

## UK Ports for the Offshore Wind Industry: Time to Act





## Department of Energy and Climate Change

The Department for Energy and Climate Change (DECC) brings together much of the Climate Change Group, previously housed within the Department for Environment, Food and Rural Affairs (DEFRA), with the Energy Group from the Department for Business, Enterprise and Regulatory Reform (BERR).



BVG Associates is a consultancy providing expertise in the design, technology and supply chain for fuel-less renewable electricity generation systems.

BVG's previous reports include *Offshore Wind: At a Crossroads* (2006) and *UK Offshore Wind: Moving Up a Gear* (2007), both for the British Wind Energy Association, which have had a significant impact on the understanding of the progress of UK offshore wind deployment within Government and across industry

BVG Associates also delivers, with PERA, the UK Renewables service that facilitates the growth of a world-scale UK renewable energy industry, sufficient to support the achievement of the UK's 2020 renewable energy targets. UK Renewables is a Government service provided by DECC.

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## 1. Executive Summary

The UK Government is committed to the development of a significant offshore wind energy portfolio to help meet its UK renewable energy targets. In March 2007, the UK agreed with other Member States an EU-wide target of 20% of energy consumption (covering electricity, heat and transport) produced from renewable sources by 2020. The UK's proposed contribution is 15% of the UK's energy from renewables. This represents a ten-fold increase in 2006 renewable energy consumption.

To reach this target, the UK Government consulted in 2008 on its Renewable Energy Strategy<sup>1</sup> which put forward a range of measures to encourage the deployment of renewable energy in the UK to achieve the 15% target. Renewable electricity will play a significant role in achieving this target, with estimates of 30-35% of total generation being required. Wind (onshore and offshore) will make the largest contribution with remaining generation coming from hydro and biomass.

In December 2007, a proposal for a major expansion of offshore wind in UK waters was announced, leading to an Strategic Environmental Assessment (SEA) by DECC to assess the feasibility for a further 25GW of offshore wind, in addition to the 8GW already in development through the Round 1 and Round 2 offshore programmes. The SEA was published on 26 January 2009, which recommends that there is enough scope for an additional 5,000-7,000 more offshore turbines.<sup>2</sup> In parallel with the SEA, the Crown Estate has opened the Round 3 leasing programme, which expects to award development rights to developers by the end of 2009.

The proposed expansion of offshore wind represents a significant economic opportunity for the UK in terms of manufacturing and jobs, with the Carbon Trust suggesting that up to 70,000 jobs could be created by 2020 in this sector from offshore wind deployment in the UK and exports overseas<sup>3</sup>.

The perceived lack UK port availability and capacity is seen by European wind turbine manufacturers and offshore wind developers as a disincentive to investing in UK projects and to expanding their offshore wind supply chain in the UK. Port capacity will in time also constrain the delivery of UK offshore wind projects from Continental manufacturing sites, increasing cost and time required to build the farms and may impact on wider energy infrastructure expansion over the next decade, particularly for the wider UK deployment of carbon capture and storage and nuclear programmes.

Securing manufacturing investment and the associated supply chain for offshore wind in the UK will require a port (or ports) with the required facilities and commercial land. These would provide an industrial hub for wind turbine manufacturers and their supply chain. Without this it will be difficult for the UK to compete against Continental ports which already provide these facilities.

DECC commissioned an independent study by BVG Associates to consider:

- The requirements of the offshore wind industry for ports;
- Current UK port capabilities;
- The opportunity for UK ports;
- Perspectives and attitudes of relevant groups of stakeholders; and
- Potential port expansion or development to meet the needs of the offshore wind sector.

This report considers the opportunities for ports from offshore wind with a focus on 2020 targets and Round 3 deployment; however, in conducting this study BVG Associates is aware of the wider energy opportunities, including nuclear, carbon capture and storage, other marine energy technologies and the potential for further offshore wind deployment beyond Round 3.

The findings will contribute to the Department for Transport's National Policy Statement for Ports, which will set out the long-term strategic requirements for port development in the UK.

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<sup>1</sup> [www.berr.gov.uk/consultations/page46797.html](http://www.berr.gov.uk/consultations/page46797.html)

<sup>2</sup> [www.offshore-sea.org.uk/site/](http://www.offshore-sea.org.uk/site/)

<sup>3</sup> [www.carbontrust.co.uk/publications/publicationdetail?productid=CTC743](http://www.carbontrust.co.uk/publications/publicationdetail?productid=CTC743)

## **The Process**

This report was prepared following interviews with wind turbine manufacturers, other key component suppliers, wind farm developers and port owners. The interviews identified the barriers and opportunities for UK construction ports. Respondents were invited to identify actions that would improve ports' capacity for offshore wind construction.

In conjunction with regional and devolved enabling bodies (such as the Regional Development Agencies (RDAs)) and port owners, a list of ports in the UK capable of handling large vessels was created. Detailed discussions were then held with the owners of locations meeting the requirements for construction ports set out by the wind industry.

## **Findings**

There are enough potential locations in the UK to meet the needs of UK offshore wind deployment by development of both existing facilities and brown-field and green-field sites. The market alone is unlikely to deliver these ports in the timeframe required for offshore delivery without UK Government intervention to facilitate the process.

Approximately 1% of the total installed cost of an offshore wind farm is incurred in port-related costs. This translates to a potential market for UK ports worth in excess of £150m per year at peak installation rate, totalling over £800m up to 2020. With O&M costs, this is likely to approach £1bn.

In the UK, unlike on the Continent, ports are generally privately owned, with a few large owners and operators controlling the major ports. In general, these major ports are well utilised. Port businesses are commercially focused but in many cases are only now starting to recognise the potential revenue opportunities from offshore wind. Historically, it can be seen that in general, port owners have been willing to invest where the business case is viable, for example in container terminal capacity.

A small number of port owners are already involved in offshore wind construction and several others are now actively marketing their sites in conjunction with regional and devolved enabling bodies. At present there are too few such sites available at suitable locations to meet the demand from Round 2 and 3 projects.

The technical requirements for ports for offshore wind construction are not too industry-specific and many UK ports are suitable. The most common reasons for ports to be ruled out of use for offshore wind construction were:

- Insufficient land area. A typical offshore construction port needs to have areas of at least 8 hectares available.
- Insufficient vessel access for the exceptionally wide jack-up vessels used for wind farm construction

A number of Continental European ports are competing to win construction contracts for offshore wind projects in UK waters, and several have an established track record.

Investment in ports in readiness for wind industry needs depends upon:

- Confidence in the continuation of the UK Government's strategy for offshore wind development.
- Readiness of port owners, operators and wind industry players to share risks to develop facilities required for efficient construction of offshore capacity in the UK.
- Continuing role of UK Government to facilitate awareness of opportunities and to ensure that development occurs.

## 2. Introduction

### 2.1. Purpose of this Study and Methodology

The purpose of this study is to identify gaps in the capabilities of UK ports and the needs of the offshore wind industry and provide considered input in to the planned National Policy Statement for Ports. This report considers:

- The current capabilities of UK ports and attitudes towards the renewables sector, particularly offshore wind;
- The port requirements of the wind industry to support offshore wind farm construction; and
- An understanding of ports perceptions of the wider energy context for future ports expansion and activity.

It goes on to provide recommendations for how to maximise the business opportunity for UK ports in meeting the needs of the offshore wind industry.

#### *Methodology*

A survey of current capabilities of UK ports was carried out with the following steps:

1. Collection of key data on ports and harbours in the UK both by web based research and direct contact with port owners.
2. Questionnaire-based interviews with key members of the wind industry including developers, constructors, turbine manufