

Table 4.5: Planned Capacity

Name	Capacity (MW)	Notes
Walney 1 + 2	367	Received full planning approval. Developer is Walney Offshore Windfarms (partnership of Dong Energy and SSE) Phase 1 (183.6MW) currently being constructed out of Mostyn (turbines) and Barrow (foundations), to be completed by Q1 2011. Phase 2 (183.6MW) to be constructed in 2011 out of Mostyn and Barrow. O&M activities likely to take place out of Barrow.
Gwynt Y Mor	576	Planning approved. Developer is RWE Npower Renewables. Port of Mostyn to be involved in construction and ongoing O&M activities. Expected construction from 2012 with target completion by 2014. Siemens will be responsible for the supply, installation and maintenance of the turbines for the scheme.
Burbo Bank Extension	234	Site awarded 2010. Planning application expected by 2012 from developer Dong Energy. Likely that the Port of Mostyn will be involved in construction, but not ongoing O&M activities. Expected construction period 2014-2015. There is some risk associated with Round 1 and 2 extension projects such as the Burbo Bank extension and Walney extension, due to delays and changes to the IPC process.
Walney Extension	750	Site awarded 2010. Planning application expected by 2013 from developer Dong Energy. Likely that the Port of Mostyn will be involved in construction, but not ongoing O&M activities. Expected construction period 2014-2015. There is some risk associated with Round 1 and 2 extension projects such as the Burbo Bank extension and Walney extension, due to delays and changes to the IPC process.

Name	Capacity (MW)	Notes
Atlantic Array	1,500	Major development zone in Bristol Channel awarded through R3 process to developer RWE npower renewables. Planning application expected in 2012. Expected to be one of the earliest R3 schemes to come forward, with construction commencing in 2015, and target completion by 2019. Port infrastructure is one of the issues at present. RWE are currently considering port options, and are in discussion with several major ports in the Bristol channel and alternative options such as Belfast. It is possible that RWE may construct the scheme out of more than one port. There are several possible port options in relation to O&M activities. Swansea is the closest Welsh port to the site – which may offer an advantage in terms of future O&M activities – although some ports in North Devon are a similar distance. Swansea is already being utilised by some of the vessels undertaking surveys in relation to the development.
Irish Sea	4,200 (max)	Major development zone in Irish Sea awarded through R3 process to developer Centrica. The zone could contain a number of wind farms up to a maximum capacity of 4.2GW. Centrica are currently undertaking a number of zonal studies to investigate the extent of constraints within the development zone (e.g. environmental / geological / shipping) which may potentially reduce the capacity which can practically be developed. Parts of the zone are in very deep water (up to 80m) which presents practical and cost challenges. Construction could potentially start in 2016 and continue until 2020 – although it is possible that a range of factors such as funding and port capacity may mean construction is delayed and/or extended. This is one of the least well-developed R3 projects at this stage, and still needs considerable work to determine the final scheme. Centrica are not yet in discussions with ports about their role, but have undertaken some preliminary port capability assessments work. There are a number of ports in North Wales, Northern Ireland, Republic of Ireland, Scotland, England and the Isle of Man which could potentially be involved in the project. Overall there is a much greater level of uncertainty related to this development than any of the others, as the development plans are at an early stage.
Total	**7,627**	

It is worth noting that there is considerable concern from the offshore wind industry that it will not be possible to deliver all of the R3 projects around the UK by 2020, due to a number of factors such as the availability of finance, planning delays, and capacity constraints. The Crown Estate projections are that 48GW of offshore wind could be delivered in the UK by 2020, however industry sources suggest that 23GW is a more realistic figure by 2020 (BVG, 2011).

Longer Term Projects

The UK is forecast by the European Wind Energy Association (EWEA) to be the largest European market for offshore wind developments, with more than 40 GW of developments by 2030.[21] This largely reflects the cumulative capacity which will be delivered through leasing rounds 1-3; however it is possible that other development rounds may come forward beyond the current R3 projects identified. In order to deliver the forecast offshore wind requirements it will be necessary for the UK to install up to 1,800 turbines per year at peak, creating a huge development potential for offshore manufacturing capability to be established in the UK. However, the awarding body The Crown Estate has not made a firm commitment to any further development beyond Round 3, and therefore there is a high level of uncertainty around this. On this basis, DTZ has not attempted to quantify the economic impact beyond known projects and leasing rounds.

Economic Impact on Ports

In order to assess the impact of an offshore wind project on ports it is essential to consider each of the phases of its lifecycle individually – in terms of their relative scale and likelihood of impact on ports. The development of an offshore wind farm involves significant upfront capital expenditure, which can be broken down into the following main elements:

Table 4.6: Offshore Windfarm Costs (Source: BVG Associates, based on industry estimates)

Category	Total percentage of CAPEX	Component	Component Percentage of CAPEX
Development & Consent	**1%**	Environmental Survey	<1%
		Sea Bed Survey	<1%
		Met Mast	<1%
		Development Services	<1%
Manufacture of Turbine	**40%**	Rotor	11%
		Nacelle	23%
		Tower	6%
Manufacture of Balance of Plant	**31%**	Foundations	16%
		Cables	6%
		Offshore Substations	7%
		Onshore Substation	3%
Deployment (Installation & Commissioning)	**27%**	Foundations	6%
		Cables	9%
		Turbines	9%
		Offshore Substations	<1%
		Port costs	3%

Offshore wind CAPEX has been increasing over recent years, and currently stands at around £3.1 million per MW[22]. The increase in capital expenditure is the result of a combination of factors including:

[21] Source: EWEA 2010

[22] UK Offshore Wind: Charting the Right Course, Scenarios for offshore capital costs for the next five years, BWEA, June 2009

- **More challenging physical conditions** such as increasing water depth and distance to shore.
- Changing **commercial conditions** including fluctuations in the Euro/Sterling exchange rate (to date, the large majority of turbines and foundations have been manufactured in Continental Europe), market dynamics in the turbine market, and the price of steel.
- **Improvements in technology and processes** have been observed but given the increasingly challenging nature of Round 3, it is expected that CAPEX will remain at the same level for the next five years before starting to see some reduction

Following commissioning of a wind farm, **Operations and Maintenance** activities must be undertaken over its lifetime. A wind turbine can have a 25 year lifetime, although the lifetime of a wind farm may be extended further if it is repowered. O&M costs have been estimated at £79,000 per MW per annum.[23]

DTZ have assessed the relevance of each of the stages in terms of economic impact to ports in Wales as follows:

1 - Development & Consent

The development and consenting phase of a project covers the process from the project's conception up to the point of financial close or a utility board's decision to proceed, when firm orders are placed with key suppliers. This will include environmental, geophysical and geotechnical surveys covering the wind farm site, the route of the cable to shore and the onshore substation site.

- Environmental surveys are carried out prior to, during and after construction. Offshore surveys are undertaken with the use of ships (from fishing boats to purpose-built craft) or aircraft.
- Geotechnical surveys require specialist vessels to allow accurate positioning and drilling for core samples. For example, it is planned that Atlantic Array will require 25 bore holes to be drilled.

Met masts are erected at a proposed wind farm site to monitor and analyse key meteorological and oceanographic conditions at the site. For example, it is planned to install one met station for Atlantic Array early in 2011, and this will remain in operation throughout the life of the wind farm.

A range of other development services are also required including applying for consent to build the wind farm, engineering studies, financial and supply chain planning and human impact studies.

Port requirements

Within this phase, there is a requirement for port use associated with undertaking environmental and sea-bed surveys, and the construction and monitoring of a meteorological mast; however the port infrastructure required is minimal. Proximity to the development site is also an important consideration - developers will tend to access project sites through the closest port which meets their requirements. The Port of Mostyn has been utilised during the development phase for nearby projects such as North Hoyle, and Rhyl Flats, and is likely to be used for the Gwynt Y Mor project. In addition to this it is worth noting Mostyn is the operational base for Siemens (70 staff) and Dong Energy (12 staff) project development teams. The Port of Swansea has already been used by survey vessels in connection with the Atlantic Array project

[23] Ernst & Young (2009) Cost of and financial support for offshore wind

Competitive Position of Welsh Ports

In DTZ's view, Mostyn is the natural access choice for access to the Gwynt Y Mor project (given its proximity), but is perhaps too distant from further projects such as the Burbo Bank Extension and Walney 3 project which are likely to be served by Barrow or Liverpool during the development phase. In terms of the Atlantic Array project, survey activities are already taking place out of Swansea (which is located close to the development site), but other ports in South Wales and North Devon may offer competition. It is not clear which port(s) would be utilised for the Irish Sea Zone - Holyhead is close to parts of the development site, but there will be competition from a number of other ports in the Irish Sea.

Calculation of Economic Impact

The following assumptions have been used to estimate the total benefit to Welsh ports:

- The Development and Consenting phase amounts to around 1% of total capital expenditure.
- Of this total, around a third relates to surveys and construction of the Met Mast, which will have an impact on a local port.
- The remainder relates to other development services, which could be located in Wales or elsewhere in the UK – for example Centrica's development team is based in Windsor, and RWE in Swindon. There are 82 jobs at Welsh Ports associated with offshore wind development activities (Siemens and Dong Energy).
- It has been assumed that Welsh ports capture 50% of expenditure on surveys and the met mast for the Gwynt Y Mor, Atlantic Array and Irish Sea zones (assumption based on consultations with developers and ports).
- The employment supported by this revenue is estimated using a ratio of £98,000 per FTE worker in the Renewable Energy sector, and the GVA impact is calculated using a ratio of £47,000 per FTE[24]

As shown in Table 4.7, the development and consenting element of offshore wind projects will support around 110 jobs in Welsh Ports on average over the period 2010-2020. Employment will be higher in the short term (2010-2015) than the medium term (2015-2020), as development activities for projects such as the Atlantic Array and Irish Sea zone will take place over the next five years – beyond which these projects will move into the construction phase.

Table 4.7: Summary Economic Impact Results

	Total turnover, £m (2010-2020)	Total GVA, £m (2010-2020), undiscounted	Average employment (2010-2020)
All Scenarios	£115	£55	107

[24] Source: DTZ (2010) Economic contribution of the Renewable Energy and Energy Efficiency sectors in the South West of England – figures relate to the Renewable Energy sector

2 - Manufacture

The cost of turbines and associated plant make up more than **70% of the total capital expenditure associated with a wind farm**.[25] The vast majority of offshore wind turbines and components are currently manufactured in Denmark, Germany, and the Far East. Offshore wind is expected to play a crucial role in meeting the renewable energy targets of a number of EU countries (including the UK). In order to meet this demand, new manufacturing and construction capacity is required (although not necessarily located in the UK) to achieve the necessary build rates.

As technology improves it is expected that turbines sizes will grow, as larger turbines reduce the cost of energy. Whereas today, most offshore wind turbines have a rated power of either 3MW or 3.6MW, it is expected that by 2015 a large proportion of offshore turbines will be 5MW or 6MW. This has an impact on the physical size of the turbines so whereas a sub-4MW turbine may have a total mass of around 500 tonnes, a 5-6MW turbine may have a total mass of around 800 tonnes. This means that it will become difficult for these components to be moved long distances by road so the new manufacturing facilities will need to be built in coastal locations.

Because of the scale of the UK domestic market, it is anticipated that the UK will attract a number of turbine manufacturers. There have been a number of recent announcements in relation to turbine manufacturers establishing production facilities in the UK, including a number of 'super-clusters' of supply chain companies around the Medway, Humber, Tyne, Tees and Forth estuaries. However, there have not been any firm announcements to date concerning the establishment of a large-scale turbine manufacturing base in Wales.[26] This is because the focus of UK and Continental development is in North Sea and manufacturers will seek to deliver turbines from their port-based factories directly to the wind farm. The Irish Sea and Bristol Channel are significant markets but they account for less than 10% of the European market, and facilities based on the UK's west coast would only be able to directly serve the UK west coast and Irish markets.

On this basis, we have concluded that it is **unlikely that Wales will attract a major turbine manufacturing facility, and have not considered this further within the study**. Notwithstanding this, there may be opportunities for the manufacture of niche components – for example Prysmiam are providing onshore cabling for the Gwynt Y Mor and Walney projects. However such activities are not port-based, and are therefore outside the scope of the quantitative assessment for this study (supply chain linkages are briefly explored in Section 5.2).

3 – Deployment

This phase involves the transportation, installation and commissioning of wind turbines and associated plant, and accounts for around **27% of the total capital cost of a wind farm**.[27] Parts are transported to a construction port relatively close to the wind farm before final assembly and installation of the turbines and the balance of plant.

[25] Source: BVG Associates, from industry benchmarks
[26] The Welsh Government has indicated that there has been some consideration by interested parties in the development of manufacturing/assemblage and other supply chain activities around the coast of Wales.
[27] Source: BVG Associates, from industry benchmarks

The construction activity is undertaken in a number of sequential phases. Foundations are taken out to site and installed by jack-up vessels or by a barge delivering to a heavy lift vessel, and monopiles are driven into the seabed using a specialist piling hammer or fitted into a drilled hole. Substations will usually be transferred directly from a quayside fabrication site to a pre-installed foundation by a heavy lift floating crane. Subsea cables are normally buried 1.5m to 3m under the seabed by specialist vessels that carry carousels with long lengths of subsea cable (up to 70km). Depending on the strategy being employed, these may be supported by trenching ploughs, subsea remotely operated vehicles (ROVs) and divers. Turbines are typically installed using a "jack-up" vessel that is able to lower legs onto the seabed to lift itself out of the water and create a stable platform. The nacelle, hub, blades and tower are loaded on to the vessel which carries them to site and assembles them on the foundation.

In addition to the specialist lifting vessel, smaller crew mobilisation vessels are required to transport the technicians and engineers to and from installation vessels at the site. Guard and survey vessels are also required to support site operations. An offshore wind farm may use 30 different vessels during construction, although developers are seeking to limit numbers to reduce costs

This phase is completed when the wind farm is handed over to the operations team as a completed asset that is generating electricity being fed into the onshore grid.

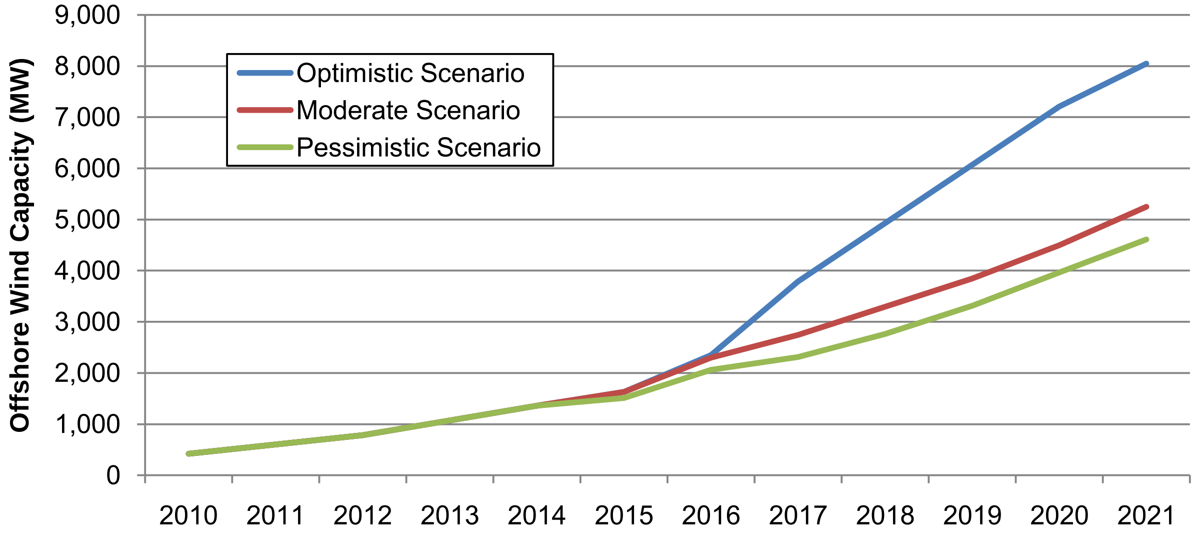
Timing / phasing

The duration of the construction phase varies depending on the scale of the project. For smaller projects up to 300MW (such as the current Walney 1 project), construction can be completed within one year, but larger projects can take 2-5 years and are often broken down in to more manageable phases of 300-500MW.

DTZ and BVG Associates have made an assessment of the likely scale and timetable for the deployment of offshore wind projects involving (or potentially involving) Welsh ports, as shown in Figure 4.3. This is based on the following assumptions:

- **Optimistic Scenario** – all known projects are delivered as planned, with 8.0GW of capacity in place by 2020 (including the 420MW existing). This scenario assumes that the Irish Sea zone delivers 4.2GW of capacity by 2020 – or 840MW per annum for the period 2016-2020. Peak deployment of 1.1GW p.a. would be reached in the period 2016-2019.
- **Moderate Scenario** – this scenario has been developed by DTZ/BVG Associates based on industry feedback, and is consistent with industry expectations that a realistic deployment figure of 20-23GW is achievable for the UK by 2020. This assumes that there are delays and possible cancellations to future projects due to constraints, and that the rollout of the Irish Sea is slower than expected, with the deployment period extended to 2025. Similarly, this scenario assumes that the Atlantic Array project is not completed until 2021 (i.e. deployment of 250MW p.a. for the period 2015-2020). All other projects are delivered as planned, with total capacity of 4.6GW by 2020, and 7.7GW by 2025. Peak deployment of 650MW+ per annum from 2019 onwards.
- **Pessimistic Scenario** – this scenario is largely the same as the Moderate Scenario, however it assumes a greater level of risk to projects. It assumes that the capacity of the Irish Sea zone is reduced by 25% due to constraints within the development zone, and is further delayed by 1 year compared to the Moderate Scenario. Total deployment of 3.8GW is reached by 2020, and 6.5GW by 2026. Peak deployment of over 400 MW from 2018 onwards.

Figure 4.3: Offshore Wind Deployment Scenarios



Port requirements

This phase of development has a significant requirement for ports which meet the following requirements:

Table 4.8: Port Requirements for Deployment Phase

Proximity to generation site	Ideally developers want to use a port no more than 100 miles from the installation site to minimise transit times and maximise weather windows.
Laydown & assembly space	15ha site would be able to install approximately 300MW per year
Quayside length	300m total – to allow two 120m jack up rigs to dock simultaneously
Vessel length	110m (min) - 140m (max)
Water depth	7m (min) - 11m (max)
Tidal gate restrictions (width)	Ideally no width restrictions, but possible to work with restrictions of 30-55m.

Competitive Position of Welsh Ports

The fact that the west coast of the UK is unlikely to see the creation of large, port-based manufacturing facilities means that developers will require local construction ports from which to install their wind farms. Depending on their scales, such ports will be able to serve a number of different developments and, depending on their location and the infrastructure put in place during this stage, may be a strong position to act as the operations and maintenance base in the long term.

The Port of Mostyn has already been used as the construction port for a number of projects since 2002 – North Hoyle, Burbo Bank, Robin Rigg, Rhyl Flats, and the ongoing Walney project. Mostyn will be used for the Gwynt Y Mor project and the Burbo Bank and Walney extensions.

In terms of the Atlantic Array and Irish Sea developments, the decision has not yet been taken on which port(s) will be used for construction. The following assumptions have been made by DTZ, tying in with the scenarios described above:

Table 4.9: Assumptions on port use

	Atlantic Array	Irish Sea
Port assessment	The developer RWE npower have carried out a number of port studies, and are currently considering which port(s) would be used for construction activities. This includes a number of ports in South Wales, plus a range of competitor ports in other regions such as Bristol and Belfast.	Centrica are at an early stage of development of the Irish Sea zone, and have not yet considered port options in depth. North Wales' ports which are competitively placed to exploit this market opportunity include Mostyn and Holyhead. There are a number of strong competitor ports in the Irish Sea such as Belfast, Barrow, Liverpool, Birkenhead, and Ellesmere.
Number of ports	Given the scale of the project and the lack of any one port with sufficient capacity, it may be the case that the construction activity is split between two ports.	Given the scale of the project, it is likely that it would be constructed out of two, three or four ports.
Assumptions: proportion of relevant construction activity in Welsh Ports		
Optimistic Scenario	100% activity within Welsh ports	50% - two ports involved including one in Wales
Moderate Scenario	50% - two ports involved including one in Wales	33% - three ports involved including one in Wales
Pessimistic Scenario	0% - all activity goes outside the region (e.g. to Bristol or Belfast)	25% - four ports involved including one in Wales

Calculation of Economic Impact

The following assumptions have been used to estimate the total benefit to Welsh ports:

- Assume total capital cost of £3.1 million per MW for all future projects[28]
- Assume that offshore substations and cabling are delivered direct to site from the manufacture location (which is likely to be outside Wales), and are deployed by specialist vessels. These elements will not have an impact on local ports.
- The elements of the deployment phase which may impact on ports proximate to the construction site are **foundations and turbines**. These account for around 18% of total CAPEX (including associated port costs). Note that for the Walney projects (phases 1, 2 and 3), Mostyn will be involved in the installation of turbines only (as foundations are being constructed out of Barrow), which accounts for 10% of total CAPEX.
- Based on industry benchmarks, it has been assumed that the employment created by the installation of the foundations and turbines amounts to 1.9 job-years per MW. For simplicity we have assumed that the employment impact takes place in the year before capacity is energised (in practice the deployment period may be longer or shorter than one year or split across two calendar years).
- Assume timing/phasing of deployment as set out above
- Assume Welsh ports' share of total activity as set out above
- The expenditure and GVA supported by this employment is estimated using a ratio of £187,000 turnover per FTE worker for the Construction of Civil Engineering projects sector, and a ratio of £59,000 GVA per FTE (source: Annual Business Inquiry, 2008).

[28] UK Offshore Wind: Charting the Right Course, Scenarios for offshore capital costs for the next five years, BWEA, June 2009

* It is worth noting that a number of alternative approaches were considered by DTZ, but all came up with similar impact results to the above approach.

The economic impact results for the three scenarios are shown in Table 4.10. The deployment of offshore wind projects is estimated to support between 230 and 880 FTE jobs in Welsh ports on average over the period 2010-2020. In all scenarios, employment is estimated to increase to around 550 jobs in 2012 as the Gwynt Y Mor project is constructed. In the optimistic scenario, employment is expected to continue to increase to over 1,350 FTEs in the period 2016-2019, as the Atlantic Array and Irish Sea projects are deployed. In the moderate scenario, employment is forecast to remain above 350 FTEs at all times, but fluctuates considerably as a number of projects come forward. In the pessimistic scenario, employment is estimated to fall back to fewer than 200 FTEs in the medium term (note that this scenario assumes that Welsh Ports have no role in relation to the Atlantic Array project, and a limited role in the Irish Sea project).

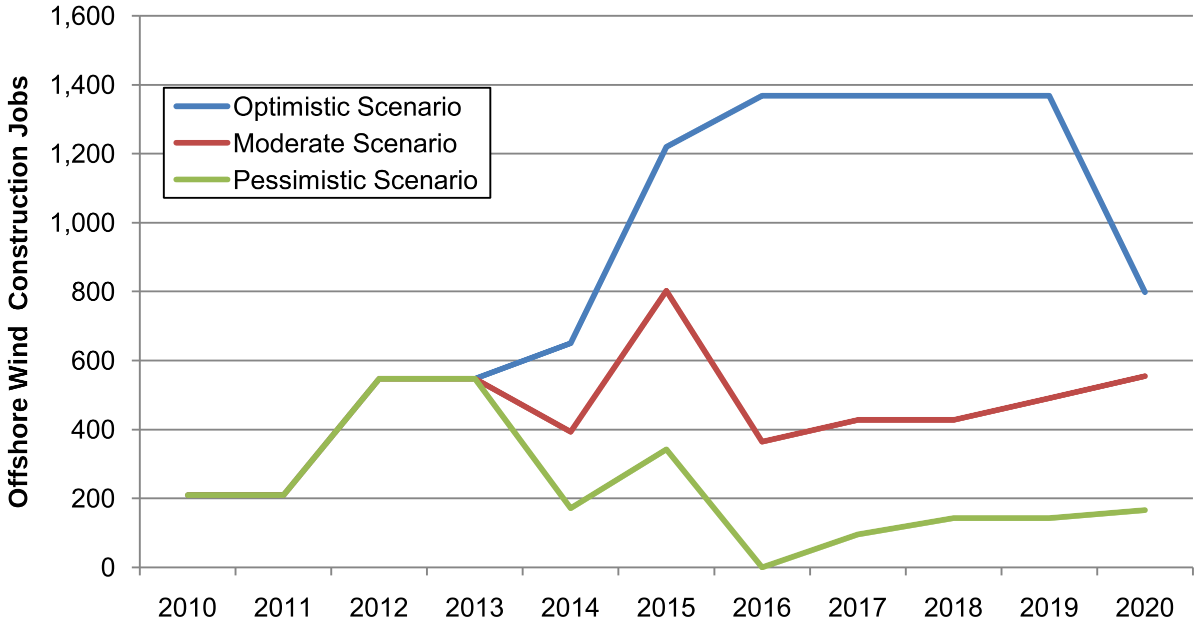
The deployment of offshore wind projects could create between £0.4 billion and £1.8 billion of turnover in Wales over the period 2010-2020, and a GVA of between £150 million and £570 million.

As noted in Section 2, employment within this phase will include jobs based on land at port sites (around 15% of the total), plus jobs on installation vessels (85% of the total). For offshore activity, one full-time equivalent 'job' may represent a number of employees working on double-shift rotations and only during the summer months.

Table 4.10: Summary Economic Impact Results

	Total turnover, £m (2010-2020)	Total GVA, £m (2010-2020), undiscounted	Average employment (2010-2020)
Optimistic Scenario	£1,807	£570	878
Moderate Scenario	£931	£294	452
Pessimistic Scenario	£482	£152	234

Figure 4.5: Summary Economic Impact Results



4 - Operations and Maintenance

Wind farms incur ongoing Operation and Maintenance costs over their lifetime. To date there have been a range of estimates about the expected level of OPEX, with some uncertainty about what is included:

- Land rent for the turbines to the Crown Estate
- Building rent for the wind farm's control building, component warehousing and vessel pontoons to the relevant port operator
- Wind farm routine maintenance providing ongoing surveys of turbines, electrical systems and subsea cables and unscheduled repairs. This will include engineering and monitoring staff salaries, boat charter, spare components, electrical and mechanical tools, cleaning equipment and personal protective equipment. This will be covered by the turbine manufacturer during any warranty period (typically 5 years) and thereafter by the developer
- Ongoing environmental surveys of the site including marine and bird life and seabed conditions.
- Management fee – for day to day operation
- Insurance and grid connection charges.

Timing / phasing

O&M activities commence when the construction period is complete and the wind farm is energised, and typically last for 20 to 25 years (or longer if a project is re-powered). O&M activities will ramp up considerably in the period to 2020 as the projects described in the above section come forward.

Port requirements

The O&M phase of an offshore wind project creates a requirement for port uses, and O&M teams are usually port-based. While many of the vessels used for O&M are small and have relatively shallow draft, developers typically require their O&M ports to have 24 hour access. There is a requirement to be able to berth up to eight 22m vessels simultaneously, plus up to 5 hectares of offices and storage. There is a strong incentive to choose the closest suitable port to the development to minimise transfer time.

Competitive Position of Welsh Ports

The Port of Mostyn is already active as the O&M base for the North Hoyle and Rhyl Flats projects, and will become the O&M port for the Gwynt Y Mor project once completed. The more distant projects of Burbo Bank, Robin Rigg, and Walney will be serviced by closer ports - Liverpool, Workington, and Barrow respectively.

In terms of the Atlantic Array and Irish Sea developments, the decision has not yet been taken on which port(s) will be used for O&M activities. The following assumptions have been made, tying in with the scenarios described above:

Table 4.11: Assumptions on port use

	Atlantic Array	Irish Sea
Port assessment	The developer RWE npower have carried out a number of port studies, and are currently considering which port(s) would be used for O&M activities. Possible ports in Wales include Port Talbot, Swansea, Newport and Milford Haven, which all have sufficient space available. Competitor ports include Bristol and smaller ports in North Devon close to the development site (e.g. Ilfracombe).	Centrica are at an early stage of development of the Irish Sea zone, and have not yet considered port options in depth. North Wales' ports that are competitively positioned to exploit this market opportunity include Mostyn and Holyhead, but there could be O&M opportunities for other ports. There are a number of strong competitor ports in the Irish Sea such as Belfast, Barrow, Liverpool, Birkenhead, and Ellesmere, and smaller ports in the area.
Number of ports	There may be benefit in splitting O&M activities between two or more ports to ensure port availability at all times, and due to the size of the development zone.	There may be benefit in splitting O&M activities between two or more ports to ensure port availability at all times. Due to the size of the development zone it may be beneficial to spread O&M sites across the Irish Sea.
Assumptions: proportion of O&M activity in Welsh Ports		
Optimistic Scenario	100% - all activity within Welsh port(s)	50% - two ports involved including one in Wales
Moderate Scenario	50% - two ports involved including one in Wales	33% - three ports involved including one in Wales
Pessimistic Scenario	25% - several ports involved including one in Wales	25% - four ports involved including one in Wales

Calculation of Economic Impact

The following assumptions have been used to estimate the total benefit to Welsh ports:

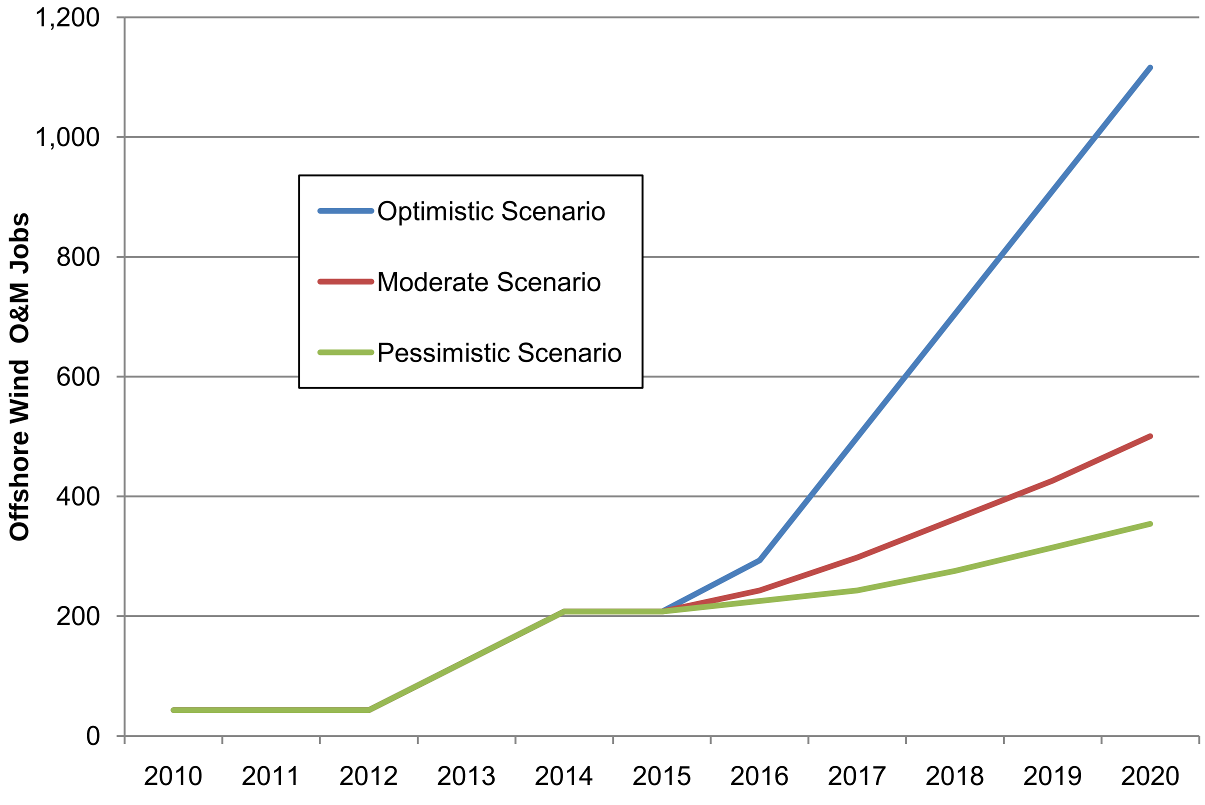
- Assume timing/phasing of deployment and O&M as set out above
- Assume total OPEX cost of £79,000 per MW p.a. (Source: Ernst & Young, 2009)
- Assume that 35% of OPEX relates to direct employment (source: BVG Associates, from industry estimates)
- Assume that just over 60% of direct employment is within the O&M port (source: BVG Associates, from industry estimates)
- Assume Welsh ports' share of total activity as set out above
- The direct employment supported by this revenue is estimated using an average labour cost of £60,000 per O&M job (source: BVG Associates, from industry estimates. This includes wages and associated taxes etc)
- It is worth noting that a number of alternative approaches were considered by DTZ, but all came up with similar impact results to the above approach.

The economic impact results for the three scenarios are shown in Table 4.12 and Figure 4.6. Employment is expected to increase over the period from the current level of 40 FTEs to between 350 and 1,100 FTEs by 2020. The average employment over the period 2010-2020 is forecast to be between 190 and 380 jobs in Welsh ports. This is estimated to generate a total turnover of between £360 million and £720 million, and a GVA of between £125 million and £250 million over the period 2010-2020.

Table 4.12: Summary Economic Impact Results

	Total turnover, £m (2010-2020)	Total GVA, £m (2010-2020), undiscounted	Average employment (2010-2020)
Optimistic Scenario	£719	£252	381
Moderate Scenario	£428	£150	227
Pessimistic Scenario	£357	£125	189

Figure 4.6: Summary Economic Impact Results



Aggregate Impact

The following table and chart aggregate the impacts of offshore wind projects on Welsh ports across the Development and Consenting, Deployment, and Operations and Maintenance phases. As shown, there is significant variation between the scenarios in terms of the estimated level of employment and wealth creation in Welsh ports. The variance is primarily driven by the **timing and choice of construction port for the Atlantic Array and Irish Sea projects**.

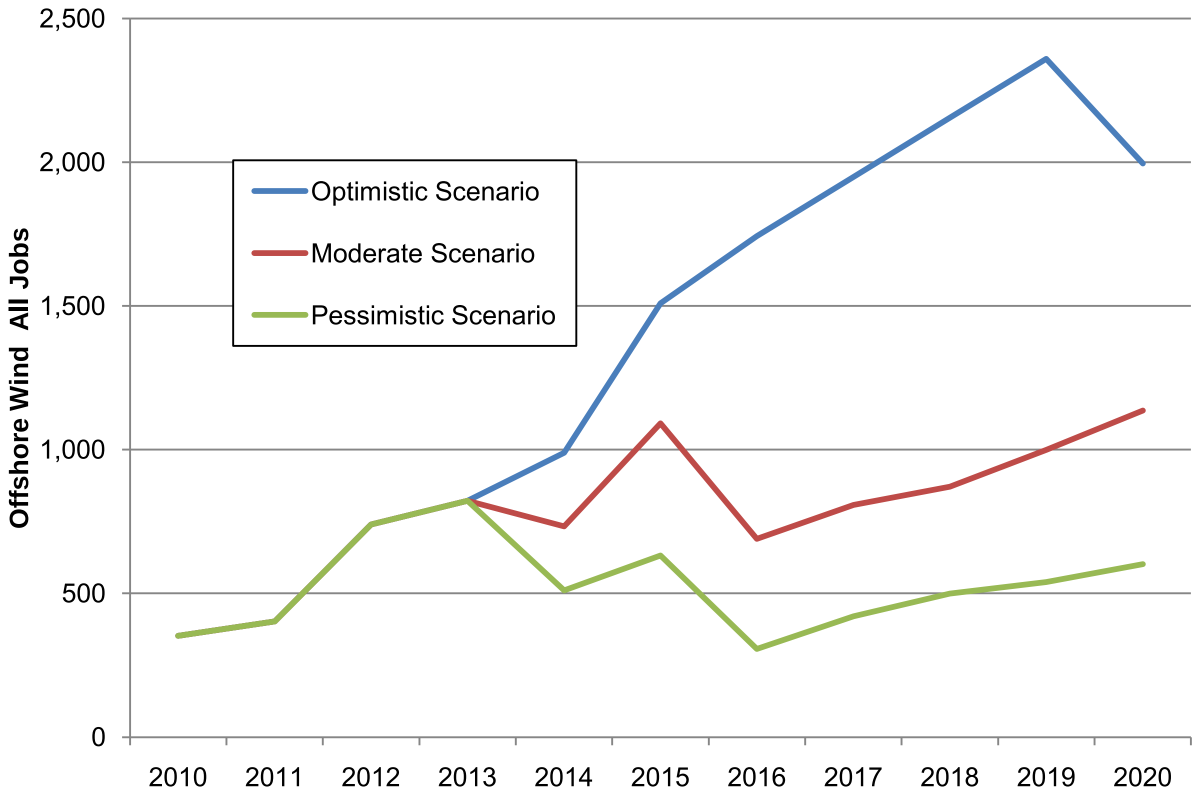
In the Optimistic Scenario, the number of jobs is expected to increase from the current figure of 350 FTEs to a peak of 2,360 FTEs in 2019 – an increase of 2,000 FTEs - but then tail off in 2020 to 2,000 jobs once the Atlantic Array project is completed (see Figure 4.6). Around **two-thirds of the employment impact is estimated to relate to the deployment phase of projects**, although the number of O&M jobs are forecast to also increase significantly over the period. In the moderate scenario, the number of jobs is expected to fluctuate between 650 FTEs and 1,050 FTEs over the period 2012-2020. However in the pessimistic scenario (which assumes limited involvement in the Atlantic Array and Irish Sea projects) the number of jobs is estimated to be considerably lower, reaching only 540 FTEs by 2020.

Overall, the scenarios demonstrate that the choices of construction port (and to a lesser extent O&M port) for the Atlantic Array and Irish Sea projects have a significant bearing on the economic impact results.

Table 4.13: Summary Economic Impact Results

	Total turnover, £m (2010-2020)	**Total GVA, £m (2010-2020), undiscounted**	**Average employment (2010-2020)**
Optimistic Scenario	£2,641	£877	1,365
Moderate Scenario	£1,474	£499	786
Pessimistic Scenario	£953	£332	530

Figure 4.6: Summary Economic Impact Results



Long Term Impact

In assessing the impact of offshore wind in the long term, there are a number of distinct elements to consider:

- Deployment of known projects which are delayed beyond 2020 (in Moderate and Pessimistic Scenarios)
- O&M of all known projects on an ongoing basis
- Repowering of existing projects at the end of the turbine life
- Deployment and O&M of new projects beyond R3

Firstly, in terms of deployment of known projects, both the Moderate and Pessimistic scenarios assume that the deployment of the Irish Sea project will be over a longer time period than expected – perhaps to 2025. This would support construction employment over an extended period of time. This has been modelled in line with the construction employment to 2020 above.

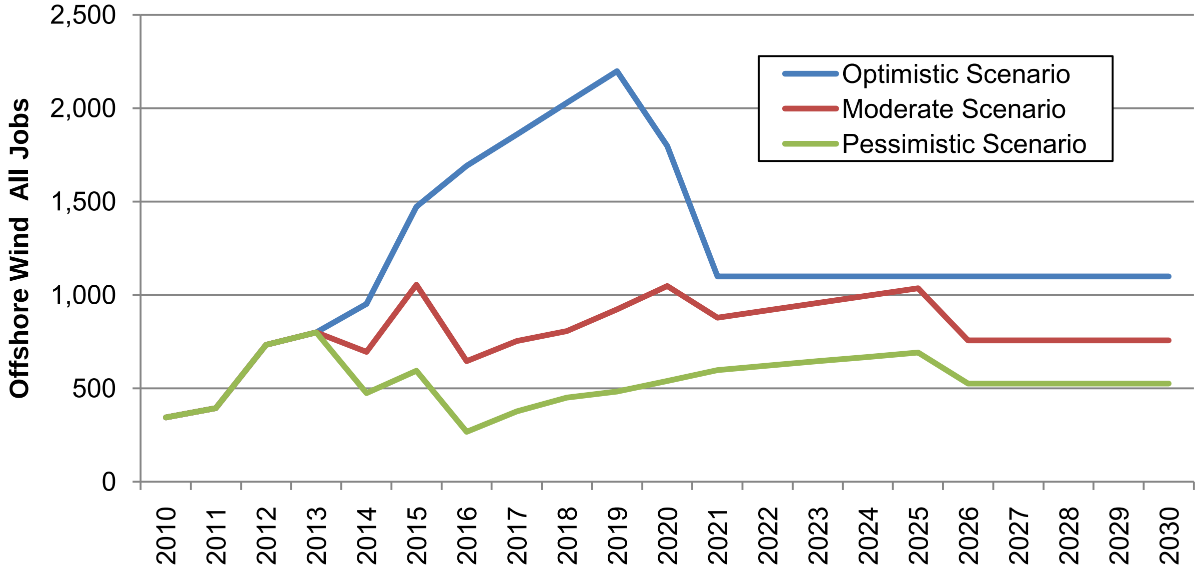
Secondly, the Operations and Maintenance of current projects and projects coming forward between now and 2020 will continue into the long term. This has been modelled as per the O&M impacts in the short to medium term above, bearing in mind the timing of additional capacity coming on stream in each scenario.

The third aspect is that existing projects may be repowered at the end of the useful lifetime of turbines. This involves the deployment of new wind turbine generators, but the retention of other wind farm components such as foundations and/or cabling.

The fourth aspect is that additional projects may come forward beyond those which are currently under consideration, potentially including additional leasing rounds beyond Round 3. However, the level of deployment of new offshore wind capacity post-2020 is extremely uncertain. It is possible that there may be extensions to current or pipeline projects, or additional leasing rounds beyond the current Round 3; however there are no details of the scale or location of such developments – as the current focus of the Crown Estate is on Round 3. Therefore it is not possible to assess the potential economic impact from deployment of additional projects in the long term (post-2020).

Drawing together the impacts from known projects (i.e. the first two elements above), the employment impacts have been calculated as shown in Figure 4.7. The chart shows that in the Optimistic Scenario, employment levels are expected to remain at 1,100 FTEs. In the Moderate and Pessimistic Scenarios, the assumed delays to the Irish Sea project would mean that there would be some employment supported by construction activity in the long term (to 2025). It is estimated that O&M employment would eventually stabilise at 750 jobs in the Moderate Scenario, and 525 FTEs in the Pessimistic Scenario.

Figure 4.7: Long Term Impact – Offshore Wind



Summary - Offshore Wind

Capacity

- 420 MW deployed to date, plus a further 183.6 MW ongoing
- Up to 7.6GW in the development pipeline – focus in the Irish Sea, plus the Atlantic Array project in the Bristol Channel
- Scenario analysis shows that there could be between 3.8 GW and 8.0 GW of installed capacity by 2020

Economic Impact

- Economic impact on Welsh ports in the Development & Consenting, Deployment, and Operation & Maintenance phases (Manufacturing not relevant as will be undertaken elsewhere)
- Welsh ports are well placed to serve opportunities in the Bristol Channel and the Irish Sea, but there is significant competition from a number of other ports. Major developments such as the Atlantic Array and Irish Sea could be constructed and maintained out of more than one port.
- **Development & Consenting** phase is estimated to support around 110 FTE jobs on average over period 2010-2020, and reflects both survey work and management functions of low carbon energy developers based at North Wales' ports.
- **Deployment** accounts for 27% of total capital cost of a wind farm, and is forecast to have a significant economic impact on Welsh ports. The deployment phase has significant requirements for port infrastructure – in particular large areas of lay-down space and the ability to accommodate large installation vessels. The average employment supported by deployment activities over the period 2010-2020 is estimated to be in the range of 230-880 FTEs, depending on whether Welsh ports are chosen for use in major projects.
- **Operation and Maintenance** activities continue over the lifetime of the windfarm, which is typically 25 years+. O&M activities have a moderate requirement for port usage – generally involving smaller vessels, but requiring 24 hour access. Proximity to the development site is a key consideration. O&M employment is estimated to ramp up considerably over the period to 2020 as new projects are constructed, and could support 350-1,100 FTE jobs by 2020.
- Overall, the offshore wind sector could support an average of **530 – 1,360 FTE jobs** (depending on the scenario). The outcome will be heavily influenced by the choice of port(s) for the deployment and O&M phases of major projects. There is still considerable uncertainty about the choice of ports for the Atlantic Array and Irish Sea projects.
- This is estimated to support between £950 million and £2,640 million of turnover, and £330 million and £880 million of GVA over the period 2010-2020.

4.3 Biomass

Overview of Technology

Biomass energy involves the generation of energy from a biological source such as wood, energy crops, wastes or landfill gas. Typically the fuel source is combusted to provide electricity and heat, although there are also some alternative advanced treatment technologies such as pyrolysis and gasification. The scale of biomass plants varies from small installations providing energy for a single dwelling or community building such as a school; through to large scale plants supplying energy to a whole district and exporting power to the national grid.

For biomass plants to be considered an effective source of low carbon energy the fuel source needs to be easily accessible (i.e. located nearby or well connected to a major transport route). If the fuel source has to be transported over long distances then the carbon saving relative to conventional forms of energy is diminished. Fuel sources available for biomass energy generation in Wales include indigenous biomass (forestry, energy crops, waste etc), and imported biomass.

As well as dedicated biomass plants, it is also possible to co-fire biomass in conventional coal power stations for electricity generation. The UK Biomass Strategy (2007) sets out the government's ambition to increase the use of biomass for power generation, including through co-firing in conventional power stations; and estimates that around 1.4 million tonnes of biomass was co-fired in the UK in 2006. Of this total, 46% was from indigenous biomass sources, whilst the remaining 54% was imported biomass, almost all of which arrived in the UK by ship.

Actual and Potential Capacity

Installed Capacity

There are currently 19 dedicated biomass facilities across Wales, with a generation capacity of **84.7MW**. The majority of capacity relates to landfill gas, and the remainder relates to small installations using local resources as feedstock. None of the existing biomass capacity is located at a port site.

Planned Capacity

There is a total of at least **800 MW of planned dedicated biomass capacity in the pipeline in Wales**, the majority of which is accounted for by a small number of major projects located at port sites (details sourced from public sources, including the DECC/RESTATS database):

- The largest site is the proposed **350MW development at Port Talbot docks**. This could use an estimated **2.5 – 3 million tonnes of biomass per year**, which would be imported through the port. This site was originally granted a licence by Environment Agency Wales (EAW) in September 2009 with commissioning expected by 2012.[29] However, the developer resubmitted proposals for the site with a new application aimed at easing emission limits[30], which the EAW recently announced was likely to be permitted.[31] The Environmental Statement for the development estimates that 600 jobs would be created during the three year construction period; and 150 permanent jobs would be created in the plant on an ongoing basis.

[29] http://news.bbc.co.uk/1/hi/wales/south_west/8281767.stm Retrieved 27th Sept 2010
[30] http://www.bbc.co.uk/news/uk-wales-11295982 Retrieved 27th Sept 2010
[31] http://www.bbc.co.uk/news/uk-wales-south-west-wales-12171409 Retrieved 21st January 2011

- The second major project is the proposed **299MW** wood burning biomass plant at the Anglesey Aluminium Metals Renewables Ltd site. This project would involve the creation of a new jetty at Holyhead harbour for the import of biomass material. The project has been submitted for approval under Section 36 of the Electricity Act 1989, with the Environment Agency recently announcing that they have no fundamental objections to the development. The £600 million construction project has been estimated to create 600 jobs during construction; plus 100 permanent jobs during the operation of the plant (source: PB Power, 2009).
- There is also a **49.9MW biomass project** planned for a 10-acre brownfield site at **Newport Docks**. The developer Dragon Generation (a subsidiary of Welsh Power) was granted permission for the scheme in January 2009. The £140 million project will create 200 construction jobs and 30 permanent operational jobs.[32]
- There is also 62MW of capacity currently in the planning system which is not at port sites.

In addition to this, DTZ have been made aware of a number of potential schemes which are at an early stage and have not yet formally entered the planning system. This includes a number of opportunities at or near to port sites which would import biomass material through a port. Further details of these opportunities cannot be made available due to commercial confidentiality; however the totality of such proposals amounts to at least 100 MW of capacity.

Long Term

Analysis in the Renewable Energy Route Map for Wales (2008) suggests that biomass (both indigenous and imported) could support 1.0-1.285 GW of total capacity (electricity and thermal). The report states that this could potentially be delivered by 2015 if public sector projects are used as exemplars to push forward the concept. However, our assessment is that given that several large projects (including those listed above) have been set back with delays, it is unlikely that this target will be met by 2015. The more recent WAG Energy Policy Statement (published 2010) suggested a figure of 1GW by 2020.[33]

On this basis, we have made the following assumptions for scenarios to 2020:

- **Optimistic Scenario** – assumes that all of the above major schemes come forward as planned, and the Route Map target of 1.285 GW is reached by 2020. This requires an additional 440MW of capacity to come forward beyond existing and known schemes.
- **Moderate Scenario** – assumes that all of the above major schemes come forward as planned, and the Energy Policy Statement target of 1.0 GW is reached by 2020. This requires an additional 150MW of capacity to come forward beyond existing and known schemes.
- **Pessimistic Scenario** – assumes that the Port Talbot and Newport schemes come forward as planned, but the Anglesey Aluminium Scheme is refused permission or shelved. Assumes that a capacity of 0.7GW is reached by 2020. This requires an additional 150MW of capacity to come forward beyond existing and known schemes.

Co-firing

In addition to dedicated biomass installations, it is also worth considering co-firing of biomass in fossil fuel power stations. In Wales, the power stations at Aberthaw and Uskmouth are already co-firing biomass with coal. The precise extent of co-firing is commercially sensitive, although is believed to be

[32] http://www.welshpower.com/index.php?page=nevis

[33] WAG (2010) A low carbon revolution – the Welsh Assembly Government's Energy Policy Statement. Includes operational and consented schemes.

in the range of 5-10% of fuel. It is likely that the use of biomass will increase in the future, as a number of major energy companies in the UK are currently investigating the increased use of biomass for co-firing.

A wide range of fuels are used for co-firing, sourced from the UK and overseas; including energy crops, sewage sludge, agricultural co-products and residues, wood and wood waste, and palm oil. The UK Biomass Strategy (2007) expects that "biomass imports will continue to be a significant source of feedstock for co-firing, however the specific level of imports will depend on international competition for biomass, and the relative availability and price of indigenous feedstocks". The source and transportation method of biomass feedstock for the Aberthaw and Uskmouth plants is commercially sensitive (and therefore has not been considered further within this assessment).

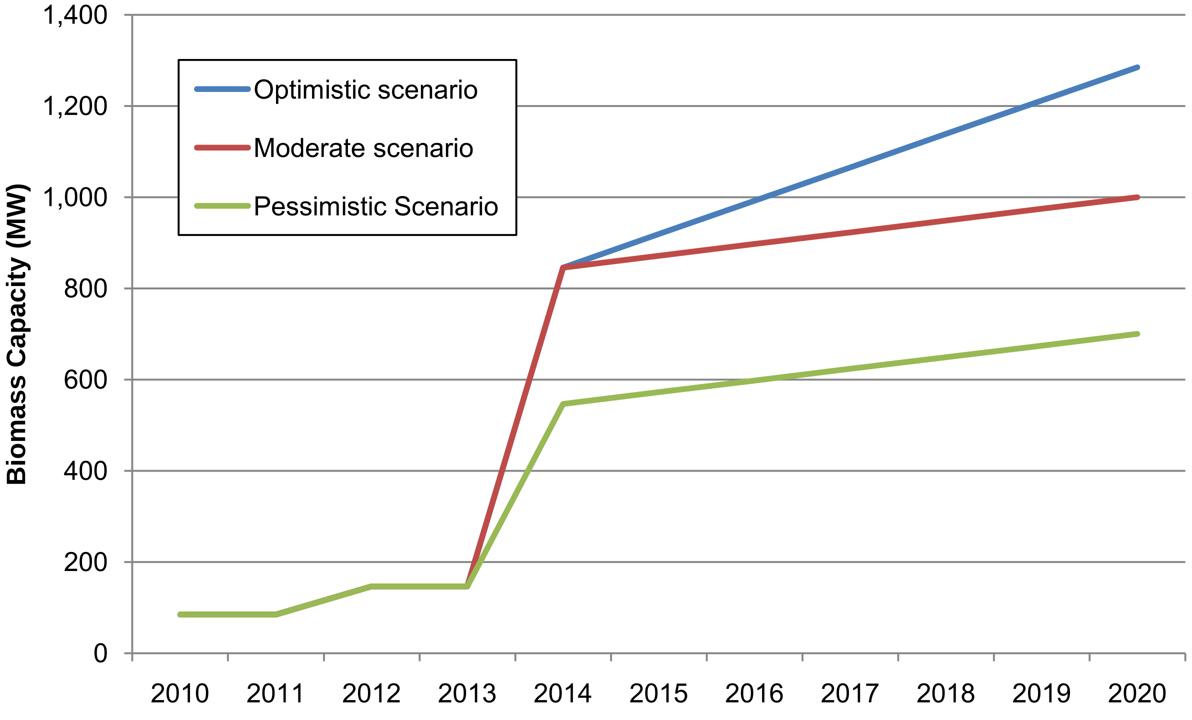
Economic Impact on Ports

Biomass developments could impact on ports due to the requirement to transport large quantities of biomass materials to site, which could be coming from other parts of Wales or abroad. Where materials are imported from abroad, given the tonnages involved there is a significant benefit to the location of biomass plants on or proximate to port sites.

Timing / phasing

The planning documentation for the Port Talbot, Anglesey Aluminium, and Newport sites state that they will take 3 years to construct – and could therefore be operational by 2014. It has been assumed that any additional capacity which comes on stream in the period 2015-2020 is spread evenly across this period. This gives the following projections for installed capacity:

Figure 4.7: Installed Biomass Capacity



Port requirements

There is a considerable opportunity for ports in relation to biomass projects – both in terms of providing land for biomass plants to be built, and related to the shipment of biomass materials. There are several examples of biomass plants at or adjacent to port sites around the UK, as follows:

Table 4.14: Port Requirements

Location	Developer	MW	Tonnage used
Port of Hull	DONG Energy	300 MW	Unknown
Port of Tyne	MGT Power	295 MW	2.4 million
Port of Blyth, Northumberland	Renewable Energy Systems	100 MW	0.5 million
Dundee, Rosyth, Grangemouth, & Leith	Forth Energy	400 MW	Leith alone 0.75-1 million

The port requirements for biomass projects are as follows:

- **Land** – biomass projects can require large areas of dedicated space for the construction of the plant and storage of materials. The 350MW Port Talbot project will require 22 ha of land at the port, whilst the smaller 50MW Newport project will require 4 ha. It may also be possible for ports to import materials for biomass plants based off-site, however it is likely that a rail connection to the plant site would be required for large projects due to the tonnages of materials required.
- **Vessel Access –** depending on the scale of the biomass project, imported biomass materials would typically be delivered by bulk carriers. For large projects such as Port Talbot, the carriers would be of Panamax size (80,000 dwt, 12m draft). Large scale biomass plants will create a demand for 3,000 - 10,000 tonnes of biomass per MW of capacity per annum.[34] For example, the proposed 350MW Port Talbot plant would utilise 2.5-3.0 million tonnes of biomass per annum (7,100 – 8,600 tonnes per MW). During the development phase, biomass projects may also create a requirement for the import of construction materials which cannot be sourced locally. The port requirements of this cargo will be akin to other general cargoes, and will not require specialist port facilities beyond those already available in Wales.

Competitive Position of Welsh Ports

A number of major Welsh Ports are well placed to benefit from opportunities related to biomass. Major projects are already coming forward at Port Talbot, Newport and Holyhead (Anglesey Aluminium site), and there is also potential for other ports in Wales to engage in this market. It appears that the majority of major biomass projects coming forward in Wales will be located at or proximate to port sites, offering opportunities for Welsh ports.

Calculation of Economic Impact

The following assumptions have been made to calculate the economic benefit at Welsh port sites:

- For known projects at port sites (i.e. Port Talbot, Anglesey, Newport) the level of employment in the construction and operational phases has been established from the Environmental Impact Assessment for each development.
- For future developments, the following assumptions have been made:

[34] Source: DTZ analysis based on a sample of proposed large biomass plants across the UK.

- 90% of additional capacity will be at or proximate to port sites (in line with current applications)
  - During construction, a 50MW scheme would create 200 jobs for two years (in line with proposed schemes)
  - During operation, the number of operational jobs would be 0.4 jobs per MW (in line with proposed schemes)
- It has been assumed that construction jobs have an associated turnover/expenditure of £187,000 per FTE and a GVA per FTE of £59,000 (source: Annual Business Inquiry 2008, Civil Engineering sector)
- It has been assumed that operational jobs have an associated turnover/expenditure of £709,000 per FTE and a GVA per FTE of £190,000 (source: Annual Business Inquiry 2008, Energy sector)

The economic impact results are shown in the following table and chart. In all scenarios, the employment impact is expected to peak in the period 2012-2014 as the Port Talbot, Anglesey and Newport projects are constructed. Biomass projects could support peak employment of 1,500 – 1,660 jobs as new projects are constructed (the corresponding figure is 900 jobs in the pessimistic scenario).

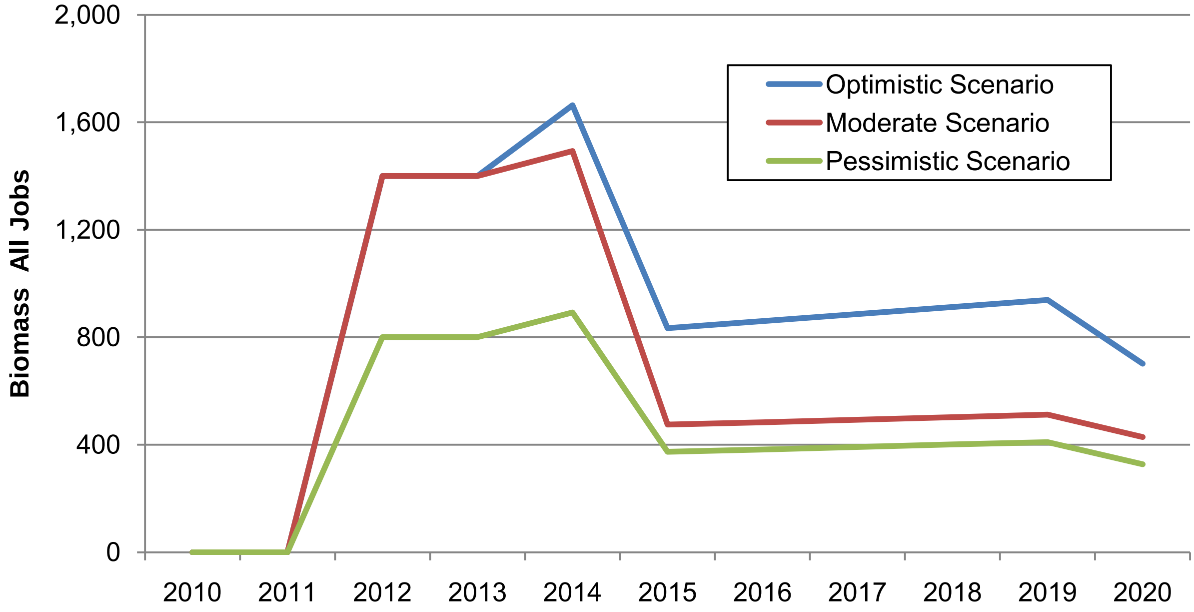
In the medium term (2015-2020) the number of jobs is estimated to stabilise at between 300 and 900 jobs as major projects are completed and become operational. The difference between the three scenarios is driven by the level of deployment post-2015.

The model results show that the biomass sector could generate turnover of £1.5 billion - £3.0 billion at Welsh ports, over the period 2010-2020, and GVA of £450 - £860 million.

Table 4.15: Summary Economic Impact Results

	Total turnover, £m (2010-2020)	Total GVA, £m (2010-2020), undiscounted	Average employment (2010-2020)
Optimistic Scenario	£2,964	£859	872
Moderate Scenario	£2,325	£670	653
Pessimistic Scenario	£1,560	£449	434

Figure 4.8: Summary Economic Impact Results



Summary - Biomass

Capacity

- 19 facilities in Wales (85MW), mainly landfill gas and small scale projects
- 800 MW in the pipeline, including 3 major projects at port sites (which amount to 700MW)
- Additional schemes at early stages of discussion (including a number of projects at or close to port sites)
- Scenarios for 0.7GW – 1.3 GW of capacity by 2020.

Economic Impact

- Impact due to the import of biomass materials through ports, and location of biomass plants at port sites
- Large scale biomass plants will create a demand for 3,000 - 10,000 tonnes of biomass per MW of capacity per annum
- Requirement for significant land area (e.g. 4ha for a 50MW project) and access for vessels up to PANAMAX dimensions (80,000 dwt, 12m draft)
- A number of major Welsh Ports are well placed to benefit from biomass opportunities.
- Biomass projects could support an average of **430-870 FTE jobs over the period 2010-2020.** Employment is likely to peak in the short term as major planned projects come forward.

4.4 Wave & Tidal Stream

Overview of Technology

Wave and Tidal energy technologies exploit the movement of the sea to generate electricity in a number of ways:

- Wave energy technologies capture the power of waves to create electricity using hydraulic and other conversion techniques. Since waves are created by the action of the wind on the sea, there is a degree of uncertainty around the level of power that will be generated at any time. However, wave energy presents a vast potential – with some research suggesting that it could meet a large proportion of global power demand, producing between 8,000 and 80,000 TWh per annum (1-10 TW of capacity)[35].
- Tidal Power is based upon harnessing the power of the tide using tidal range or tidal stream devices. Tidal range devices such as barrages or lagoons harness the flow of the tide using turbines to produce electricity. Tidal stream devices rely on the tidal flow of water during both ebb and flood tides.

At present wave and tidal stream technologies are at an early stage of deployment and are still subject to significant scientific research and development.

Research by Douglas-Westwood on behalf of BERR assessed the supply chain constraints on the deployment of renewable energy technologies in order to meet the 2020 targets[36]. The study identified the UK as a primary location for the development of wave and tidal technology. It states 'the UK is by far the most prominent tidal current stream market in Europe having the best natural resources. In wave energy, Portugal and Spain are the other major competitors'.

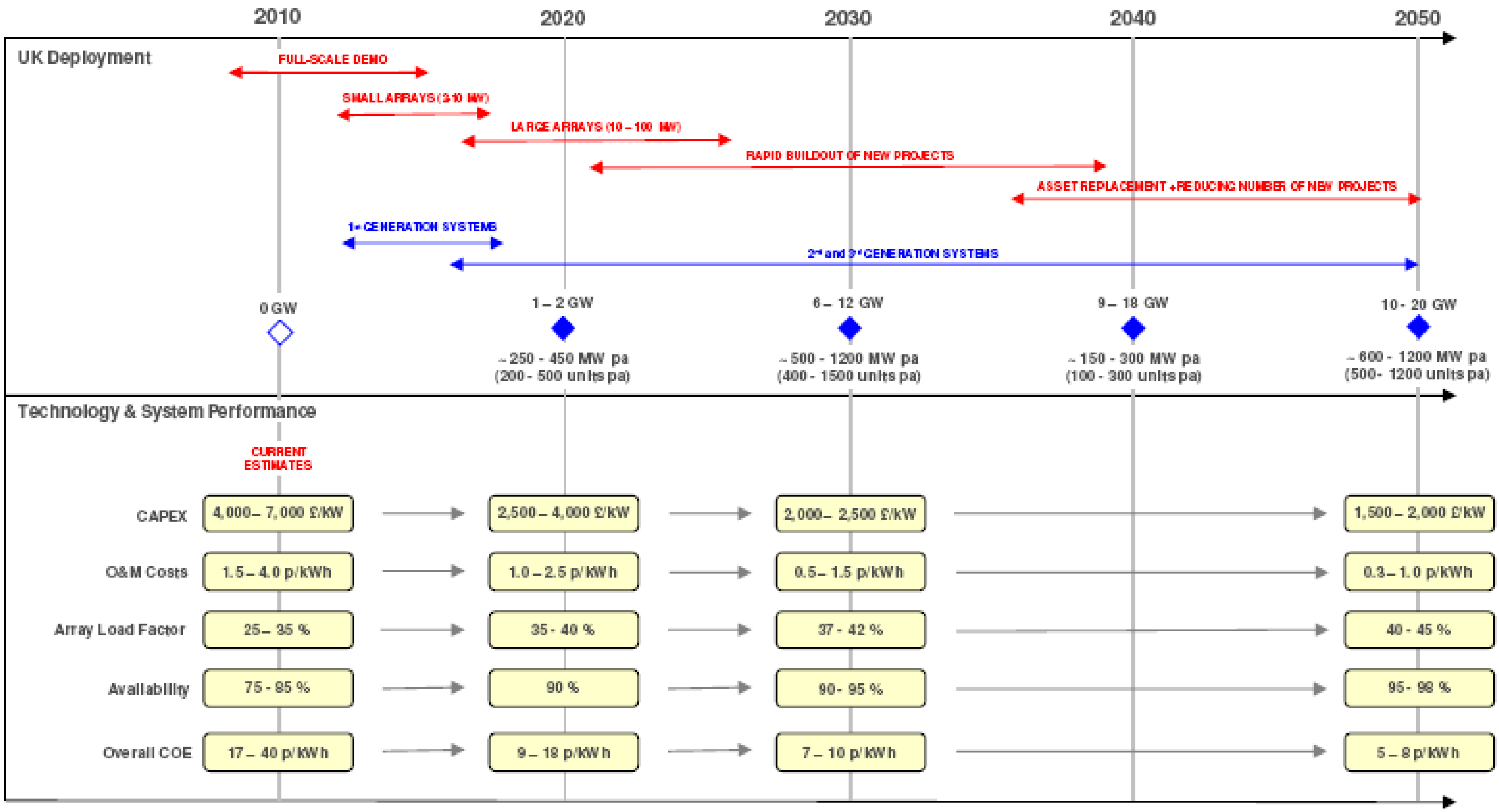
At the UK level, optimistic forecasts suggest that 1.4GW of capacity could be added by 2020.[37] However, much of this development is likely to occur in the Pentland Firth, an area which research has identified as a strong location for marine development. The Scottish Government has completed a detailed Strategic Environmental Assessment (SEA) of the marine resource in Scotland, as a consequence of which they hold an advantage over Wales and England where their SEA is currently in progress. On the back of the research in Scotland, the Crown Estate has launched a leasing round for 1.2GW of wave and tidal projects in the Pentland Firth and Orkney Waters Strategic Area.

The UK Energy Research Centre (UKERC) and the Energy Technologies Institute (ETI) have produced a document which identifies the key technology and deployment issues faced by the marine energy sector in the UK[38]. The document provides initial prioritisation of these issues and suggests timelines for their delivery. Ultimately the aim is to support the development of a commercially viable marine energy sector in the UK, supported by an extensive supply chain.

[35] Future Energy Solutions Report. Comment sourced from Renewable UK website.
[36] Douglas-Westwood report for BERR, Supply Chain Constraints on the Deployment of Renewable Electricity Technologies, June 2008.
[37] Bain and Company, A closer look at the development of wind, wave and tidal energy in the UK, Employment opportunities and challenges in the context of rapid industry growth
[38] Energy Technologies Institute and UK Energy Research Centre, Marine Energy Technology Roadmap, 2010

Techno-economic modelling performed by ETI has provided a preliminary assessment of the likely improvements in performance and cost reduction that will have to be delivered by the marine energy sector in order to deliver commercially viable projects. The assumption is that the sector will move from demonstration projects to small arrays (circa 10MW) around 2013-2017, followed by a step up to larger arrays from 2017/2018 onwards. There would then be a rapid rollout of new commercial scale projects from 2020 onwards, peaking around 2030. After 2030, it is assumed that the deployment of new devices per annum is reduced as resource availability declines. However, from 2035 there is assumed to be some level of asset replacement as early farms reach the end of their technical life.

Figure 4.9: UK Marine Energy Deployment Strategy and Technology Development Targets



Source: UKERC / ETI, 2010

Actual and Potential Capacity

Installed

Currently there are no installed marine devices in Welsh coastal waters.

Planned/Proposed

There are three marine projects in Wales which have reached the proposal / planning stage. They are:

- The application for a **Wave Dragon** demonstrator near Milford Haven. The device will be deployed for a 3-5 year testing period in order to gain operational experience and knowledge of the energy transfer capabilities. It will have a capacity of 7MW.
- A 10.5MW tidal stream project (seven 1.5MW SeaGen tidal turbines) in **The Skerries** off the coast of Anglesey. The developers Marine Current Turbines and RWE npower renewables have applied for planning permission, which if granted means that the project could be commissioned as early as 2012.
- Cardiff-based Tidal Energy Limited (TEL) is in the process of developing **DeltaStream** – a new tidal stream device. Consent has recently been granted to deploy a full scale demonstrator of the Deltastream device in Ramsey Sound off Pembrokeshire for a one-year trial, starting in 2011. TEL has stated that if the trial goes well, then they may expand the site to 12MW by 2013.

Through this assessment, DTZ has been made aware of a number of additional marine energy projects currently at an early stage of development. Consultees suggested that there were up to 10 distinct projects at this stage, with most at or around the 10MW level. However, due to commercial confidentiality, further details of the proposed schemes could not be made available.

A Strategic Environmental Assessment for marine energy in English and Welsh waters is expected by late 2011, which will then allow the Crown Estate to initiate the process of a leasing round for wave and tidal farm development. Ultimately the extent to which this resource is developed will depend upon the successful development and implementation of a range of technologies, and the extent of support for the marine industry.

Longer Term Projects

Research by Crown Estate and BERR mapped out the areas of the UK which could have the best potential for wave and tidal technologies (see Appendix 4 for detailed maps). This indicates that wave power in the UK is concentrated in the North West of Scotland, and South West of Wales' and tidal power is concentrated in a number of locations around the UK coastline including the Bristol Channel, Pembrokeshire, and the Isle of Anglesey. These maps will help to inform the Strategic Environmental Assessment. It will assist decisions on future rounds of licensing for large scale deployment of marine renewable technologies.

The Renewable Energy Roadmap for Wales identifies a total operational capacity figure for wave and tidal stream technologies of 1-2 GW by 2025. The Energy Policy Statement (2010) sets out a higher level of ambition for Wales to have 4GW of capacity by 2025, although it should be noted that this includes both operational and consented schemes.[39] For the purposes of the impact model, the figures from the Renewable Energy Roadmap have been used as the model is driven by operational schemes only.

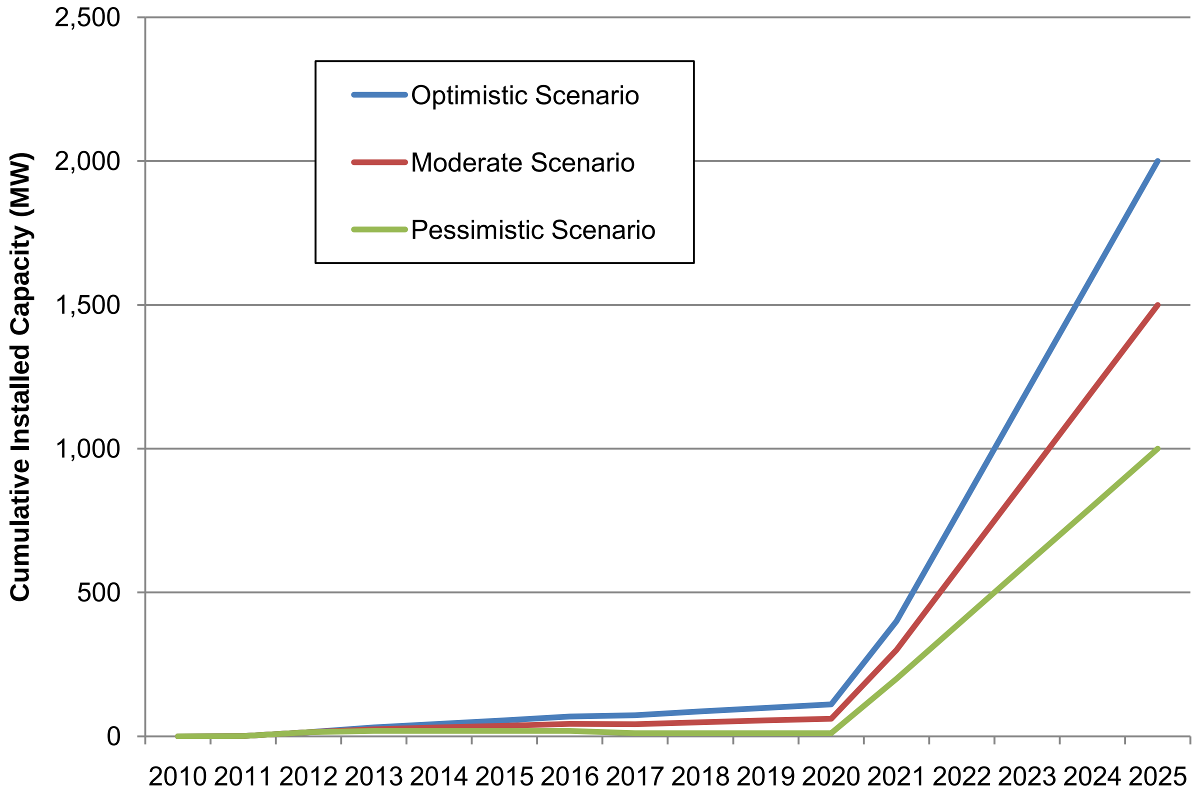
[39] WAG (2010) A low carbon revolution – the Welsh Assembly Government's Energy Policy Statement. Includes operational and consented schemes.

Timing of Deployment

A number of scenarios have been developed for this study for the deployment of marine energy capacity over the period 2010 to 2025 – based on consultations with stakeholders.

- **Optimistic Scenario** – this assumes that current proposed projects come forward as planned. It also assumes that a further 100MW is deployed by 2020 (i.e. ten 10 MW schemes or equivalent), based upon project enquires and the likely size of devices at this point. It is then assumed that after 2020, the deployment of capacity will increase much more rapidly as technology improves, research reveals the most promising locations for development and relevant policy is put into place to support the sector. The optimistic scenario assumes that 2GW of capacity could be installed by 2025 in line with the more aspirational figure from the Renewable Energy Roadmap document.
- **Moderate Scenario** – assumes that 50MW is delivered by 2020 and that by 2025 overall deployment reaches 1.5GW (i.e. the midpoint of the figures given in the Renewable Energy Roadmap document).
- **Pessimistic Scenario** – assumes that the only projects delivered by 2020 are the Wave Dragon and Skerries, and that overall deployment reaches 1 GW by 2025.

Figure 4.9: Marine Energy Capacity Scenarios



Economic Impact on Ports

Competitive Position of Welsh Ports

DTZ have assessed the extent to which project stages will have an impact on Welsh ports as follows:

- **Manufacture** – There is a high level of uncertainty at present about the future location of manufacturing sites for marine devices. In the offshore wind sector, since the focus of development is in the North Sea, it is unlikely that there will be any manufacturing capability in Wales. However in terms of marine, the focus of deployment will be on the West coast of the UK, leading to different market and location drivers. It is more likely that Welsh ports will attract manufacturing functions in the marine sector than the offshore wind sector.
- **Deployment** – There is potential for Welsh ports to be involved in the deployment of turbines and equipment, whether they have been manufactured within Wales or imported from elsewhere around the world. If zones for marine development are identified in Welsh waters, then it is likely that Welsh Ports could be involved in the deployment of the technology.
- **Operations and Maintenance** – As with offshore wind there is the potential for Welsh ports to be heavily involved in the O&M of marine energy projects, particularly those located in or very near to Welsh waters. Effective servicing of sites is likely to be delivered from a location close by, which could include locations at Welsh ports.

The main competition for Welsh Ports is likely to come from other parts of the UK and other countries with strong natural marine resources such as Spain and Portugal. As larger scale commercial projects are developed it is possible that the marine sector will follow a similar pattern to Offshore Wind, with the major manufacturers having one or two manufacturing bases to service all of their European markets. This could be supplemented with more local construction and O&M facilities.

Calculation of Economic Impacts

At present there is a general lack of evidence on the economic impact of marine energy projects, due to the lack of completed commercial scale projects to reference as benchmarks. However, due to the similarities in the method of deployment, comparisons can be made between wave/tidal and offshore wind. The following assumptions have been used to estimate the total benefit to Welsh Ports:

Manufacturing and Deployment

- The UKERC Marine Energy Roadmap provides indicative capital costings, showing how costs are anticipated to decrease over time. We have assumed that the capital costs before 2020 (the demonstrator phase) are likely to be £5.5m per MW falling to £3.25m after 2020 (large scale rollout).[40]
- The main uncertainty is the proportion of capital expenditure which could be captured by Welsh ports in relation to deployment and possibly manufacture. Reviews of projects coming forward in the Pentland Firth area undertaken by BVG Associates indicate that the deployment activity alone accounts for around 25% of CAPEX for marine – and that this activity is typically captured by the local construction port.
- It may also be possible for Welsh ports to capture a share of the manufacturing market (since, as described above the location drivers for marine energy manufacture will be different to offshore wind). At this stage there is little indication about the types of manufacturing functions or proportion of CAPEX which could be relevant to Welsh ports, but consultations with industry suggest that UK ports could capture a significant share of manufacturing activity if there is sufficient government support.

[40] Source: UKERC Marine Energy Roadmap

- On this basis we have made three assumptions:
    - Pessimistic scenario – Welsh ports involved in deployment only (25% of CAPEX)
    - Moderate Scenario – Welsh ports involved in deployment plus minority share of manufacturing (50% of CAPEX)
    - Optimistic Scenario – Welsh ports involved in deployment plus majority share of manufacturing (75% of CAPEX)
- Employment supported by expenditure in this sector is calculated using a turnover per worker ratio of £187,000 per FTE worker in the Civil Engineering sector.

Operations and Maintenance

- The UKERC Marine Energy Roadmap provides indicative costings for O&M activities at £57,800 per MW before 2020 and £51,700 per MW after 2020.[41]
- As there is very little information on which to base assumptions regarding the potential share of O&M expenditure which could be captured by Welsh Ports, assumptions have been made in line with those for the offshore wind sector, as follows:
    - Assume that 35% of OPEX relates to direct employment
    - Assume that 62% of direct employment is within the O&M port
    - The direct employment supported by this revenue is estimated using an average labour cost of £60,000 per O&M job
- Employment supported by expenditure in this sector is calculated using a turnover per worker ratio of £187,000 per FTE worker in the Civil Engineering sector and a GVA per FTE worker of £59,000.

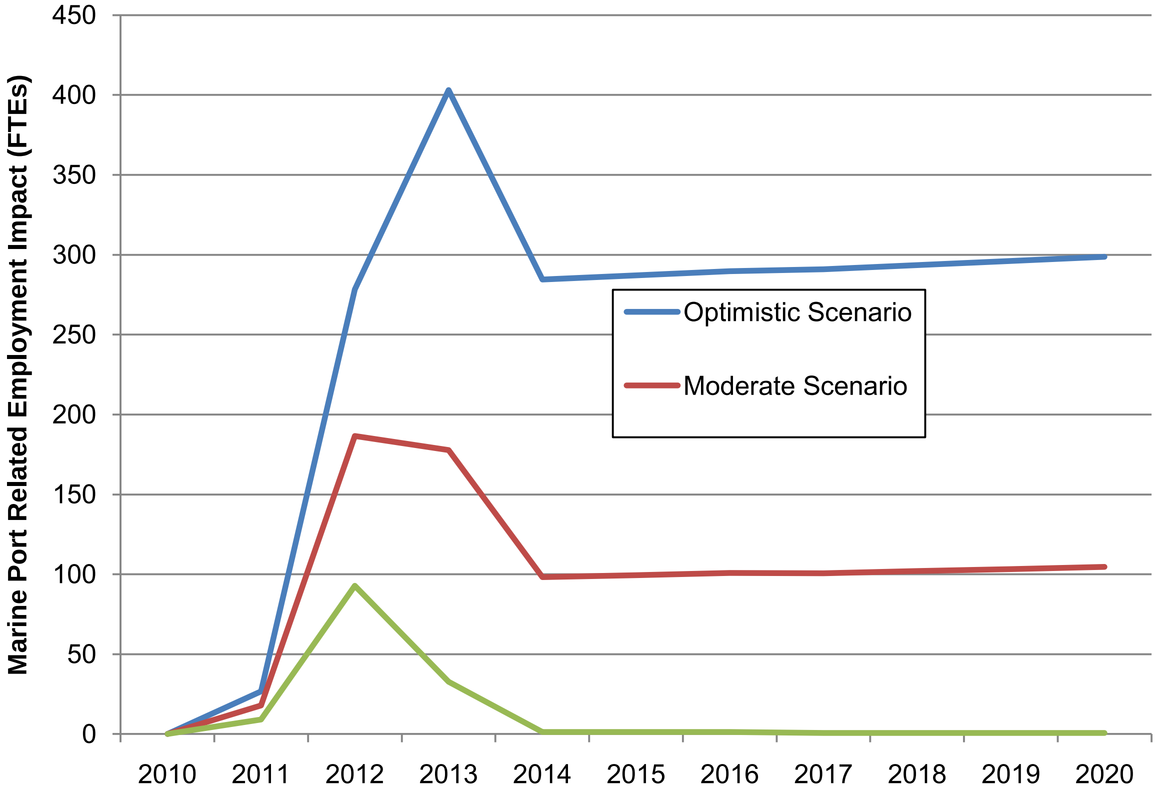
The employment impact of the three scenarios is shown in Table 4.16 and Figure 4.10. As shown, the marine energy sector could support an average of between 15 and 250 FTEs in Welsh ports – depending on the level of deployment. The employment impact is expected to be boosted during 2012 as the Skerries and Wave Dragon projects are installed. The optimistic scenario assumes that ports have gathered a greater proportion of the economic benefit; hence the employment impacts are higher. After 2012, the divergence between the scenarios occurs due to the higher development rate in the optimistic scenario than other scenarios. Much of the employment benefit relating to the ports is estimated to occur after 2020 as the installed capacity of devices increases rapidly. Faster development of the sector could lead to some of these developments being brought forward before 2020. In the optimistic scenario nearly £500m of turnover is estimated to be generated, equating to £160m of GVA.

Table 4.16: Summary of Port Economic Impact: Marine

	Total turnover, £m (2010-2020)	**Total GVA, £m (2010-2020), undiscounted**	**Average employment (2010-2020)**
Optimistic Scenario	£494	£162	250
Moderate Scenario	£192	£64	99
Pessimistic Scenario	£25	£9	15

[41] Source: UKERC Marine Energy Roadmap

Figure 4.10: Summary of Port Employment Impact: Marine



Longer Term Impacts

It is anticipated that the rollout of commercial-scale marine energy devices will not pick up until at least 2020, hence the economic benefit is likely to be larger in the long term. The exact scale of longer term economic impacts will depend on the scale of the opportunities proximate to Wales identified by SEA, and the overall deliverability and viability of technologies. Under the scenarios defined above the estimated impact would be as follows:

- The optimistic scenario assumes that 2GW of marine capacity is delivered by 2025 (of which 1.9 GW between 2020 and 2025). Under the optimistic scenario this could create up to **5,200 jobs during the manufacturing and construction phase,** and then around **375 O&M jobs** on a long-term basis.
- Under the moderate scenario (1.5GW of capacity by 2025), it is estimated that up to **2,600 jobs could be created during the manufacturing and construction phase, with a total of 280 jobs supported by O&M activities.**
- Under the pessimistic scenario (1GW of capacity by 2025), it is estimated that **870 jobs could be supported during the construction phase,** with around **190 jobs in O&M beyond 2025.**

There is a significant variation in the economic impact results – driven by the scale of deployment, and the proportion of manufacturing activity which is captured in Wales. In order to maximise impact, government support is likely to be required to encourage the step up from pilot-scale devices to commercially viable projects. The SEA process should also help to identify suitable areas for development, and kick-start the leasing process. The public sector could work with ports and developers in order to maximise the proportion of manufacturing activity which is captured in Wales.

If successful, Wales could replicate the 'first-mover advantage' achieved by Denmark within the offshore wind sector – which invested heavily in the sector before other countries. This has helped to establish a strong manufacturing presence which is now being exported across many other countries. However, Scotland is already somewhat ahead of Wales in respect of marine energy – with a project leasing round already underway, and a focus of activity at the European Marine Energy Centre (EMEC) in the Orkney Islands.

Summary – Wave & Tidal

Capacity

- Currently no deployed devices in Welsh waters.
- 18MW of devices currently in the pipeline (Skerries, Wave Dragon, and Deltrastream), plus a number of schemes at an early stage
- The rate of deployment is likely to increase after 2020.

Economic Impact

- Marine Energy is currently at an earlier stage of development than offshore wind, and hence there is little information available on economic impact.
- Economic impacts are most likely to occur in the deployment and O&M of marine development. It is possible that Welsh ports could be involved in the manufacture of wave devices but given the early stage of development in the sector this is difficult to quantify.
- The marine sector could support an average of up to **250 FTE jobs** in Welsh ports over the period 2010-2020.
- In the longer term (post 2020), the marine energy sector could potentially support a large number of jobs (1,000-5,500), depending on the level of deployment in Welsh waters and the degree to which Welsh ports capture manufacturing activity.

4.5 Nuclear

Overview of Technology

Nuclear power generation in Wales has involved two sites; Wylfa on the Isle of Anglesey and Trawsfynydd in Gwynedd. Construction of the 980MW Wylfa A power station started in 1963 with commercial operation beginning in 1971. The station was originally due to close in 2010 although there is the option to extend potential generation for a further four years. Decommissioning is likely to start in 2015. The nuclear power station at Trawsfynydd operated between 1965 and 1991 with a capacity of 450 MW.

A Revised Draft National Policy Statement for Nuclear Power Generation was published in October 2010. This identified 8 sites which may be considered suitable for deployment of nuclear power developments across the UK. The sites which have been identified are typically next to existing nuclear power stations including proposals for Wylfa B next to the existing station on the Isle of Anglesey. The proposals for the development of Wylfa B are still at an early scoping stage and it is not likely that there will be any construction until Mid-2013 at the earliest, with a planned construction period of approximately 6 years to 2019.

Horizon Nuclear Power (a partnership of RWE and E.on) are the party who will be responsible for the construction and operation of Wylfa B. Although the exact proposals are yet to be confirmed, it is known that there are two nuclear reactor manufacturers in contention - Westinghouse and Areva. It has been estimated that the construction would require up to 6,000 workers, and that once operational the plant would employ 1,000 workers.

The main way in which Welsh ports could benefit from nuclear power is in relation to the importing of raw materials and parts to be used in the construction phase of Wylfa B. This will create a need to bring significant quantities of construction materials to the site. The transportation of a significant proportion of material by sea is deemed to be the most sustainable option, and due to the poor road infrastructure on Anglesey (for the abnormal loads likely to be involved) Horizon are planning to build a Marine Off-loading Facility (MOLF) close to the development site. This would allow the transportation and off-loading of construction materials and some of the larger plant components by sea.[42]

There will also be a need to transport waste materials as part of the decommissioning process of Wylfa A. This could include hazardous (i.e. reactor parts) and non-hazardous materials (general materials used in the construction), which could potentially be moved by ship; however spent fuel will be transported by train to Sellafield for reprocessing.

Actual and Potential Capacity

The current installed nuclear capacity in Wales is 980MW at Wylfa A. The life of this station has recently been extended and is now due to close in 2012, with a lengthy decommissioning process occurring after this point.

The proposed Wylfa B power station will have a capacity of 3.2GW. Assuming that there are no planning delays, the construction process could begin from around 2013.

[42] Working with the local community, Horizon Nuclear Power, Dec 2010

Economic Impact on Ports

It should be noted that DTZ have experienced difficulties in establishing the economic impact on ports associated to nuclear development and decommissioning. There is a paucity of information in the public domain about the likely impact, coupled with a high level of uncertainty at this stage.

There is unlikely to be any economic impact on Welsh Ports from Wylfa A power station whilst it is still operational. The decommissioning process could use Welsh Ports for the transportation of waste materials, although at this stage there is still a high level of uncertainty about this, as even the contractors to be used are still unknown. It is possible that some of the scrap waste material may be shipped overseas to be recycled or reused. However, much of the waste material could be transported from the site by road and recycled or disposed of within the UK.

In respect of Wylfa B, the main impact will be related to the import of materials and parts to the site. The developer Horizon has recently undertaken research to establish the preferred mode and route for transportation, and have indicated that the preferred mode is via sea. Given that road access from Holyhead to the site is relatively poor, this is likely to involve the construction of a Marine Offloading Facility (MOLF) close to the nuclear power station site. However it has not been possible to establish from Horizon the likely construction cost of this facility, or the likely number of staff working in the facility once operational. Therefore the economic impact of nuclear has not been assessed quantitatively as part of this study.

4.6 Other Technologies

A number of other low carbon energy technologies were considered in the early part of this study, but were not considered further as the assessment indicated that they offer limited economic potential for Welsh ports. Further details are provided in Appendix 4.

Tidal Range

- The feasibility of tidal power options in the Severn Estuary has been under serious investigation over the last few years. A number of schemes were considered including a number of barrage options, and offshore and onshore lagoon options.
- These options have been demonstrated to have significant economic potential if brought forward. All options would have required the use of local ports for construction and potentially operations and maintenance activities.
- However, the UK Government announced in October 2010 that all of the options under consideration have been ruled out from public funding as part of the Comprehensive Spending Review, due to risk and lack of available public funding. The government has indicated that there will be no further consideration by government of Tidal Power options in the Severn Estuary in the short to medium term.
- It should be noted that there has been some interest from private consortia (in particular Corlan Hafren Limited) in taking forward a private-sector led tidal power scheme in the absence of public support; however this is highly uncertain at present.
- On this basis, tidal range has not been considered further within this study.

Carbon Capture & Storage (CCS)

- CCS involves the capture and storage of Carbon Dioxide from large industrial point sources (such as a fossil fuel power plants) in suitable geological storage sites, to prevent it entering the atmosphere and acting as a greenhouse gas.[43]
- The long-term potential of CCS is unclear as the technological processes involved are still at a very early stage. There are a number of CCS technologies currently under development, and further research is required to improve the overall efficiency of CCS technologies before they will be adopted widely. If CCS were to become commercially viable it could be retrofitted to many existing power plants, creating a huge market opportunity. However this is not likely to occur for some time (e.g. 2020-2030) and would probably only be viable with large scale power stations.
- In Wales, CCS technologies could potentially be retrofitted to existing fossil fuel plant, and proposed new plant such as the Abernedd/Baglan gas fired power station.
- Potential locations for storage include depleted oil and gas fields, coal seams and saline aquifers.
- There are a number of potential storage locations (depleted oil and gas fields) in the Irish Sea off the Welsh coast. However, even if these were to be used for storage, it is unclear whether carbon would be transported by pipeline or vessel.
- At this stage it is unclear what impact CCS technologies could have on ports in Wales or elsewhere.
- Given the high level of uncertainty at this time, and the fact that the impact of CCS will only be experienced in the long term, CCS was discounted from further analysis.

Micro-renewables

- Micro-renewables includes renewable technologies such as micro-wind, solar and biomass/CHP deployed at domestic or community scale rather than commercial scale.
- Given that the devices are relatively small, they would not require any specific port infrastructure, and would be treated as general cargo. In the context of overall port traffic in Wales, the additional cargo volumes would be negligible.
- Therefore these technologies were not considered in detail in this report as the impact on Welsh ports is likely to be minimal.

4.7 Summary of Impact

This section summarises the impact of all low carbon energy technologies on Welsh ports, across all stages of development, as shown in Table 4.17.[44] The following conclusions can be drawn:

- The baseline level of employment in Welsh ports supported by low carbon energy projects was estimated to be around **350 FTEs in 2010**, almost all of which related to Offshore wind (plus fewer than 10 jobs supported by Onshore wind).
- The average employment in ports supported by low carbon energy projects for the period 2010-2020 is estimated to vary from **1,000 FTEs in the Pessimistic Scenario to 2,500 FTEs in the Optimistic Scenario.**

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[43] BGS (2006) Industrial Carbon Dioxide emissions and carbon dioxide storage potential in the UK

[44] The economic impacts have been summed across all technologies. There is a possibility that there may be some economies of scale for companies serving more than one technology market, however it is too early to say with any precision the extent of this effect.

- In all scenarios, the majority of the impact to 2020 is expected to be related to the **Offshore Wind and Biomass sectors, which together account for 90%+ of the total employment** impact across all low carbon sectors. It is estimated that the Onshore wind sector will support a negligible number of jobs in ports (notwithstanding that there will be significant impacts at onshore wind development sites). In terms of the Wave/Tidal sector, the impact is expected to be modest in the short to medium term, but is likely to increase in importance significantly in the longer term.
- In the short term, the level of employment supported by low carbon energy projects is forecast to **increase significantly across all scenarios. It is estimated that** there will be a **rapid increase in employment to between 1,640-2,450 FTEs by 2012.** This rapid increase is due to the expected construction of major biomass plants at Port Talbot and Anglesey, the sizeable Gwynt Y Mor offshore wind project, and the Skerries tidal stream project.
- In the medium term (2015-2020), the scenarios diverge considerably. Employment is expected to remain high in the Optimistic Scenario to 2020 (i.e. average of over 3,100 FTEs in the period 2015-2020), as it is assumed that Welsh ports continue to be utilised for major offshore wind projects, and there is a continuing stream of new biomass projects. By contrast, in the Moderate Scenario, low carbon energy projects are estimated to support 1,500 FTEs on average over the period 2015-2020, whilst in the pessimistic scenario this is expected to be further reduced to 900 FTEs.

The scenario analysis demonstrates that the economic outcomes could vary significantly depending on the following factors:

- The extent to which **limitations and barriers** (such as planning/environmental issues, financing, logistics, supply chain, capacity etc) cause development projects to be delayed, scaled back or even cancelled.
- The **choice of port** for construction and O&M activities (Offshore Wind and Wave/Tidal) and location of biomass projects.

Barriers and possible mitigation options are discussed further in Section 6 of this report.

Table 4.17: Total Employment Impact (FTEs) – All Low Carbon Technologies

	Average employment (2010-2020)	Average employment – Short Term (2010-2015)	Average employment – Medium Term (2015-2020)
Optimistic Scenario	2,501	1,908	3,115
Moderate Scenario	1,547	1,587	1,526
Pessimistic Scenario	982	1,081	888

Figure 4.11: Total Employment Impact in Welsh Ports – All Low Carbon Energy Technologies

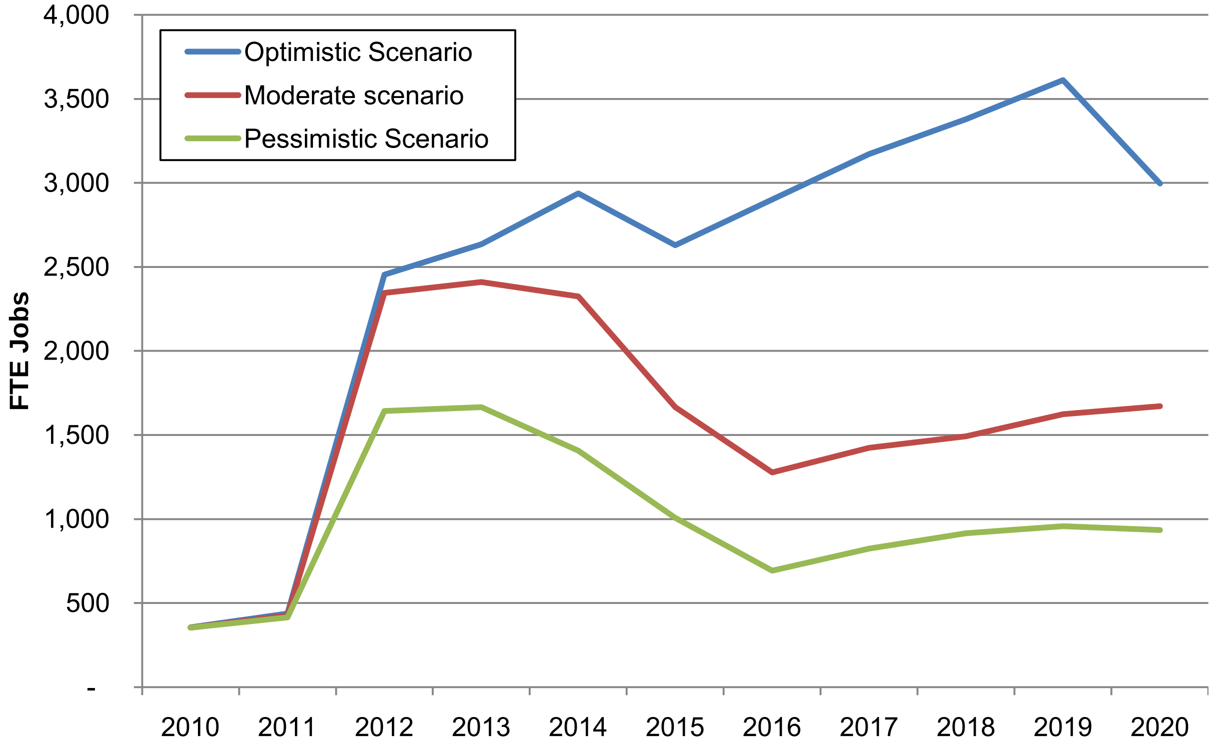
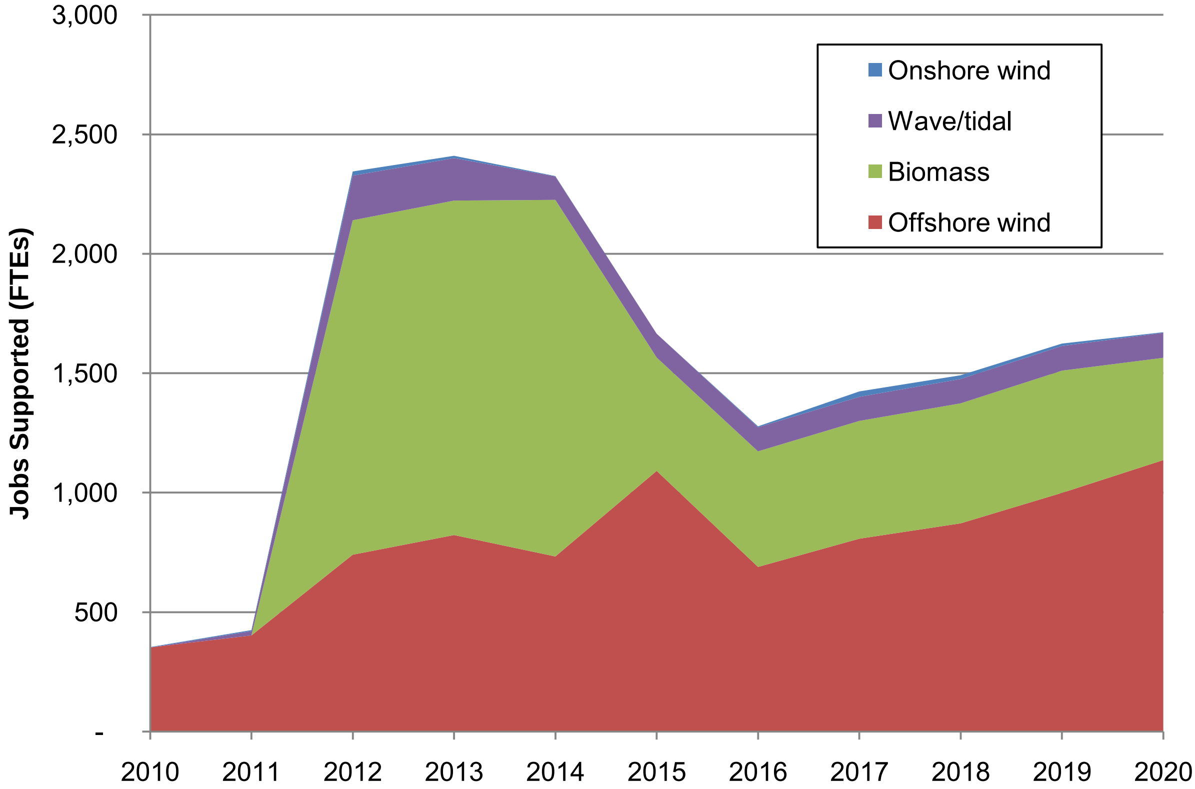


Figure 4.12: Total Employment Impact in Welsh Ports – All Low Carbon Energy Technologies (Moderate Scenario)



In the longer term, there is considerable uncertainty around the level of employment which could be supported by low carbon energy projects, but this assessment has highlighted the following key trends:

- **Offshore Wind** is expected to continue to support a number of jobs associated with O&M activities on current and pipeline projects (540-1,200 FTEs depending on the scenario chosen). There may also be some further construction activity in the long term associated with known projects (assuming some delay beyond 2020), and potentially additional projects beyond the current Round 3 leasing process.
- **Wave / Tidal** - It is expected that the roll-out of commercial scale wave and tidal stream devices would take place from 2020 onwards – although there is uncertainty around the likely level of deployment. Welsh ports will be well-placed to capture economic activity related to deployment, O&M, and potentially also manufacture of marine energy devices. If Wales can capture a significant share of manufacturing activity related to marine energy, then this could potentially support several thousand jobs at port sites in Wales; however there is significant uncertainty around this.
- **Biomass** – in the long term, there will be a requirement to operate biomass plants and import biomass materials through Welsh ports. Depending on the level of deployment to 2020, this could support between 230 and 440 FTEs. It is also possible that there will be further deployment of biomass capacity at port sites in the long term, which would support additional construction and operational jobs.
- **Onshore Wind** – It is expected that much of the onshore wind capacity in Wales would be deployed by 2020. Hence the impact of onshore wind on ports post 2020 is expected to be negligible.

4.8 Additionality of Impact

As noted in the introduction to this report, all of the figures within the quantitative assessment above relate to Gross impacts rather than Net impacts. It has not always been possible to convert Gross impacts to Net due to a lack of data on additionality factors, however the following provides a broad indication of the likely magnitude of additionality factors:

- **Deadweight** – defined as a measure of the impact in the absence of an intervention or project. In this case, DTZ has considered the future impact with and without further low carbon energy development.[45] The baseline scenario (see Section 2) assumes no further low carbon energy development, and static traffic volumes to 2030. We have therefore assumed that any growth in port employment related to Low Carbon Energy is additional, and would not have happened otherwise.
- **Leakage** – defined as the benefit which leaks outside of the target area – which in this case is Welsh ports. The assessment has considered leakage in that it has focused purely on impacts which relate to employment in Welsh ports, and not in the rest of Wales or the UK. Section 4 outlines for each technology the proportion of benefit which is likely to relate to Welsh ports (and by consequence the proportion which will leak).

[45] Note: We have not considered the impact of specific policy measures by the UK or Welsh Government to support low carbon energy development, as this was not the focus of this study.

- **Displacement** – this is defined as the extent to which businesses in the target area shift from one activity to another as a result of the intervention or project, and therefore partially or wholly offset any growth. In this case, it is relevant to consider whether growth in employment and port activity related to Low Carbon Energy will come at the expense of other port based activities. DTZ's view is that displacement has been low, since the levels of traffic in Welsh ports have been static or in decline in recent years – for example the decline in dry bulk traffic such as ores and coal. Therefore it is more likely to be the case that low carbon activity has been a much needed new source of business rather than displacing other activity. Individual ports must make decisions on the most attractive sources of future revenue on a case by case basis, deciding on the sectors which present the best options in the long term. It is also relevant to consider that many of the port infrastructure upgrades currently being considered are predicated on the assumption that they will be used by a range of sectors – not just low carbon energy.
- **Multiplier Effects** – this is defined as the additional economic benefit arising both from supply chain expenditure, and from additional expenditure related to increased incomes in the target area as a result of the intervention or project. For the purposes of this assessment, we have as far as possible attempted to capture supply chain benefits which will fall within the scope of the assessment (i.e. at Welsh Ports). This has been possible in some sectors such as offshore wind construction, where detailed information exists on the likely packages of work required, and it has been possible to identify suitable contractors (See Section 5 for more discussion of supply chain linkages); notwithstanding that there is still considerable uncertainty concerning the actual contractors which will be appointed by project developers. However, this has not been possible in all sectors, and it is possible that there would be further supply chain linkages involving port tenants which have not been fully captured. Equally, the assessment has not sought to capture income effects; although it is likely that the vast majority of income earned by workers on port sites would be spent off-site (e.g. close to their home location, or in retail establishments).

5. Assessment of Wider Economic and Qualitative Impacts

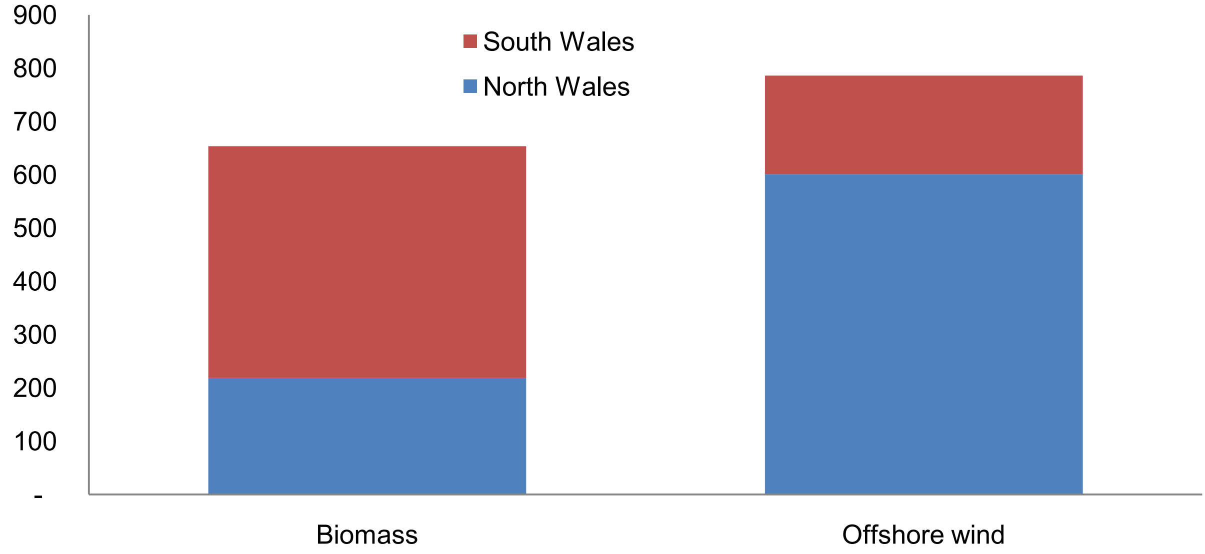
This section considers the wider economic and qualitative impacts of low carbon energy projects on Welsh ports, including the distribution of employment across Wales, and supply chain opportunities for Welsh firms.

5.1 Distribution of Impact

The distribution of impact across Wales has briefly been considered for the Offshore Wind and Biomass sectors (other sectors have not been considered, since as shown in Section 4 the overall impact is minimal in any case). The average employment supported in the North Wales and South Wales sub-regions (Moderate Scenario only) has been calculated based on assumptions on the likely location of impact, as follows:

- **Offshore wind –** there is a cluster of development zones for offshore wind relevant to Wales in the Irish Sea including: Walney, Gwynt Y Mor, Burbo Bank extension, Walney extension, and the Irish Sea zone (with a total capacity of 6.1GW). These developments are relevant to North Wales' ports such as Mostyn and Holyhead, but not to the South Wales ports. South Wales' ports are well-placed to attract business related to the Atlantic Array project (1.5GW), but are unlikely to have any role in projects located in the Irish Sea. Correspondingly, **around three-quarters of the total impact related to Offshore Wind is expected to be in North Wales** (600 jobs on average in North Wales in the period 2010-2020, out of a total of 790 for the whole of Wales).
- **Biomass** – of the three major known projects coming forward at Welsh ports, one is in North Wales (Anglesey) and two are in South Wales (Port Talbot and Newport). Through the assessment, a number of other pipeline schemes have been identified involving South Wales ports, but the pipeline of additional schemes at North Wales' ports appears limited. On this basis, around it is estimated that **two-thirds of the total impact related to Biomass will be in South Wales** (435 jobs on average in South Wales in the period 2010-2020, out of a total of 650 for the whole of Wales).

Figure 5.1: Regional Distribution of Impact

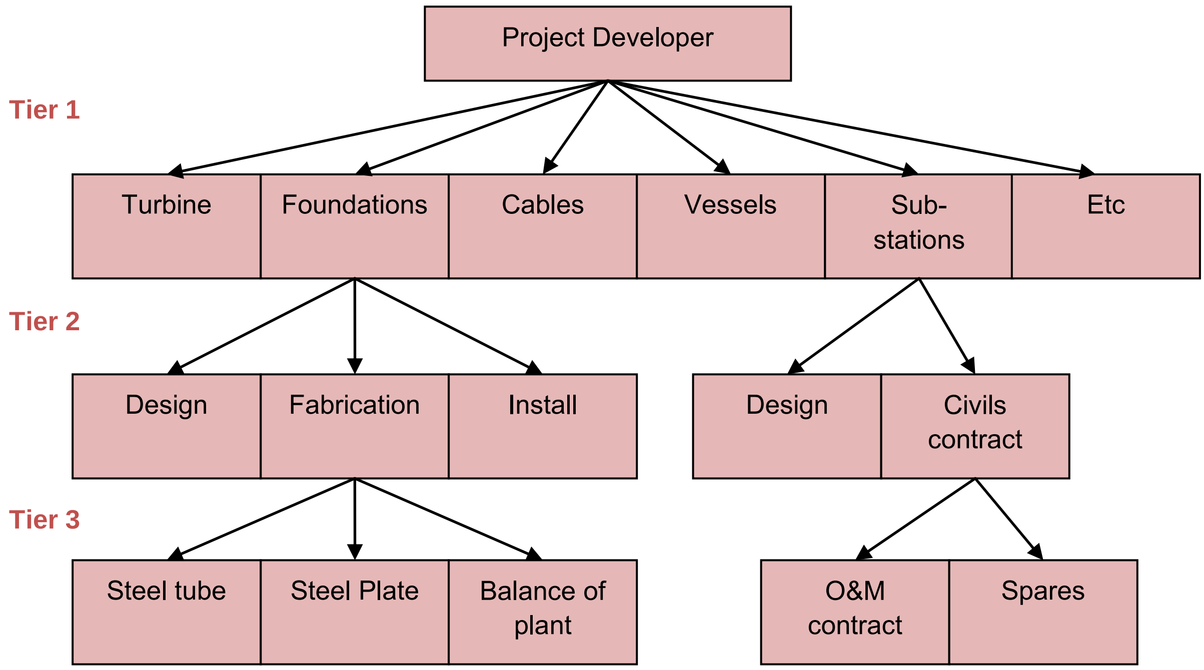


5.2 Opportunities for Welsh Suppliers

As well as directly supporting employment in Welsh ports, low carbon energy projects will indirectly create opportunities for Welsh suppliers - either located at port sites or elsewhere. For the purposes of this assessment, the Offshore Wind supply chain has been used as an example to highlight the types of opportunities available to Welsh firms, and the capabilities and areas of expertise within Wales. The Offshore Wind sector has been chosen as an example, as there is good information available on the types of supply chain opportunities available, and due to the fact that ports will be the access points and facilitators for suppliers to the offshore wind sector (and therefore this is of high relevance to the study).

Figure 5.2 provides an example contracting structure for the Offshore Wind sector – demonstrating that projects are often divided into a number of Tier 1 contracts (often with major firms), which are then sub-divided into smaller Tier 2 contracts, and may be sub-contracted further still beyond this. Welsh firms will be able to compete for business at all of these stages. In the case of Offshore Wind, it is often the case that major elements are imported, but smaller elements are sub-contracted to local firms proximate to the construction port.

Figure 5.2: Example contracting structure for Offshore Wind



It is commonplace for the construction port to act as a Ships Agent to installation vessels to arrange the supply of a wide range of goods and services – for example the Port of Mostyn acts as a ships agent, and recorded spend of £200,000 over an 8 month period for a single installation vessel, on a range of services.

The following table sets out the key supply chain opportunities generated by the Offshore Wind sector. As can be seen, the list of requirements is extremely diverse – ranging from goods and services very specific to the sector, to more general goods and services such as transportation, office supplies, waste management etc.

It is worth noting that the developers of major offshore wind projects such as RWE npower Renewables are becoming much more active in managing and monitoring contracting throughout the entire supply chain.

Table 5.1: Supply Chain Opportunities in the Offshore Wind sector

- Civil works / site preparation
- Supply of turbine / components
- Supply of foundations
- Offshore and onshore substations
- Installation vessels
- Cabling (supply and installation)
- Sea based support - guard boats, crew boats and mooring boats
- Helicopter transfer
- Ship repair
- Fabrication
- Structural engineering
- Technical consultancy, testing and certification
- Architects
- Equipment – marine, navigation etc
- Recruitment agency services / manpower
- Risk assessment and fire safety equipment
- Survey services and vessels
- Plant and tool hire
- Divers
- Security (services and fencing)
- Oil spill response
- Ships chandlery
- Hotels and self-catering accommodation
- Offshore accommodation
- Transportation - mini-bus hire / car hire / taxis
- Waste management / cleaning
- Fuel supplies
- Office supplies and courier services
- Mobile catering
- Welfare services

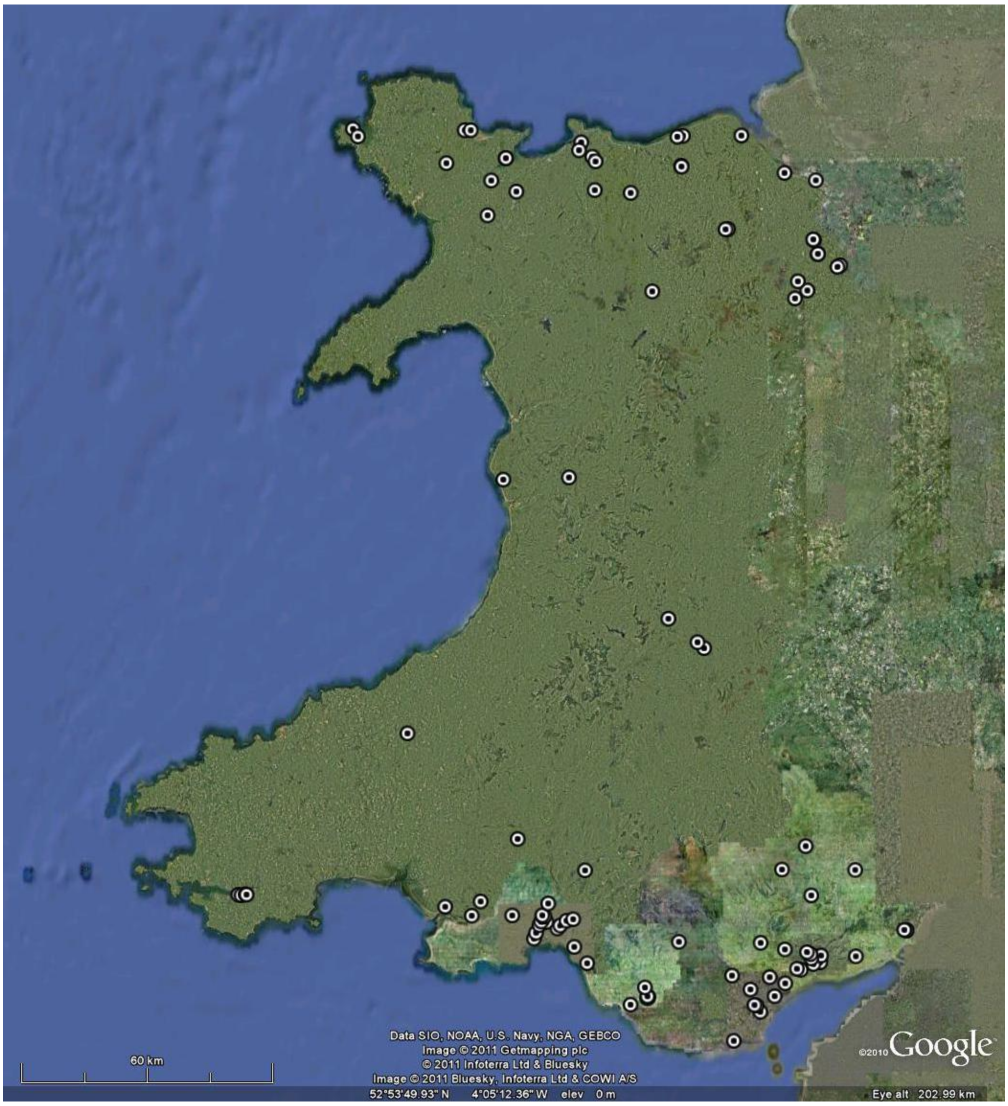
Welsh Supplier Capabilities

The capabilities of Welsh firms have briefly been considered to identify key areas of strength within Wales. A number of Offshore Wind supply chain events have taken place over the last 12 months, and around 100 Welsh firms have been recorded as having expressed an interest in Offshore Wind – the locations of which have been mapped in Figure 5.3. The map shows that there is a spread of relevant firms across Wales, with clusters of firms in the North and South, and a natural focus in large centres of population and industrial areas.

Analysing by type of firm, it is clear that there is no particular regional specialism, with the companies identified involved in every phase of the wind farm lifecycle:

- **Development**: surveying, legal, financing, project consenting
- **Manufacture**: Concept development, sub-component design and manufacture, large component production, foundation design
- **Installation**: Health and safety, cranage, diving, vessel charter
- **O&M**: Vessel charter, health and safety.

Figure 5.3: Businesses Involved in the Offshore Wind sector



5.3 Qualitative Impacts

This section provides a high-level assessment of the qualitative impacts of low carbon energy projects on Welsh ports and their surrounding areas. It should be noted that this assessment has not considered the wider qualitative impacts associated with other onshore locations (e.g. such as onshore wind development sites) as this is outside the scope of this assessment.

Skills

Section 4 of this report identifies that there could be significant growth in the number of jobs in ports related to low carbon energy developments. This finding sits within a broader trend of a significant expansion in the number of low carbon jobs in Wales, the UK and globally. For example, it is estimated that the Offshore Wind industry could generate from 40,000 to 70,000 jobs over the next decade[46]. The rapid growth of low carbon industries means there is a pressing need for key skills if the UK is going meet the labour demand and maximise the domestic supply chain.

The increase in the number of low carbon jobs will create demand for workers with a range of particular skills. Given that this is an emerging industry, these skills may not be in sufficient supply, potentially creating skills gaps and upward wage pressure within low carbon sectors. The presence of skills gaps may hold back development projects, and increase labour costs. An alternative outcome is that skilled workers may be brought in from elsewhere. For example, to date in the offshore wind sector, industry experience suggests that workers on installation vessels are generally brought in from other European countries – indeed they generally remain with the installation vessels, moving from one development site to another.

However counter to this trend, it is possible that increased demand in some low carbon activities could be met through the transfer of skills from other sectors and/or retraining. Welsh staff already engaged in low carbon industries are becoming more skilled over time, and reducing this in-migration of skills. For example, the Port of Mostyn report that technicians involved in projects to date are moving up the value chain of activities. This trend is supported in locations where there is an ongoing stream of work over a prolonged period – as has been the case in North Wales in relation to Offshore Wind. Furthermore, the fact that the UK is the current market leader in low carbon industries such as Offshore Wind means that engineers, designers and technicians who build up expertise in domestic projects will also be in a strong position to sell their skills around the world.

Impact on Other Sectors

Ports, by their very nature, tend to be space constrained, and have a defined maximum capacity at any point in time. Although it is possible to increase the capacity and amount of space available either through purchase of land or reclamation from the sea, this can be an expensive process. Therefore, whenever the potential development of a port for low carbon energy purposes is considered, it is relevant to consider potential alternative uses of the port, and potentially negative impacts upon other sectors or uses. As demonstrated in Section 4, low carbon energy uses such as offshore wind construction and biomass plants can occupy a significant amount of space. Offshore projects also often require unrestricted access in order to ensure that the installation remains on target, and to ensure that installation costs are minimised. For these reasons, it may be the case that low carbon energy uses conflict with other port uses; depending on the port characteristics.

[46] Source: Carbon Trust - Big Challenge, Big Opportunity

However, it may not always be the case that low carbon energy activities come at the expense of other activities. The levels of traffic in Welsh ports have been static or in decline in recent years – for example the decline in dry bulk traffic such as ores and coal. Therefore it is more likely to be the case that low carbon activity has been a much needed new source of business rather than displacing other activity. Individual ports must make decisions on the most attractive sources of future revenue on a case by case basis, deciding on the sectors which present the best options in the long term. It is also relevant to consider that many of the port infrastructure upgrades currently being considered are predicated on the assumption that they will be used by a range of sectors – not just low carbon energy.

Parallels can be made with the North Sea oil and gas industry. Both Peterhead and Aberdeen developed successfully into major supply bases for the North Sea oil and gas industry, yet still managed to protect their role as leading white fish ports. Indeed, Peterhead is still the largest white fish port in Europe. The key to this success was the ability to segregate activities and ensure that the operational needs of quite different industries were met successfully. Also, Invergordon manages to act as a service base for the oil rigs and handle more than 50 cruise visits per annum – again due to segregation between piers

In addition, it is important to consider the impact of development (particularly offshore wind and marine) on shipping and navigation. Previous EIA studies of offshore wind projects have shown that they can have a moderate adverse effect in disrupting shipping. However the impact can be mitigated by designing project layouts to avoid shipping lanes and minimise impacts on recreational, cargo and fishing vessels.

R&D impacts

There are some potential R&D impacts which could arise as a result of the location of low carbon energy developments in and around port sites in Wales. Knowledge exchange between ports, project developers and Universities is most likely to occur in sectors where the technology is less well developed and therefore there is a greater role for academic research to help establish the technical capabilities and the possible return on investments – for example in the marine energy sector. There are many examples of researchers from Welsh Universities involved in marine energy projects in Wales – for example on aspects such as hydro-environmental modelling, ecology, site selection, and mechanical engineering. Swansea University is currently working with Tidal Energy Limited to undertake underwater sound measurements at their Ramsey Sound development site, and working with Wave Dragon Wales on environmental modelling.[47]

With regard to Offshore Wind, whilst technology is relatively mature, there will still be technological challenges faced as projects move further offshore into deeper water. Organisations such as the Carbon Trust have identified key areas for further R&D, such as foundation designs for deep water, which could offer significant savings to drive down costs and therefore increase the potential for wider roll-out of wind farms.

Other possibilities for R&D investment and collaboration include the development of test facilities to help progress technology from the design stage to first prototyping and manufacture. Test facilities already existing in a number of locations in the UK, such as the EMEC (European Marine Energy Centre) in Orkney; the WaveHub in Cornwall; the NaREC facility in Northumberland; and the QinetiQ marine testing facility in Gosport. However there are no such test facilities in Wales at present.

[47] Source: Low Carbon Research Institute, http://www.lcri.org.uk/th1-research-pri-3.html

There are already a number of R&D centres in low carbon sectors in Wales, the largest of which is the **Low Carbon Research Institute** – led by the Welsh School of Architecture at Cardiff (in partnership with University of Wales Bangor, University of Glamorgan, and the University of Wales Swansea).

Inward Investment and Profile of Wales

The development of a low carbon sector in Wales could boost the profile of Wales and encourage inward investment from foreign firms. The scale of the proposed developments identified in Section 4 could encourage businesses to locate in Wales to service the market. The development of the Wylfa B nuclear power station and biomass power plants will also bring a considerable amount of inward investment into Wales (although not all of the investment will necessarily be related to ports). It is also relevant to note that the old Anglesey Aluminium site is currently being marketed to potential new occupiers – with interest shown by companies across a range of low carbon sectors including nuclear, offshore wind, and biomass. It is possible that development in other sectors such as marine could also encourage firms to locate in Wales, although given the likely timescales for development major investment is unlikely in the short term up to 2020.

Social Impacts

Previous EIA studies of low carbon developments in Wales have identified a number of potential social impacts, such as:

- Impacts on tourism and leisure
- Noise (particularly during construction)
- Congestion (both onshore road traffic, and offshore shipping traffic)

The extent of such impacts depends on the nature and scale of developments, and the sensitivity of the surrounding area. In many cases, some impacts can be mitigated and minimised through design.

Environmental Impacts

Potential Environmental Impacts identified in previous EIA studies of low carbon developments in Wales have included:

- Marine ecology, ornithology, and seabed habitats
- Onshore ecology and environment
- Landscape/seascape and visual environment
- Physical environment – effects on sediment transport, water quality, waves and tides, scour effects, hydrology, and flood risk
- Environmental mitigation measures funded by project developers

The extent of such impacts depends on the nature and scale of developments, and the sensitivity of the surrounding environment. In many cases, some impacts can be mitigated and minimised through design.

6. Barriers & Mitigation

This section sets out the potential barriers to the realisation of economic benefits at Welsh ports, associated with low carbon energy developments; and a selection of possible mitigation options and policies which could be adopted. The following barriers and mitigation options have been identified, based on a review of relevant literature, industry knowledge and industry consultations. This section starts with barriers related to ports, and concludes with other factors related to the low carbon sector more generally.

6.1 Barriers related to Ports

Market Awareness and Engagement of Welsh Ports in Low Carbon Energy

In order to fully engage and maximise opportunities in low carbon sectors, port operators require a good understanding of commercial opportunities and port requirements for a range of technologies. A number of consultations have been completed within this review, which generally demonstrated that port operators generally have a high level of understanding of low carbon sectors, and engagement with developers. The majority of major ports are in dialogue with low carbon energy developers, and have developed or are developing plans to upgrade port infrastructure to maximise opportunities. That said, within small/medium sized commercial operators the level of engagement and understanding of low carbon sectors is lower.

Mitigation: In order to maximise the involvement of Welsh ports in low carbon sectors, public sector bodies should continue to engage with ports and increase their understanding of the opportunities in the sector.

Port Infrastructure and Capacity Constraints

The analysis presented in Section 4 demonstrates that there are a number of major Welsh ports which could have a significant involvement in low carbon energy developments. However, significant investment at port sites will be required in respect of the largest projects such as the Atlantic Array and Irish Sea Offshore Wind projects, the Port Talbot and Anglesey Biomass projects, and the Wylfa B nuclear power station. In the case of the Atlantic Array and Irish Sea projects in particular, where a number of ports are still under consideration, there is a risk that Welsh ports may not be successful in winning business. As shown in the economic impact scenarios, the choice of construction and O&M ports for these projects will have a major bearing on the level of economic benefits at Welsh ports.

Mitigation: Public sector bodies in Wales should consider targeted support to ports to invest in the necessary infrastructure to compete in low carbon markets.

Planning Restrictions and Environmental Issues

Local planning authorities have the authority to make planning decisions for low carbon energy projects up to 50MW, above this size decisions are taken at the UK Government.

Planning has been an issue for a number of renewable energy projects and associated infrastructure in the past, and was identified by many of the ports and renewable energy developers consulted during this study. An area of concern for the industry is the time it takes for applications to be considered by both the local planning authorities and the Planning Inspectorate.

Reforms to the consenting process have taken place, allowing sites to be developed in a shorter period and at lower cost, and fast tracking large projects in the national interest. Specifically, the Planning Act 2008 (England and Wales) was recently amended, removing the Infrastructure Planning Commission (hereafter IPC), originally set up to manage applications for nationally significant infrastructure projects, with power output levels exceeding 100 MW for offshore sites, and the consents for high voltage transmission lines to the sites. This responsibility has now been transferred to the Planning Inspectorate.

As outlined in Section 5.3, there are a range of environmental and social issues associated with low carbon energy developments and associated infrastructure (e.g. expansion of ports and dredging), and planning refusal is often made on this basis. Failure to obtain planning consent will mean that projects do not proceed and/or that developers utilise port infrastructure elsewhere.

On the other hand, the planning process may be utilised as a framework to identify the most suitable sites for development (for example the SSAs for onshore wind development, and the forthcoming SEA for marine renewables).

Mitigation: Complete a SEA for marine renewable to identify suitable sites for development; and then work with The Crown Estate to facilitate a leasing round for marine energy at the earliest opportunity. This will reduce uncertainty within the marine sector.

Work with project developers across all sectors to ensure that environmental impacts are mitigated as far as possible, to ease developments through the planning process.

Uncertainty

There is still significant uncertainty in relation to the choice of ports to be used in connection with major developments, and even uncertainty about when and where projects will come forward. This may act as a barrier and hamper investment by ports to improve infrastructure, and supply chain companies to increase capacity.

Mitigation: There should be ongoing monitoring of progress of developers of major projects – to update the findings from this study as new information becomes available, and monitor against the targets in the Renewable Energy Roadmap for Wales. Public bodies should facilitate dialogue between project developers, ports and supply chain companies on an ongoing basis.

6.2 Barriers related to Low Carbon sectors more generally

Availability of Skills

As described in Section 5.3 above, there is a risk that the growth of the low carbon sector in Wales will create skills gaps, and potentially lead to the in-migration of skills and/or upwards pressure on related wages. It is possible that increased demand in some low carbon activities could be met through the transfer of skills from other sectors and/or retraining.

Mitigation: Close cooperation between public enablers, training providers and the low carbon industry will be essential to focus investment in skills in the areas of greatest need. Further research should be undertaken to better understand the skills requirements of low carbon industries, and the supply of skilled labour in Wales.

Financing and Viability of Low Carbon Energy Projects

Financing and viability are common issues across all low carbon technologies. The economics of low carbon technologies mean that they are currently more expensive than conventional power generation technologies, and therefore require government support in order to be financially viable. Low carbon energy technologies also carry a degree of risk, which may deter investment.

The UK's main market incentive to develop renewable electricity generation is the Renewables Obligation (RO). This places an obligation on retailers of electricity to obtain an annually increasing proportion of their electricity from renewable sources. Plans are being proposed to replace the RO with a feed-in tariff (FIT) system, which has been used with success elsewhere in Europe. While it is believed that FITs will reduce electricity price risk, the RO system is understood by the industry and working well. The current level of support also means that most developers see the UK as an economically attractive market for development.

There is concern that uncertainty over the Electricity Trading Reform and the transition between the two systems will introduce delays and hamper the ability to attract finance for projects. A further concern is that replacing the RO removes the obligation on electricity suppliers to source from renewable energy suppliers.

Another potential barrier to development is the availability of finance for project development, and equally for upgrades to port facilities. The UK Government is currently considering the introduction of a £1 billion Green Investment Bank which would invest in low carbon energy projects – and is set to be launched fully in September 2011.

In terms of viability - as projects move further offshore into deeper water, it is anticipated that capital costs will increase which may make it more difficult for projects to be funded. Further R&D activity may mean that savings can be made to drive down costs and therefore increase the potential for wider roll-out of low carbon technologies.

As shown in the economic impact scenarios, the delay or cancellation of projects will have a major bearing on the level of economic benefits in Wales.

Mitigation: Public sector and industry bodies in Wales should work with developers to better understand the risks to major development projects. Public sector bodies should also consider making targeted investment into R&D activities which could improve the viability and/or deliverability of low carbon projects.

Power Network Infrastructure and Capacity Constraints

Another key risk to the delivery of major low carbon energy projects on time is the availability of grid infrastructure and grid capacity for connection. Given the remote nature of many low carbon energy projects, the grid infrastructure can often be insufficient for connection, and upgrades are therefore required – which the project developer may be required to contribute towards. This problem is particularly acute in Wales, as South Wales and North Wales are served by quite separate East to West networks which are effectively 'spurs' from the main UK network, whilst the grid connectivity in Mid Wales is especially poor. National Grid are proactively planning ahead to ensure that there is sufficient grid capacity available, and have announced investment of £22billion into the UK grid over the next five years.[48] This includes plans for a sub-sea connection from North Wales to South Wales to complete a loop (thus reducing risk to the network) and an upgrade to the network in Mid Wales to 400kV to allow additional onshore wind projects to be connected.

Mitigation: National Grid is already working to ensure that there is sufficient network infrastructure and capacity available. Project developers must engage with National Grid at the earliest opportunity to ensure that capacity will be available. Future projects should be located with capacity constraints in mind.

Land-side infrastructure requirements

Land-side infrastructure is a significant issue in a number of low carbon energy sectors. For Onshore Wind, road infrastructure is an important consideration in the choice of port for import of components, as outlined in Section 4.1. Land-side access to ports is also an important factor for companies seeking to supply the Offshore Wind and Marine energy sectors.

Mitigation: Targeted investment could be made in land-side infrastructure to increase the usage of Welsh ports within the onshore wind sector – however the overall impact on Welsh jobs would be minimal. Public bodies could potentially undertake further research to better understand the land-side infrastructure requirements of low carbon supply chain companies.

Supply Chain Bottlenecks

There is a concern that supply chain bottlenecks may hold up major development projects – particularly within the Offshore Wind market over the next few years. There are fears within the industry that the scale of deployment predicted by the Crown Estate by 2020 is undeliverable. A number of key reports (e.g. Crown Estate - Towards Round 3: Building the Offshore Wind Supply Chain) have highlighted potential bottlenecks in the supply chain such as the supply of cables and installation vessels.

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48 http://www.businessgreen.com/bg/news/1803917/national-grid-seeks-gbp32bn-upgrade-britains-ageing-network

UK companies are well placed to win business in low carbon markets, but many have postponed large-scale investment due to the degree of uncertainty and perceived risk, and in some sectors are behind companies in other countries such as Germany and Denmark.

Public development bodies and The Crown Estate have organised a number of UK-wide supply chain events to help address these issues, encourage industry dialogue, and facilitate introductions between firms.

> **Mitigation:** More focused support to major project developers and supply chain firms is required to support product development and provide industry contacts. One idea suggested through consultations for this study is the use of the Sell2Wales system to act as a meeting-point for project developers and suppliers – and then monitor whole supply chains within the low carbon industry.

6.3 Summary

The following table sets out the factors which could act as potential barriers to the realisation of economic benefits from low carbon energy – identified through consultation with ports, renewable energy developers and other stakeholders as part of this study. Based on these identified barriers, DTZ has suggested a selection of possible mitigation options available to the public sector in Wales, and a possible prioritisation in terms of potential impact. However, further work will be required to assess the suitability of any such policies.

Potential Barriers	Potential Public Sector Response / Mitigation Options	Priority / Potential Impact
Barriers related to ports		
Market Awareness and Engagement of Welsh Ports	High engagement amongst larger ports. Need to engage smaller ports more fully to ensure they understand opportunities	Medium
Port Infrastructure and Capacity Constraints	Targeted support to ports to invest in the necessary infrastructure to compete in low carbon markets.	High
Planning Restrictions and Environmental Issues	Complete SEA and leasing round for Marine renewables. Work with project developers to ensure that environmental impacts are mitigated as far as possible.	High
Uncertainty of which ports will be used	Requires ongoing engagement with developers of major projects.	Medium
Barriers related to low carbon sectors more generally		
Availability of Skills / risk of skills gaps	Further research required to identify specific skills demand, skills gaps, and education provision inside/outside Wales.	Medium
Financing and Viability of Low Carbon Energy Projects	Work with developers to better understand the risks to major development projects.	Medium
	Targeted investment in R&D on technologies which can improve the viability of low carbon projects.	High

Potential Barriers	Potential Public Sector Response / Mitigation Options	Priority / Potential Impact
Power Network Infrastructure and Capacity Constraints	National Grid already working to ensure sufficient network infrastructure and capacity. Project developers must engage with National Grid at the earliest opportunity to ensure that capacity will be available.	High
Land-side infrastructure requirements	Targeted investment to increase the usage of Welsh ports by onshore wind sector (overall impact on Welsh jobs would however be minimal).	Low
Supply Chain Bottlenecks (particularly offshore wind)	Support to major project developers and supply chain firms Mapping of supply chain capabilities? (as has been done in SW) Use of the Sell2Wales system as a meeting-point for project developers and suppliers?	Medium

Overall, our analysis demonstrates that there is a need for a holistic approach to the low carbon energy sector in Wales to ensure that economic benefits are maximised. Most importantly, this needs to facilitate dialogue between project developers, ports, supply chain companies, and R&D providers on an ongoing basis. Public sector support (Welsh Government, Local Authorities and other relevant parties) needs to be business and investment focused, integrating across the following domains (in no particular order):

- Ports
- Planning (e.g. including SEA)
- Land-based infrastructure (transport, grid connectivity, sites)
- Skills
- Supply chain
- Financial support
- Inward Investment
- R&D and demonstration projects

7. Summary and Conclusions

Policy Context

There is a strong policy commitment to low carbon energy generation in Wales, and the low carbon energy sector has been identified as a sector of increasing importance to Wales. A House of Commons Inquiry into Ports in Wales (2009) identified Welsh ports as an 'underexploited resource' which could play a greater role in economic development, particularly through their potential role in relation to low carbon energy.

Baseline Review of Ports in Wales

There are a total of **14 ports in Wales** which currently handle commercial traffic. Collectively they handled a total of **54 million tonnes** of cargo in 2009, which amounted to 11% of all port traffic in Great Britain. The throughput of Welsh ports has fluctuated between 50-60 million tonnes per annum for the last decade. Milford Haven accounts for nearly three-quarters (74%) of all traffic, followed by Port Talbot (10%), Holyhead (5%), Newport (5%), and Cardiff (4%). Port traffic forecasts show that **overall traffic volumes in 2030 are expected to be in line with 2009, with zero growth overall in this period.**

Despite difficulties in assessing the economic contribution of ports, a range of estimates have been made for the total employment and economic benefit they generate. For example Oxford Economics (2009) suggest that UK ports directly support 132,000 jobs. In the absence of any corresponding assessment for ports in Wales, DTZ has estimated that **Welsh ports currently support at total of 18,400 jobs** (based on an existing study of ABP ports in South Wales, plus supplementary data in respect of remaining Welsh ports), which equates to around 14% of the total employment supported by UK ports.

The engagement of Welsh ports in the low carbon energy sector to date has been focused on a small number of ports (Mostyn, Port Talbot & Swansea). There is limited secondary information available to estimate the current level of economic impact which this activity generates, however DTZ has consulted with ports and low carbon energy project developers, and modelled potential economic impacts. The primary impact to date relates to the construction and operation of offshore wind projects out of the Port of Mostyn, which currently supports around 350 FTE jobs.

Port Infrastructure Assessment

Low carbon energy projects often have significant port infrastructure requirements, hence port infrastructure is expected to be fundamental to Welsh ports unlocking economic opportunities in this sector. The key criteria used to assess the suitability of ports for servicing the low carbon energy sector includes: marine access, navigation, port facilities, maximum ship size, road/rail transport links and land holdings.

DTZ has assessed all commercial ports in Wales, based on their current and planned infrastructure relative to the port infrastructure requirements for low carbon sectors. In our view, the following ports appear to have the greatest competitive advantage in exploiting the opportunities from low carbon energy sectors, although this does not preclude niche roles for other ports in Wales, for example in supporting the O&M of offshore wind projects.

- **North Wales** - Holyhead and Mostyn
- **South Wales** - Milford Haven, Port Talbot, Newport, and Swansea

Our analysis highlights that there are several key competitor ports located in the geographical catchment of Wales relevant to the low carbon energy sector. All of these ports must be considered very serious competitors given their location, port specification, facilities and competitive intent to secure emerging opportunities from the low carbon energy sector:

- **Irish Sea & Morecombe Bay** - Belfast, Barrow-in-Furness, Liverpool, Birkenhead and Ellesmere Port
- **Severn Estuary** – Bristol and potentially North Devon ports

A clear spatial pattern is evident with different levels of competition in North and South Wales. For example, if one focuses on the offshore wind sector the following competitor analysis is informative:

- **North** – for the major offshore wind opportunities in the Irish Sea, there are only two ports on the North coast of Wales that are competitively placed to target this opportunity, with five serious competitors outside Wales.
- **South** – for the Atlantic Array there are four Welsh ports – all of which are better located than the main competitor port Bristol, and larger than other smaller competitors such as minor ports in North Devon.

Economic Impact of Low Carbon Energy

DTZ has reviewed the potential economic impact of low carbon energy projects on Welsh ports in the short term (2010-2015), medium term (2015-2020) and long term (2020-2030). DTZ constructed three scenarios (Optimistic, Moderate and Pessimistic) to assess the potential likely level of impact. It should be noted that the assessment considers only the impacts associated with Welsh ports, and not the wider low carbon sector in Wales.

As shown in the following figures, the number of jobs supported by low carbon energy in Welsh ports is forecast to increase from the current figure of around 350 jobs to between 1,000 – 3,000 jobs by 2020. **The average employment in ports over the period 2010-2020 supported by the low carbon sector is forecast to be between 1,000 and 2,500 jobs.** In all scenarios, it is forecast that there will be a **rapid increase in the number of jobs by 2012** (to between 1,640 and 2,450 jobs) due to the expected construction of major biomass plants at Port Talbot and Anglesey, the sizeable Gwynt Y Mor offshore wind project, and the Skerries tidal stream project.

In all scenarios, the majority of the impact to 2020 is expected to be related to the **Offshore Wind and Biomass sectors, which together account for 90%+ of the total employment** impact forecast across all low carbon sectors. The Onshore wind sector is expected to support a very small number of jobs in ports (notwithstanding that there will be significant impacts at onshore wind development sites). In terms of the Wave/Tidal sector, the impact is anticipated be modest in the short to medium term, but is likely to increase in importance significantly in the longer term. Regional analysis suggests that around three quarters of the total estimated impact related to offshore wind could be in North Wales, whilst two-thirds of the total impact related to Biomass could be in South Wales.

In the medium term (2015-2020), the scenarios diverge considerably. The Optimistic Scenario is forecast to sustain average employment of over 3,100 FTEs in the period 2015-2020, as it is assumed that Welsh ports continue to be utilised for major offshore wind projects, and there is a continuing stream of new biomass projects. By contrast, in the Moderate Scenario, low carbon energy projects are estimated to support 1,500 FTEs on average over the period 2015-2020, whilst in the pessimistic scenario this is anticipated to be further reduced to 900 FTEs.

Figure 1: Total Employment Impact in Welsh Ports – All Low Carbon Energy Technologies

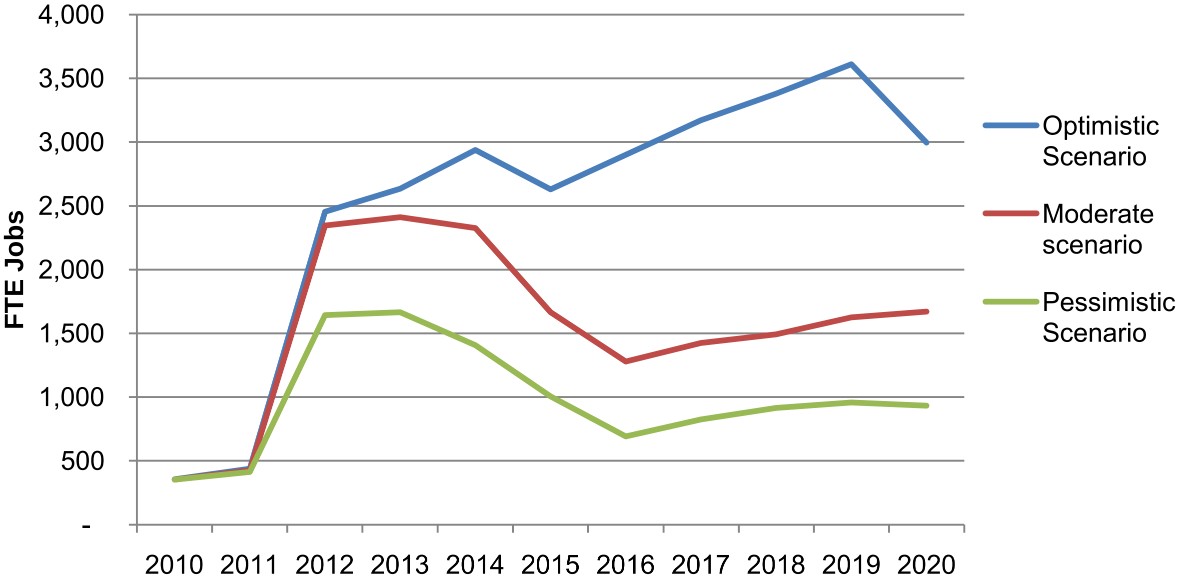
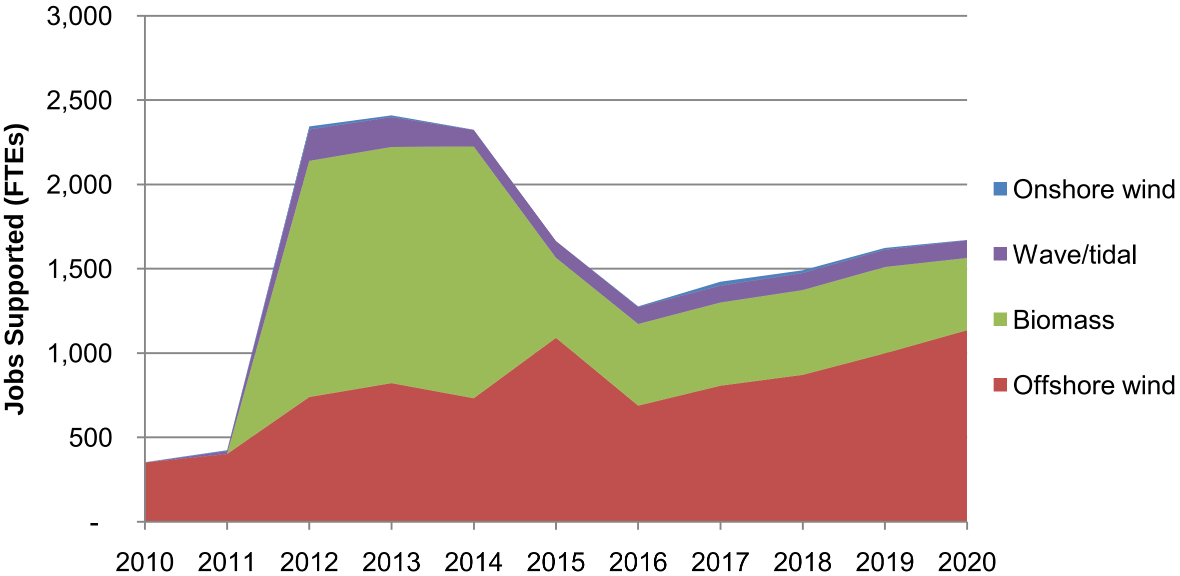


Figure 2: Total Employment Impact in Welsh Ports by technology (Moderate Scenario)



The scenario analysis suggests that the economic outcomes could vary significantly depending on the following factors:

- The extent to which **limitations and barriers** (such as planning/environmental issues, financing, logistics, supply chain, capacity etc) cause development projects to be delayed, scaled back or even cancelled.

- The **choice of port** for construction and operations and maintenance activities (Offshore Wind and Wave/Tidal) and the location of biomass projects.

In the longer term (2020-2030), there is considerable uncertainty around the level of employment which could be supported by low carbon energy projects, but this assessment suggests the following possible trends:

- **Offshore Wind** is anticipated to continue to support a significant number of jobs associated with operations and maintenance activities on current and future projects (540-1,200 FTEs depending on the scenario chosen). There may also be some further construction activity in the long term associated with known projects (if they are delayed beyond 2020), and potentially additional projects beyond the current Crown Estate Round 3 licensing process.
- **Wave / Tidal** - It is expected that the roll-out of commercial scale wave and tidal stream devices would take place from 2020 onwards – although there is uncertainty around the likely level of deployment. Welsh ports should be well-placed to capture economic activity related to deployment, operations and maintenance, and potentially also the manufacture of marine energy devices. If Wales can capture a significant share of manufacturing activity related to marine energy, then this could potentially support several thousand jobs at port sites in Wales; however there is significant uncertainty around this.
- **Biomass** – in the long term, there will be a requirement to operate biomass plants and import biomass materials through Welsh ports. Depending on the level of deployment to 2020, this could support between 230 and 440 FTEs. It is also possible that there will be further deployment of biomass capacity at port sites in the long term, which would support additional construction and operational jobs.
- **Onshore Wind** – It is expected that much of the onshore wind capacity in Wales would be deployed by 2020. Hence the impact of onshore wind on ports post 2020 would be very small.

In addition to the quantitative impacts identified above, the assessment also highlighted the following qualitative and wider economic impacts:

Impact	Description
Supply Chain	Low carbon energy projects are anticipated to generate significant opportunities for Welsh suppliers (including companies at port sites and elsewhere). The range of supply chain opportunities is extremely diverse. This assessment has highlighted that Welsh firms are well-placed to engage in this market – with 100 firms across Wales expressing an interest in offshore wind supply chain opportunities.
Skills	There is expected to be significant growth in the number of low carbon jobs in Wales (at port sites and elsewhere), which will create demand for workers with a range of particular skills. Given that this is an emerging industry, these skills may not be in sufficient supply, potentially creating skills gaps and upward wage pressure within low carbon sectors; although it is possible that increased demand could be met through the transfer of skills from other sectors and/or retraining. Welsh staff already engaged in low carbon industries are becoming more skilled over time, moving up the value chain of activities, and exporting their services to the rest of the UK.

Impact	Description
Other sectors	Ports tend to be space constrained, and have a defined maximum capacity at any point in time; and low carbon energy uses such as offshore wind construction and biomass plants can occupy a significant amount of space. However, it is not always the case that low carbon energy activities come at the expense of other activities. The levels of traffic in Welsh ports (particularly dry bulk traffic) have been static or in decline in recent years, therefore low carbon activity could provide a much needed new source of business rather than necessarily displacing other activity.
Research and Development	R&D impacts could arise as a result of the location of low carbon energy developments at port sites, and knowledge exchange between ports, project developers and Universities. This is most likely to occur in sectors where the technology is less well developed, such as marine energy. There are already a number of R&D centres in low carbon sectors in Wales, the largest of which is the **Low Carbon Research Institute** – led by the Welsh School of Architecture at Cardiff University.
Inward Investment	The development of a low carbon sector in Wales could potentially boost the profile of Wales and encourage inward investment from foreign firms to service this growing market.
Social	Possible impacts include: • Impacts on tourism and leisure • Noise (particularly during construction) • Congestion (both onshore road traffic, and offshore shipping traffic)
Environmental	Possible impacts include: • Marine ecology, ornithology, and seabed habitats • Onshore ecology and environment • Landscape/seascape and visual environment • Physical environment – effects on sediment transport, water quality, waves and tides, scour effects, hydrology, and flood risk

Barriers and Mitigation Options

The following table sets out the factors which could act as potential barriers to the realisation of economic benefits from low carbon energy – identified through consultation with ports, renewable energy developers and other stakeholders as part of this study. Based on these identified barriers, DTZ has suggested a selection of possible mitigation options available to the public sector in Wales, and a possible prioritisation in terms of potential impact. However, further work will be required to assess the suitability of any such policies:

Potential Barriers	Potential Public Sector Response / Mitigation Options	Priority / Potential Impact
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Potential Barriers	Potential Public Sector Response / Mitigation Options	Priority / Potential Impact
Planning Restrictions and Environmental Issues	Complete SEA and leasing round for Marine renewables. Work with project developers to ensure that environmental impacts are mitigated as far as possible.	High
Uncertainty of which ports will be used	Requires ongoing engagement with developers of major projects.	Medium
Barriers related to low carbon sectors more generally		
Availability of Skills / risk of skills gaps	Further research required to identify specific skills demand, skills gaps, and education provision inside/outside Wales.	Medium
Financing and Viability of Low Carbon Energy Projects	Work with developers to better understand the risks to major development projects.	Medium
	Targeted investment in R&D on technologies which can improve the viability of low carbon projects.	High
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Land-side infrastructure requirements	Targeted investment to increase the usage of Welsh ports by onshore wind sector (overall impact on Welsh jobs would however be minimal).	Low
Supply Chain Bottlenecks (particularly offshore wind)	Support to major project developers and supply chain firms Mapping of supply chain capabilities? (as has been done in SW) Use of the Sell2Wales system as a meeting-point for project developers and suppliers?	Medium

Overall, our analysis demonstrates that there is a need for a holistic approach to the low carbon energy sector in Wales to ensure that economic benefits are maximised. Most importantly, this needs to facilitate dialogue between project developers, ports, supply chain companies, and R&D providers on an ongoing basis. Public sector support (Welsh Government, Local Authorities and other relevant parties) integrated across the following domains, is also of importance:

- Ports
- Land-based infrastructure (transport, grid connectivity, sites)
- Skills
- Supply chain
- Financial support
- Planning (e.g. Including SEA)
- Inward Investment
- R&D and demonstration projects

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Appendix 2: Welsh Port Traffic Analysis

Table A2.1: Welsh Major port traffic growth 1999-2009

All foreign and domestic traffic				**Total**			**% Change**
	1999	**2007**	**2008**	**2009**	**2007-09**	**2008-09**	**1999-2009**
Liquid bulk							
Liquefied gas	-	883	651	5,072	474.4%	679.2%	
Crude oil	14,713	14,866	14,881	14,494	-2.5%	-2.6%	
Oil products	18,071	19,824	20,454	19,981	0.8%	-2.3%	
Other liquid bulk products	-	58	67	46	-20.7%	-31.3%	
All liquid bulk traffic	*32,784*	*35,631*	*36,053*	*39,593*	*11.1%*	*9.8%*	*20.8%*
Dry bulk							
Ores	8,455	5,779	5,768	3,551	-38.6%	-38.4%	-58.0%
Coal	3,844	3,418	3,532	3,116	-8.8%	-11.8%	-18.9%
Agricultural products	212	40	42	75	87.5%	78.6%	-64.6%
Other dry bulk	1,567	1,875	1,915	1,306	-30.3%	-31.8%	-16.7%
All dry bulk traffic	*14,078*	*11,112*	*11,257*	*8,048*	*-27.6%*	*-28.5%*	*-42.8%*
All bulks							
Bulk fuels	36,423	38,990	39,517	42,663	9.4%	8.0%	17.1%
Other bulks	10,439	7,752	7,793	4,978	-35.8%	-36.1%	-52.3%
All bulk traffic	*46,862*	*46,743*	*47,310*	*47,641*	*1.9%*	*0.7%*	*1.7%*
Other General cargo							
Forestry products	57	341	275	156	-54.3%	-43.2%	173.7%
Iron and steel products	18	2,577	1,777	953	-63.0%	-46.4%	5194.4%
General cargo & containers <20'	-	34	39	22	-35.3%	-43.9%	Na
All other general cargo traffic	*587*	*2,974*	*2,091*	*1,131*	*-62.0%*	*-45.9%*	*92.7%*
– Containers							
All container traffic	239	238	160	105	-55.9%	-34.4%	-56.1%
Roll-on/Roll-off							
All Ro-Ro traffic	4,323	4,099	4,660	4,084	-0.4%	-12.4%	-5.5%
All container and ro-ro traffic	*4,562*	*4,337*	*4,820*	*4,189*	*-3.4%*	*-13.1%*	*-8.2%*
All Major port traffic	**52,011**	**54,054**	**54,221**	**52,961**	**-2.0%**	**-2.3%**	**1.8%**

(1) Included in figure below

Source: DfT Maritime Statistics, analysis by MDS Transmodal

Projected Traffic Trends (2009 – 2030) - Methodology

Traffic Forecasting Methodology – these national growth rates are based in part upon the Department for Transport National Port Traffic Forecasts (2007 publication) and in part upon the latest Government energy policy contained within the Low Carbon Transition Plan.

The way in which the national forecasts (compiled by MDS Transmodal for the Department for Transport) were produced varied by broad cargo type, i.e. whether bulk or unitised. For specific bulk cargoes: coal, oil, animal feeds and biomass the approach was to:

(i) identify long term trends in demand, and relate that to identifiable drivers,
(ii) to assess whether those drivers were likely to change in the future
(iii) to take those drivers into account in projecting future traffic.

For other cargo, including that which is unitised, our approach is based on our world trade forecasting model (WCD), which takes account of detailed trends in commodity flows by country of origin and destination.

Forecasting Assumptions relevant to Welsh Ports – the following explains some of the key assumptions made in developing these forecasts which have relevance to Welsh ports.

Energy bulks (oil, gas, refined oil products, coal)

- Liquefied gas imports are assumed to vary in line with overall gas imports, as set out in the UK Low Carbon Transition Plan, which assumes that demand for gas declines up to 2025 as the UK becomes less reliant on carbon for the generation of electricity. At the same time, the proportion of gas that is imported is expected to increase.

- Liquefied gas exports are assumed to remain stable, as a function of stable refining capacity

- Coal imports are assumed to vary in line with the UK Low Carbon Transition Plan, which assumes that demand for coal declines up to 2015 as the UK becomes less reliant on carbon for the generation of electricity. As UK coal production is assumed to remain stable, the proportion of coal that is imported is expected to fall.

- Coal exports are assumed to remain stable as the UK Low Carbon Transition Plan assumes that UK coal production remains stable up to 2025.

- Crude oil imports are assumed to vary in line with forecasts for oil demand and import dependency as set out in the UK Low Carbon Transition Plan, which assumes that demand for crude oil increases up to 2025 as the UK's demand declines slightly but domestic production from the North Sea declines more rapidly. The proportion of crude oil that is imported is expected to increase. The forecast also includes Norwegian crude oil that is imported and then re-exported through UK-based tank storage on the Tees.

- Crude oil exports include the Norwegian crude oil (see above) and a fixed percentage (11%) of UK North Sea oil production.

- Oil products exports are assumed to remain stable, as a function of stable refining capacity up to 2030.

- Oil products imports are assumed to reflect forecasts for oil demand in the UK included in the UK Low Carbon Transition Plan and forecast exports of oil products and an assumption that UK refinery capacity will remain stable at 85 million tonnes of output.

Biomass (dry bulk)

This is both an existing traffic (imports for co-firing at existing coal-fired power stations) and a new traffic as a feedstock for planned port-based biomass power stations. The forecast for the future port-based biomass power stations has been based on the following assumptions:

- The equivalent of 90% of the existing proposed power stations at or close to ports will receive permission and will be developed.
- 100MW of capacity requires 0.5 million tonnes of imported feedstock p.a.
- 20% of this capacity is developed by 2013, 60% by 2014 and 100% by 2015
- From 2015-20 traffic grows by 3% p.a., from 2020-30 traffic grows by 2% p.a.

The forecasts for imports of biomass for co-firing at coal-fired power stations have been based on the following assumptions:

- 12.5% of gross volumes of imported feedstock for coal-fired power stations are imported as biomass through ports
- 50% of imported volumes are agricultural bulks and 50% are "other dry bulks"

Biomass projects are being discussed at several Welsh ports including Milford Haven, Holyhead, Port Talbot, Swansea and Newport

Other bulk forecasts

All other bulk traffics were based on a review of the DfT port traffic demand forecasts produced in 2006-07 in the light of the economic recession and other known trends. The DfT forecasts were either:

- Left unchanged, as current trends are broadly in line with the DfT forecasts
- Assumed to be delayed by 5 years due to the impact of the economic recession
- Assumed to remain stable from 2009 due to uncertainty about future trends (mainly due to significant historic annual fluctuations)
- Volumes for "other dry bulks" and "agricultural products" were reduced by the volumes of biomass for co-firing at coal-fired power stations

The general trends indicated here set the broad overview for national port markets. The degree to which Welsh ports can benefit from predicted growth and adapt to contraction in other markets will be the result of individual port development plans. Profiles for the larger and more significant Welsh ports are presented in Appendix 3.

Appendix 3: Port Infrastructure Assessment

Port Summaries for Key Ports

Milford Haven

Location / Context

Milford Haven is located in Pembrokeshire on the South Western tip of Wales.

Port Specification

	Maximum Vessel Acceptance Dimensions			
	Length (m)	Beam (m)	Draught (m)	Approx DWT
Pembroke Port parameters	168.0	33.0	9.7	
Milford Docks parameters	151.0	19.0	7.5	
Tidal Harbour parameters			20.0	290,000

Overview

Milford Haven is Wales's largest port. In 2009 the port handled a total cargo volume of 39.3 million tonnes, up by 3.4 million tonnes or 10% on 2008 and 2007. This increased further to 42.9 million tonnes in 2010.[49] It was one of the few UK ports to have shown an increase in traffic in the last 12 months as other ports suffered the effects of the economic slowdown.

Liquid bulks

The port's main business is in the import of crude oil to two oil refineries (Chevron and Murco), oil products to an oil products tank farm owned by SemLogistics and the export of refined oil products in coastal shipments around Britain and to overseas destinations. Shipments of crude oil into the port amount to around 14.5-15.0 million tonnes annually. Annual shipments of refined oil products amount to around 19 million tonnes. (2009 figures)

LNG

Until recently there was very little LNG import traffic to the UK as the first LNG terminal, at the Isle of Grain (Medway), only became operational in July 2005. Two other import facilities now also exist at Teesport (Gasport) and Milford Haven. Small amounts of LNG historically have also been imported through Immingham.

Milford Haven began importing to the first of two new regasification terminals - South Hook and Dragon in 2008. The Dragon Project is a venture between BG (50%), Petronas (30%) and 4Gas (20%). Total capacity at that facility will be 4.4 million tonnes/year. The South Hook facility, promoted by ExxonMobil, Qatar Petroleum and Total with capacity purported to be in the region of 15 million tonnes/year came on stream in 2009 and will become Europe's largest LNG import terminal. Combined imports to the two terminals will push up Milford Haven's traffic by some 20 million tonnes.

Ro-Ro

Ro-ro services to Ireland from Pembroke Port make up the other principal cargo sector at Milford Haven. The ferry terminal is presently used by Irish Ferries for twice daily sailings to Rosslare. Traffic had been growing steadily in the last few years, but recent economic conditions brought about a drop in ro-ro traffic to 68,000 units in 2009, compared with 86,000 units in 2008 and 94,000 units in 2007.

[49] Source: Milford Haven Port (2011) Annual Report and Accounts 2010

Ro-ro traffic further declined to 62,000 units in 2010. Pembroke port carried 325,000 ferry passengers in 2010.

Other cargoes
Few other cargoes are handled at the port apart from a small amount of general cargo, though heavy-lift project cargo associated with LNG and renewable energy is becoming more important. Recent activity has been stimulated by LNG-related construction works, with the main contractor for South Hook utilising the Port's facilities for the transhipment of equipment and another major contractor that is setting up their Jetty pre-cast yard within the Port. The Port has also been involved in the import of turbines for onshore wind farms.

Pembroke Port also handles shipment of sand and aggregates on a regular basis (50 - 60,000 tonnes p.a.) while a new animal feed import business utilising some of the covered storage started up in 2009.

Milford Docks is an important fishing port, with around 3,000 tonnes of fish being landed in 2009. The port supports both local fishing vessels as well as trawlers operating from fishing waters in Spain and Belgium.

Future development
Milford Haven Port Authority (MHPA) is in the process of developing a 'Clean Energy Terminal' concept, which comprises a number of development plans related to low carbon energy.

Firstly, MHPA is in advanced negotiations with RWE npower renewable concerning the use of Pembroke Dock for the assembly of offshore wind turbines in connection with the Atlantic Array project – although it should be noted that no decision has yet been made by RWE in terms of the port(s) which will be used for the project. The Pembroke Dock site is fairly limited in terms of the amount of land available, and requires some reconfiguration.

Secondly, MHPA propose to develop the Pembroke Dock area as a centre of excellence in fabrication and engineering activities related to low carbon energy technologies. The port is in advanced negotiations with a number of marine energy developers concerning the development of facilities for both the fabrication and pre-assembly of devices at Pembroke.

Thirdly, MHPA is also pursuing plans to bring back into use a 35 acre (14 ha) site at Blackbridge plus adjacent land owned by Pembrokeshire County Council, formerly occupied by the MoD. The Blackbridge site offers close proximity to the available oil, gas and electricity grid connections, as well as road and rail. At its core is a brownfield site that was previously used as a berth facility, and it is adjacent to the already industrialised areas of Dragon and SemLogistics. Finally it is adjacent to deep water. MHPA are still in the process of working up plans for this site, but have indicated that low carbon energy will be central to the concept.

Mostyn

Location / Context

Mostyn is located on the North Wales coastline not far from the major English ports of Ellesmere and Liverpool.

Specification

Maximum Vessel Acceptance Dimensions			
Length (m)	Beam (m)	Draught (m)	Approx DWT
160.0	15.0	6.0	7,000

A port has existed at Mostyn dock in the Dee estuary for centuries. A ‘modern’ dock was developed by Thomas Telford in the early 19th century primarily to handle exports of locally mined coal. Later an ironworks was built, exports of steel products commenced and operations continued until 1965 when the ironworks closed down. The port continued to handle a mix of general cargoes. Traditionally the port had dried at low tide, offering NAABSA berthing (not always afloat but safe aground) to ships that are able to ‘take the bottom’. In 1998 the port commenced the first stage of major development, which was a 120m berth with 6.5m of water alongside at any state of the tide and the reclamation of 6 acres of intertidal land. This was followed by the present development of an additional 310m of quay with a minimum of 9m draught at all states of the tide and a new roll-on roll-off (ro-ro) berth which involved the reclamation of a further 15 acres of intertidal land. For a period the port enjoyed a boost in traffic after attracting P&O ferries to transfer its ferry service to Ireland from Liverpool, but the operator subsequently decided to leave the port.

The port has received a new lease of life from the offshore wind farm business, having now participated as a construction port for five wind farm developments in the Irish Sea: North Hoyle, Burbo Bank, Rhyl Flats, Robin Rigg, and the ongoing Walney project; providing a pre-assembly and lay-down area. Over 40 acres of laydown is available. There is also 6000m2 (28,000 sq/ft) of clearspan fabrication and workshop space for electrical component storage. The Port of Mostyn is currently considering further investment to extend the quays on site and ensure that they meet the 10 tonne per sq m industry standard.

The port also acts as a transfer point for Airbus A380 aircraft wings, which are manufactured at Broughton near Chester and transferred down the Dee by specially constructed barges. The wings are encased in a special pallet or ‘jig’ and the unit is pulled ashore by a transporter unit (similar to a ro-ro tugmaster for trailers) and rolled back onto a seagoing ro-ro vessel for onward transport to France.

The Port is adjacent to the Crewe – Holyhead main rail line and has its own siding together with a railhead which enables it now to offer intermodal options.

Holyhead

Location / Context

Holyhead is located on the North Westernmost edge of Wales. It is a relatively small town, with strong sea links with Ireland.

Specification

	Maximum Vessel Acceptance Dimensions			
	Length (m)	Beam (m)	Draught (m)	Approx DWT
Holyhead Harbour Parameters	210.0	n/r	7.0	
Holyhead - Anglesey Aluminium Bulk Jetty	183.0	n/r	13.0	50,000
Holyhead Anglesey Aluminium Conventional Berth	90		3.4	

The Port of Holyhead is operated by Stena Line Ports Ltd. It is one of the largest deep water sheltered harbours on the west side of the UK. This was created during the 19th century by the construction of a 1.5 mile long breakwater, which is now in need of refurbishment. The port handles nearly 2 million passengers a year and 300,000 road goods vehicles on services to Dublin and Dun Loaghaire operated by Stena Line and Irish Ferries. The tonnage volume of goods passing through the port has decreased by 16% in the last year reflecting the impact of the downturn in the Irish economy, while the numbers of passengers has contracted steadily over the last five years reflecting both economic conditions, but more importantly, the impact of increasing competition from low-cost airlines.

Non-ferry sea freight operations at Holyhead Port are fairly limited. The port was previously used for the landing of aluminium ore for the Anglesey Aluminium smelter on a special jetty off Salt Island on the western side of the harbour – however this has now ceased as the Anglesey Aluminium site has now closed down. Occasional use is made of Soldiers Quay, at the root of the breakwater, for loading or unloading bulky goods e.g. for marine construction. This berth is tidal and draft restricted, but potentially could be used for handling heavy lift renewable energy components. A further restriction is that land adjacent to the port in this location is council owned and within / close to an Area of Outstanding Natural Beauty (AONB). Further land areas of about 4 acres to the south of the port adjacent to a small jetty - 'Fish Dock' also used as a cruise passenger landing area - is also council owned.

The deep water jetty is owned by Anglesey Aluminium Metals Ltd (AAM), a subsidiary of Rio Tinto Group, and was previously used for the import of bauxite and alumina in large bulk carriers. A subsidiary company, Anglesey Aluminium Metal Renewables (AAMR), submitted proposals for the development of a 245m extension to this jetty to increase docking facilities for vessels associated with a proposed biomass plant at the AAM works site. Capital dredging will be required to increase the berth pocket alongside the jetty extension to allow berthing of larger ships, which could be up to 50,000 dwt. Proposals for the biomass plant have progressed, with the Environment Agency Wales recently announcing that had 'no serious reservations' about the biomass proposals.

Use is also made of this facility by visiting cruise vessels and the port has invested in a new cruise terminal as one of several projects that are aimed at the regeneration of the town of Holyhead. The Welsh Government has collaborated with AAML over the last 18 months with a view to establishing the feasibility of using the deep water jetty as an along-side cruise berth. This has included technical appraisals and a series of test berthings by vessels including the Westerdam (82,500 GRT and 285.3m long) which visited the port in 2010. Whilst no decision has yet been made in relation to the provision of a permanent purpose built facility, a number of liners will be calling during the 2011 season. Previously, the largest cruise vessels had to anchor outside the harbour, and tender their passengers.

Stena has been considering the possible expansion of port facilities at Holyhead for some time. A study was commissioned in 2004, part sponsored by the then Welsh Development Agency, to consider possible new business streams, which included a wind farm supply base. At that time a number of possible locations within the harbour were considered for development. A more recent study was commissioned from Royal Haskoning in November 2009 specifically to provide a short pre-feasibility study regarding a possible extension to the West of the Salt Island. An additional piece of research has recently been commissioned by the Welsh Government to investigate the use of Holyhead as base for the offshore wind and nuclear industries. In terms of offshore wind, the study considered the use of the port as a construction base, and as a manufacturing base in combination with the Anglesey Aluminium site.

Port Talbot

Location / Context

Port Talbot is a medium-sized town on the South Wales' coast, located close to Neath and Swansea. It has a long heritage of coal and steel industry.

Specification

	Maximum Vessel Acceptance Dimensions			
	Length (m)	Beam (m)	Draught (m)	Approx DWT
Port Talbot Tidal Harbour	305.0 (Jetty length)	n/r	18.2+	180,000
Port Talbot Docks	137.0	18.3	7.7	8,000

Source: ABP Port Handbook

Port Talbot Tidal Harbour was built in 1970 and is predominantly used for imports of coal and iron ore for the local Corus steelworks (now owned by Tata Steel). However, increasing volumes of third party coal are being handled for power generators. In 2008, 5.6 million tonnes of iron ore and 2.2 million tonnes of coal were handled.

The rationalisation carried out by Corus in 2004-05 confirmed Port Talbot steelworks as one of the three basic oxygen (BOS) furnaces on which investment would be targeted.

The docks at Port Talbot, which were reopened in 1998, handle outward movements of processed slag from the Corus works, along with steel imports, sand, cement and heavy lift cargoes.

There was a significant fall in iron ore volumes in 2008 because Blast Furnace No.4 was mothballed in January 2009 and then turned back on in November 2009. The mothballing was due to a decline in the market for steel as manufacturers de-stocked. The steel produced at Port Talbot is high quality product for the automotive sector and prospects for the plant are believed to be good. In 2012-13 Corus is investing some £18 million in refurbishing Blast Furnace No.5 and this will have an impact on volumes of ore and coal imports in coming years.

Other traffics, handled at Port Talbot Docks, are imports of steel and sand-dredged aggregates and exports of processed slag.

ABP is discussing with Prenergy the development of a 350MW biomass power station on the port estate, which would require some capital investment by ABP estimated to be in the region of £50 million to include refurbishment of the tidal jetty. The developer recently applied to reduce the emissions limit for the plant, and the Environment Agency Wales have recently indicated that this was likely to be approved.

In targeting wind farm business, ABP has drawn up proposals for a for a land reclamation project entailing the construction of up to 28ha (60 acres) alongside the southern breakwater of the tidal harbour, providing 24-hour access to new deep-water quays.

Newport

Location / Context

Newport is a city on the South Wales Coast. Newport has good road connections, with the M4 bisecting the town. It has a large labour market catchment, being proximate to Cardiff. Newport is the leading general cargo port in South Wales, competing with Bristol for some Midlands cargo.

Specification

Maximum Vessel Acceptance Dimensions			
Length (m)	Beam (m)	Draught (m)	Approx DWT
244.0	30.1	10.4	40,000

Source: ABP Handbook

Steel

Newport's major trade has traditionally been steel, serving steel importers in the West Midlands and exports from Corus. However, the export traffic from the Llanwern steel slab processing facility and strip mill was lost to a competitor supplier in 2010. Steel traders in the port struggled in 2009 due to the recession and re-stocking. Traffic volumes are now recovering.

Bulk cargoes

Coal throughput amounted to 1.2 million tonnes in 2009 and has had two customers:

- Uskmouth power station, which has been sold by Welsh Power to Scottish & Southern Electricity
- Aberthaw power station, which is owned by RWE and which sources about 1/3 of its coal via Newport; there has been decline in volumes through Newport in 2009 because of the high price of coal compared to gas for electricity generation and de-stocking at the power station.

Although the terminal at Newport is rail-linked, the port suffers from the fact that the maximum ship's beam that can be accepted is 30.1 metres - marginally too narrow to handle the panamax size ships that are commonly used for the carriage of coal and other bulks on the deep-sea trades. This means that any panamax ships have to be accommodated at alternative ports.

A 13-hectare metal recycling and export facility operated by the Sims Group is located on South Dock. A further agreement was signed with Sims in 2006-07 and saw the construction of a waste electrical and electronic equipment (WEEE) recycling facility at the port with the capacity to process some 100,000 tonnes of WEEE per year.

Nevis Power, part of Welsh Power, has been granted planning permission to develop a 49MW biomass power a 10-acre brown-field site on the port estate with an investment of more than £140 million.

Forest Products
Import centres for timber are operated at the port, but traffic volumes have declined during the recession as construction activity has decreased.

Swansea

Location / Context
Swansea is the second largest city in Wales, located on the South Wales Coast 40 miles west of Cardiff. It has good road connections onto the M4.

Specification

Maximum Vessel Acceptance Dimensions			
Length (m)	Beam (m)	Draught (m)	Approx DWT
200.0	26.2	9.9	30,000

Source: ABP Port Handbook

Overview
Swansea handled 401,000 tonnes in 2009, compared to 589,000 tonnes in 2008 and 683,000 tonnes in 2007. Swansea handles a broad range of commodities and products for its local hinterland as well as accommodating a RoRo service for passengers and freight to Cork.

Ro-Ro
The Swansea Ferry port is located outside the dock complex on the River Tawe and provided facilities for the Swansea-Cork ferry, which offered a service over 10 months of the year until it closed at the end of 2006. There was a freight only service on the route in 2007, but there was no ferry service from the port in 2008 and 2009. However, a new service backed by a public-private partnership started a service for passengers and freight in March 2010. The service provides three sailings a week in each direction and will operate for 11 months of the year. The service secured 76,000 passenger cars from March 2010 and provides a shorter drive, but longer crossing, than the West Wales services from Fishguard and Pembroke Dock (if coming from the East). However, the service is struggling to secure freight traffic.

Other traffics
The port handles a number of other bulk and general cargo traffics, all for the local hinterland:
- Imported coal and wood pulp for use by local manufacturing companies
- Coal exports from Welsh mines
- Fertiliser imports for the local agricultural hinterland
- Steel scrap exports
- Cement imports
- Sea-dredged aggregates for the local construction market

Other opportunities
Swansea has an under-utilised 3 hectare rail-served container terminal, which has been taken over by a company that wants to develop a 50MW biomass power station. The planning application has been turned down by the local authority, and an appeal process which was completed in October 2010 was also recently refused.
Proposals developed to meet the possible future needs of the renewable energy industry include the development of 16 hectares (40 acres) of land adjacent to Queen's dock as well as land on the outer

wall of Queen’s Dock for the potential development of offshore wind operations and maintenance facilities.

Cardiff

Location/Context

Located on the South Wales coastline, with access to the Bristol Channel. Cardiff is the largest city in Wales with a population of approximately 340,000. It has good road connections to the M4.

Specification

Maximum Vessel Acceptance Dimensions			
Length (m)	Beam (m)	Draught (m)	Approx DWT
198.0	27.0	10.37	35,000

Source: ABP Port Handbook

Overview

Cardiff handled 2.3 million tonnes of cargo in 2004, which increased to 2.9 million tonnes in 2006 and then fell back to 2.6 million tonnes in 2008. The principal revenues of the port are gained from the import of oil petroleum and oil products and export of steel scrap.

Liquid Bulks – petroleum products

Liquid bulk traffic consists mainly of inbound petroleum products transported coastwise from the Chevron refinery at Milford Haven, mainly diesel, petrol and heating oil for the consumer market. In 2009 the port handled 1.2m tonnes of petroleum products, compared to 1.3m tonnes in 2008 and 1.4 million tonnes in 2007. Traffic volumes have therefore been fairly stable in the recession.

Containers

Cardiff Container Terminal is operated by Cardiff Container Line, an operating division of ABP, after Peel decided to pull out of the port and cease its service from Cardiff to Ireland. The new line operates services to Dublin and Warrenpoint and has won containerised steel traffic from Corus, and traffic from other manufacturers in South Wales. 9,000 units were handled in Cardiff in 2009, compared to 20,000 in 2008 and 28,000 units in 2007.

Steel

202,000 tonnes of steel were handled in 2009, compared to 509,000 tonnes in 2008 and 858,000 tonnes in 2007. The major decline has been in steel imports, due to the reduction in demand from the construction industry and automotive industry, and de-stocking. Celsa, which purchased the Allied Steel and Wire plant in Cardiff, has been investing in the plant and therefore traffic growth from this source is anticipated.

Other traffics

Sea-dredged aggregates and road salt are handled, bound for the immediate hinterland of the port, and EMR operates a scrap handling and export terminal at the port.

ABP has not announced any particular plans involving low carbon energy developments at Cardiff. A key restriction is the width at the lock gates

Barry

Location/Context

Barry is a medium sized town on the south coast of Wales. It is only a short distance from the City of Cardiff and therefore has access to a large labour force within a short commuting distance.

Parameters for Barry

Maximum Vessel Acceptance Dimensions			
Length (m)	Beam (m)	Draught (m)	Approx DWT
178.0	23.8	9.0	23,000

Source: ABP Port Handbook

The port of Barry handled 327,000 tonnes of cargo in 2009, down from 465,000 tonnes in 2008 and 456,000 tonnes in 2007. The loss of traffic in 2009 was mainly due to Ineos Chlor closing its vinyl plant in early 2009 and consolidating its production in this sector at Runcorn on Merseyside. However, Dow Corning has a silicon plant adjacent to the port and the company imports its feedstock through Barry.

There are also some imports of timber for Scott Timber Ltd. (which manufactures pallets) and exports of scrap metal from the Dunn Brothers terminal at the port.

An intermodal rail freight terminal at the port is currently used by DB Schenker as a terminal for the distribution of deep sea containers between deep sea container ports and South Wales.

ABP has not put forward any proposals for the development of low carbon energy-related business for this port.

Review of Smaller Ports in Wales

The following smaller ports in Wales have been reviewed, but as they no longer handle significant commercial traffic, they have been omitted from the main analysis of ports.

Port	Status/ owner	Usage	Cargo volume 2008 (000 tonnes)	Principal Commodi-ties handled	Marine Access/ navigation	Port facilities	Max ship dimensions				Transport links.		Area available for develop-ment
							dwt	draft (m)	Total berth length (m)	Width (m)	Road	Rail connected	
Aberdovey	Municipal/ Gwynedd council	Leisure/ Commercial	-	General cargo	River/Tidal berths. Bar at port entrance	1 quay/3 jetties	200	3.0	45m/ Quay 120m, Jetty No.1 94m			No	None
Burry	Municipal/ Carmarthen-shire CC	Leisure/ fishing	86	Sea-dredged aggregates. Originally a coal export port. Redevelope d as a marina	Tidal harbour							No	
Caernarfon	Trust	Leisure	-	Not handled commercial cargo vessels for a number of years	River/Tidal berths	Larger vessels accommodated at Landerne Pier (jetty with mooring buoys)	1,500	4.57	75/40	14.8	A487, A4806, A4085	No	No
Conwy	Municipal/ Conwy BC	Leisure/ fishing	-	Fish	River/Tidal berths. Tidal range 8.0m. Quay dries at LW.	Town Quay 90m. Mobile cranes available.	200	4.0	30/90	8.0	A55 dual	No	
Menai Bridge	Municipal/ Isle of Anglesey CC	Commercial / Leisure	-		River/Tidal berths			3.6	60		A55 dual	Yes (not active)	

Port	Status/ owner	Usage	Cargo volume 2008 (000 tonnes)	Principal Commodities handled	Marine Access/ navigation	Port facilities	Max ship dimensions				Transport links.		Area available for develop-ment
							dwt	draft (m)	Total berth length (m)	Width (m)	Road	Rail connected	
Porthmadog	Municipal/ Gwynedd Council	Leisure/ Commercial	-	Serves hydroelectric power station for loading of transformers.	River/Tidal berths. Bar at port entrance, depth 0.3-0.5 LWST. Entry affected by SW winds above force 5. Harbour dries at LW.	2 berths, privately operated. Ro-ro facility. Access restricted by private leisure craft moorings	600	3.0	46/100	15.0	A287 single	No	None
Shotton Wharf, Bangor	Welsh Water Authority	Commercial	-	River/Tidal berth, only accessible on HW, vessels must take ground			4.0	85/180	13.0	A4087 A55 dual	Yes (not active)	Quayside storage only	

Appendix 4: Demand Analysis

Wave and Tidal

Figure A4.1: Annual Mean Wave Power

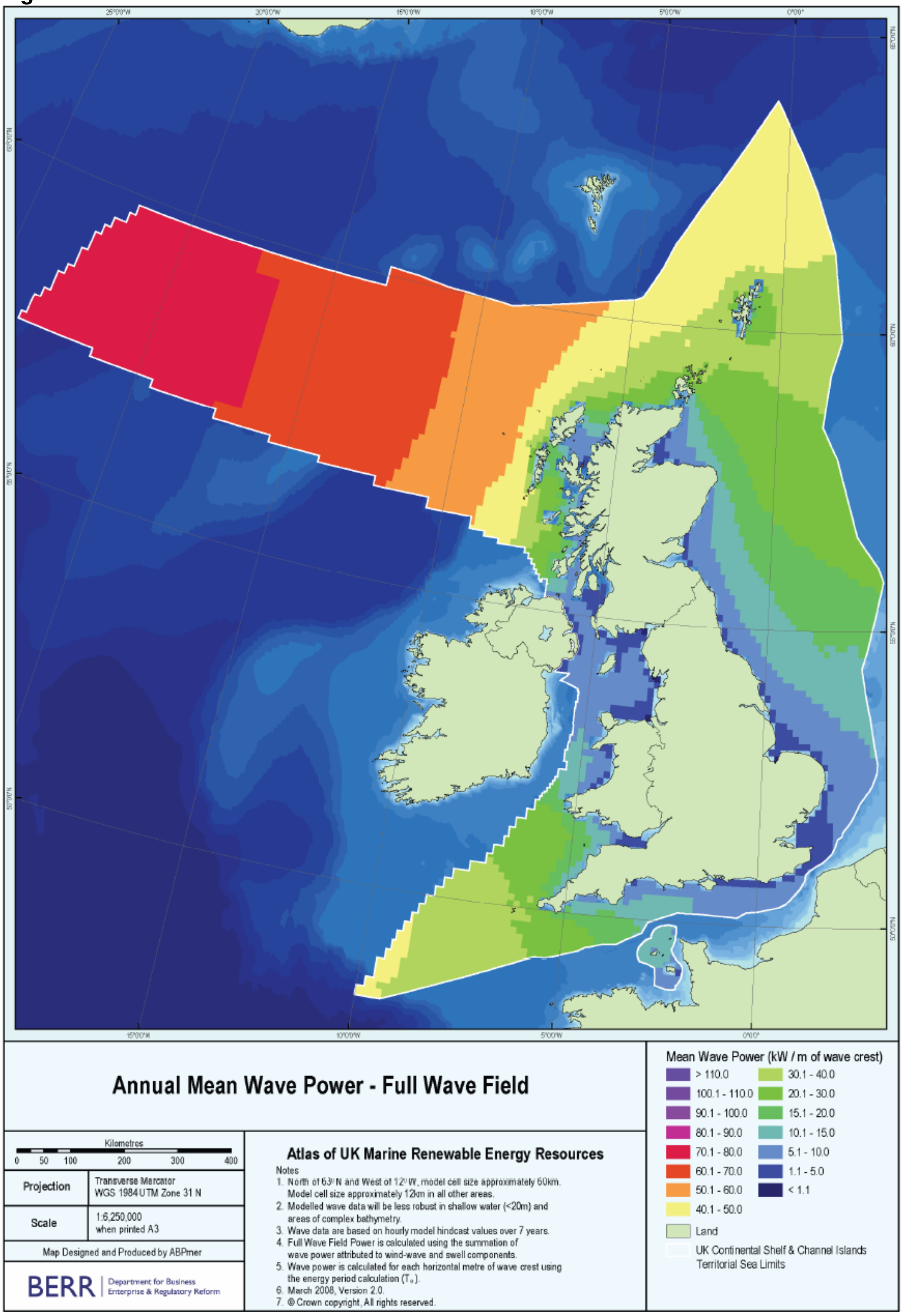
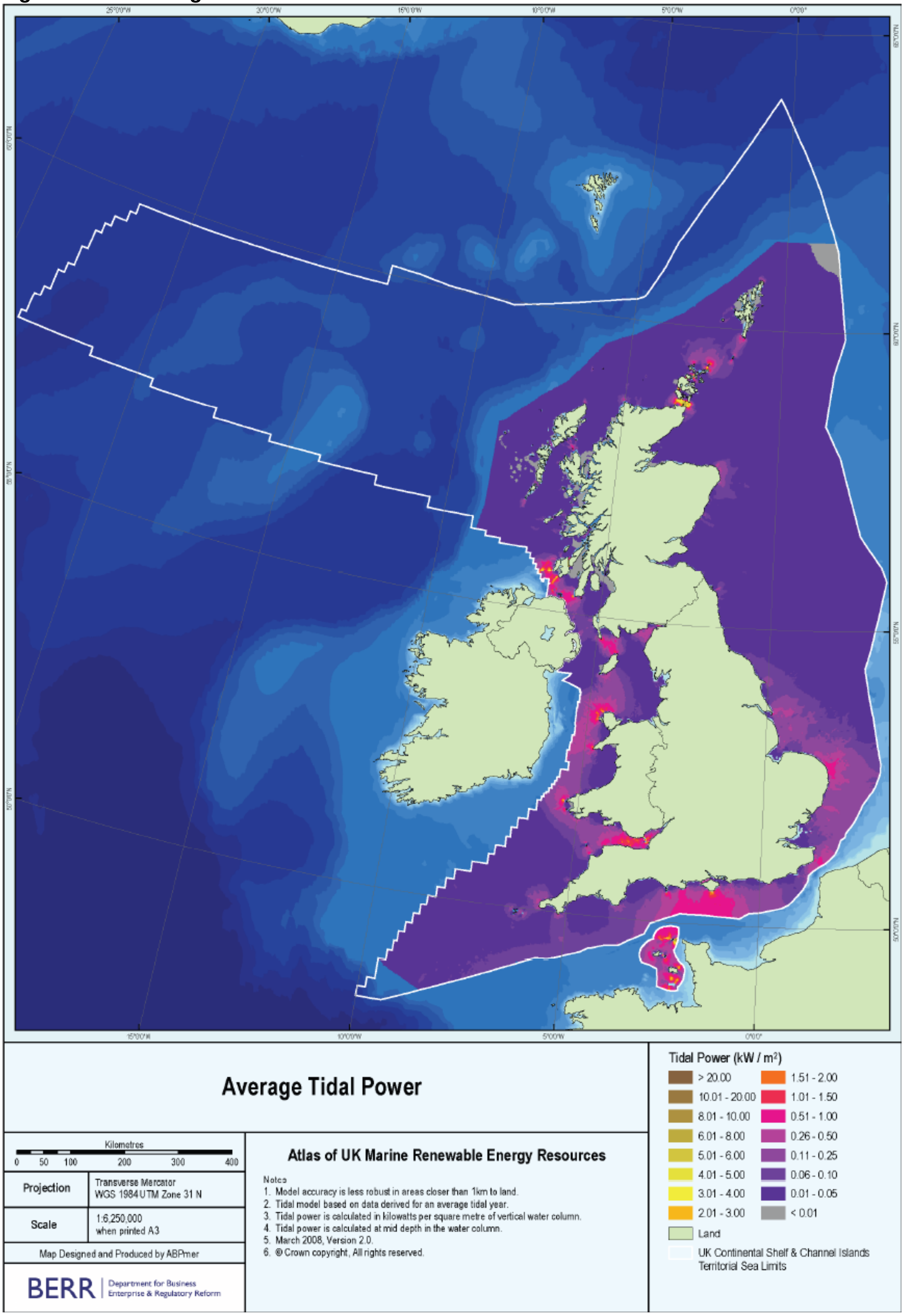


Figure A4.2: Average Tidal Power



Other Technologies

Severn Estuary Tidal Power

The feasibility of tidal power options for the Severn Estuary has been under investigation over the past 20 years. The most recent feasibility exercise was completed in October 2010 (HM Government, 2010). The outcome of this review was that the UK Government ruled out the project for public funding for the following reasons:

- A tidal power scheme in the Severn estuary could cost as much as £34billion, and is high cost and high risk in comparison to other ways of generating low-carbon electricity;
- A scheme is unlikely to attract the necessary private investment in the current circumstances, and would require the public sector to own much of the cost and risk;
- Over their 120 year lifetime, Severn tidal power schemes could in some circumstances play a cost-effective role in meeting our long term energy targets. But in most cases other renewables (e.g. wind) and nuclear power represent better value. Moreover as a Severn scheme could not be constructed in time to contribute to the UK's 2020 renewable energy target, the case to build a scheme in the immediate term is weakened.
- The scale and impact of a scheme would be unprecedented in an environmentally designated area, and there is significant uncertainty on how the regulatory framework would apply to it.
- Overall a scheme is likely to benefit the regional economy with net value added to the economy and jobs created. However these benefits would come at the expense of negative impacts on the current ports, fishing and aggregate extraction industries in the estuary;

The options which had been considered can be summarised as follows:

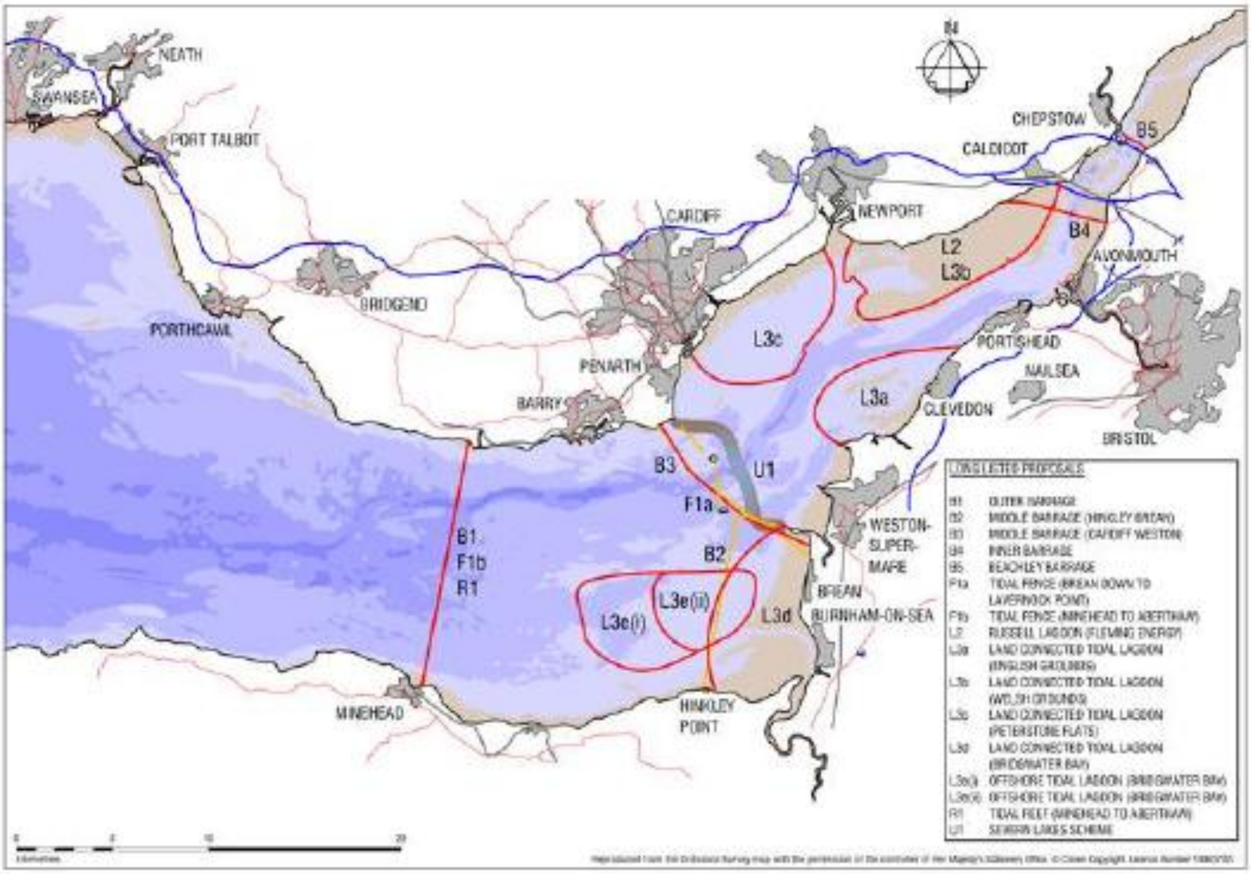
Large Barrage – the world's largest tidal project considered to date is the Severn Tidal Barrage which would span the Bristol Channel. This estuary has one of the highest tidal ranges in the world at 14m and is second only to the Bay of Fundy in Eastern Canada. The opportunity to construct a large tidal barrage has been reviewed on and off over a period of at least 20 years. The large barrage option considered would have been 10 miles long and would have stretched from Cardiff to Weston-super-Mare. Its capital cost was estimated at up to £34bn, with a maximum generation capacity of 8.6 GW during peak flow.

Shoots Barrage – the Shoots Barrage option considered was 4.1km in length and situated further upstream by the Severn Bridge. This barrage would have had a capacity of 1,050MW, with an estimated cost of £7 billion.

Bridgewater Lagoon (onshore) – The onshore lagoon would be located on the English side of the Severn Estuary between Hinkley Point and Weston-super-mare. It would have the capacity to produce 3.6 GW and cost £17.7 billion to construct. It would generate electricity by manipulating the water level inside and outside the lagoon, releasing the water through turbines to produce power. The offshore lagoons in Bridgwater Bay have been discounted as an option due to the high unit cost of electricity associated with the project.

The Beachley Barrage and Welsh Ground Lagoon options were considered not to be feasible.

Figure A4.3: Location of Tidal Options in the Severn Estuary



Source: Severn Estuary Tidal Power, April 2010, WAG
L3d – Bridgewater Bay (onshore) lagoon
L2 – Fleming Lagoon
B4 – Shoots Barrage
B5 – Beachley Barrage

The Government has ruled out public funding to support the large barrage project. Given the risks in taking the project to planning approval stage which is estimated to cost up to £250m, the Severn Tidal Power Group (STPG), comprising a consortium made up of Sir Robert McAlpine, Balfour Beatty and Taylor Woodrow, is unlikely to commit to the project without public sector support to share the risk.

There is some interest from a private sector led consortium (Corlan Hafren) to continue to work up proposals for Tidal Power options, but there is a great deal of uncertainty concerning this at present.

Carbon Capture and Storage (CCS)

Overview of Technology

Carbon dioxide capture and geological storage (CCS) is a technology that has the potential to significantly reduce the UK's CO2 emissions to the atmosphere. At its simplest, CCS technology consists of three steps: capturing CO2 from a large industrial point source such as a fossil fuel power plant, transporting it (by pipeline or ship) to a suitable geological storage site and storing it underground in geological formations - for millennia or longer – which prevents the stored CO2 entering the atmosphere and acting as a greenhouse gas.[50]

Currently there are three methods of Carbon Capture being researched:

- **Pre combustion** involves separating the fossil fuels into hydrogen (used for power generation) and CO_2, which can then be stored;
- **Post combustion** involves removing CO2 gases after combustion of the fossil fuel. It is possible that this could be adapted to many of the power plants currently in operation worldwide; and
- **Oxyfuel separation** involves the process of burning the fossil fuel in oxygen rather than air. The resulting process is an almost pure carbon dioxide stream which can be transported and stored.

Currently these three methods are indistinguishable in terms of cost and efficiency, although further research is required to improve the overall efficiency of carbon capture technologies.

Once the waste carbon has been captured, a safe place is required for storage. Given the vast quantities of CO_2 produced is not deemed possible to store waste carbon in man-made storage, therefore natural storage spaces are needed.

- **Depleted oil, gas and coal fields –** depleted oil, gas and coal fields could be used as a storage point for waste carbon. The reservoirs are well mapped and have stored fossil fuels for a long time making them a good site for CO_2 storage.
- **Saline Aquifers -** waste CO_2 can be stored in deep salt water rock formations. The geology and the effect of storing CO_2 in these locations are less well understood.
- **Coal Seams -** There is thought to be limited quantifiable storage potential in UK coal seams

Actual and Potential Capacity

The global demand for energy is forecast to grow strongly between 2007 and 2030. Even with the efforts of renewable energy programmes worldwide the major source of energy in 2030 will still be from fossil fuels. CCS is one way to mitigate against some of the environmental impacts of increasing worldwide demand for energy.

Currently there are no industrial scale CCS plants in operation in the UK. Worldwide there are four industrial scale CCS projects which are currently operational, all of which are pumping waste carbon

[50] BGS (2006) Industrial Carbon Dioxide emissions and carbon dioxide storage potential in the UK

into depleted oil and gas fields. There are many other research and testing projects being undertaken worldwide with the aim of identifying suitable locations for carbon storage.

Planned

RWE, have applied for planning permission to attach a pilot carbon capture system to their Aberthaw Power station. This will generate 3MW of energy and will be capable of capturing 50 metric tonnes of CO2 per day.[51] RWE hope that this will lead to further understanding of the capabilities of carbon capture which will inform future development of full carbon capture and storage systems.

Long-term potential

The long-term potential of CCS is unclear as the technology involved is at a very early stage. If CCS were to become commercially viable it could be retrofitted to many existing power plants, creating a huge market opportunity. However this is not likely to occur for some time (e.g. 2020-2030) and would probably only be viable with large scale power stations.

In order to assess the opportunities from CCS for ports in Wales it is essential to consider the likely locations for CO2 storage. As shown by Figure A4.4, the majority of potential storage sites in the UK are on the East coast of England and Scotland. The only potential storage sites in proximity to Wales are the Douglas, Lennox, and Morecambe oil fields, and adjacent gas fields. Lennox and Douglas and several adjacent gas fields are connected by existing pipelines to Connah's Quay power plant. It is therefore likely that any future CCS project would utilise the existing pipeline rather than transporting CO_2 by ship, and therefore it is difficult to identify a role for Welsh ports at present.

CCS Conclusion

Overall, whilst there is clearly a significant long-term economic opportunity for the UK associated with CCS, the role for Welsh ports is unclear and likely to be limited. For these reasons, CCS was not considered in detail within the study.

[51] Walesonline:http://www.walesonline.co.uk/business-in-wales/business-news/2009/11/10/biggest-carbon-capture-test-planned-for-aberthaw-power-station-91466-25128289/ Retrieved 30th September 2010.

Figure A4.4: Potential CO2 Storage Sites

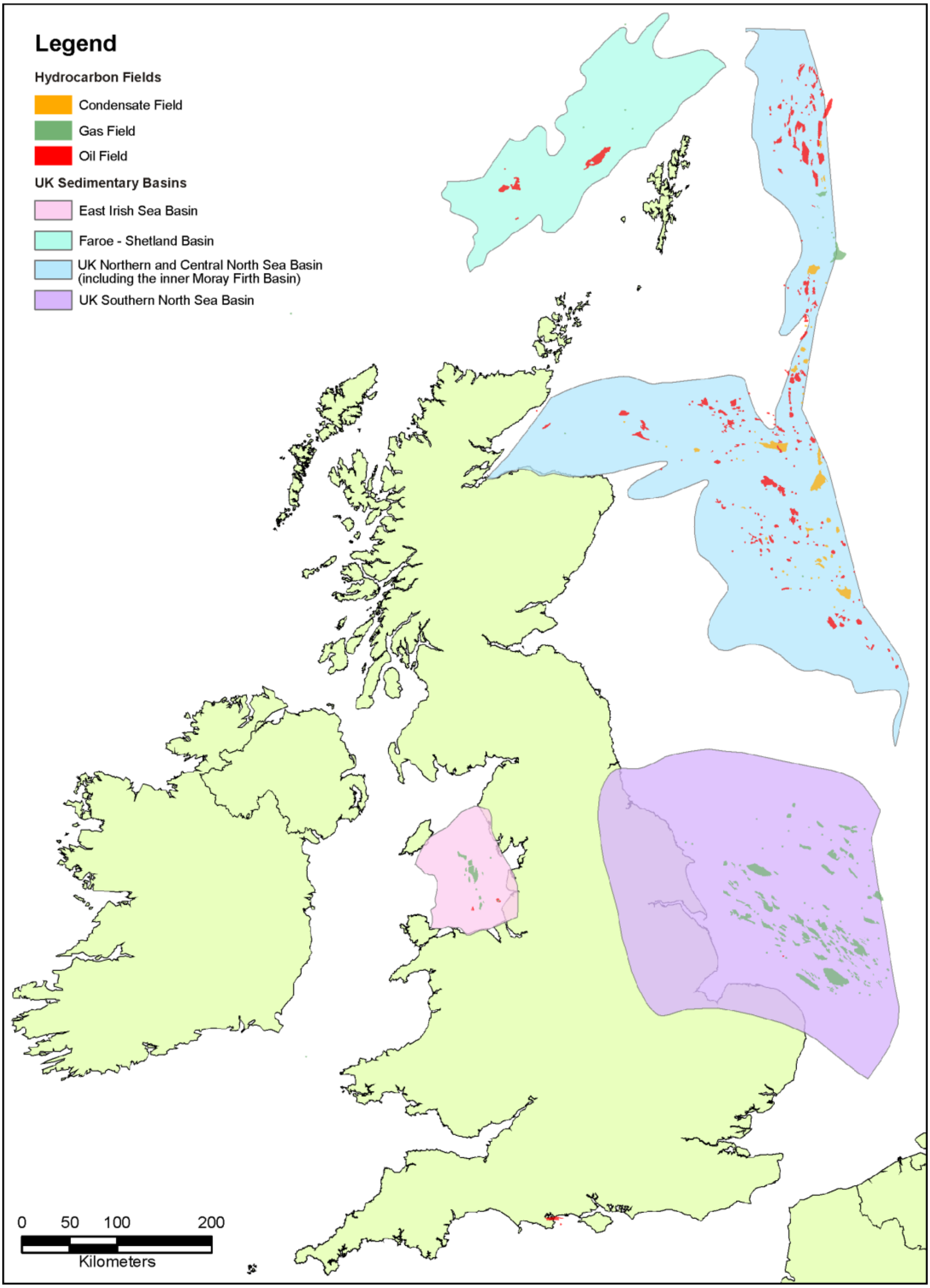
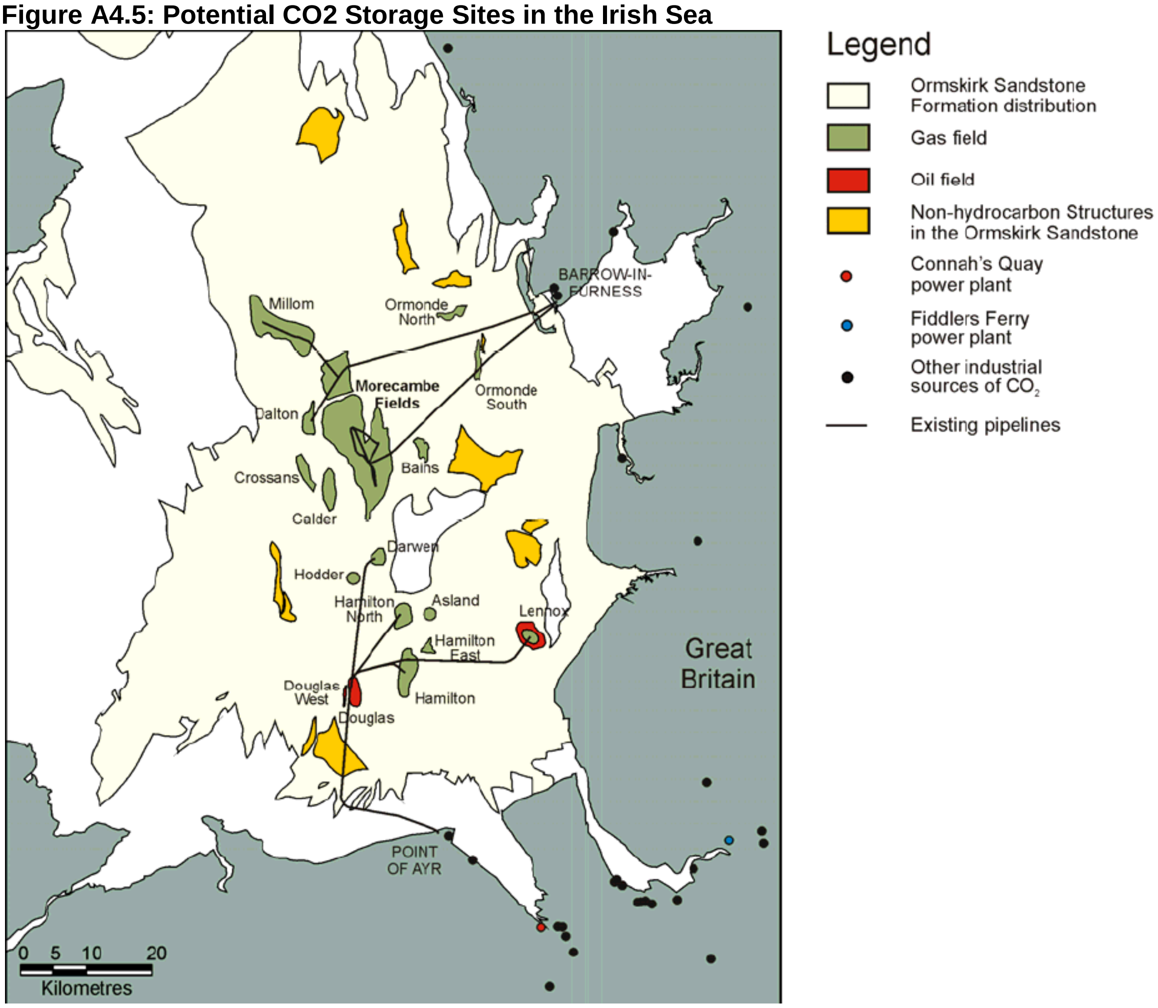


Figure A4.5: Potential CO2 Storage Sites in the Irish Sea



Appendix 5: List of Consultees

The following businesses/organisations were consulted during the course of this study:

- Associated British Ports
- Centrica
- Horizon Nuclear Power
- Mabey Bridge Group
- Magnox North
- Milford Haven Port Authority
- Neath Harbour Commission
- Neath Port Talbot Council
- Port of Mostyn Ltd
- Renewable Energy Association
- RWE npower renewables
- Stena Line Ports Ltd
- Swansea Council
- The Crown Estate
- Welsh Assembly Government (at the time of the consultations, the departments consulted were Sustainable Futures, and the Department for the Economy & Transport; although departmental structures and names have since changed)
- Welsh Local Government Association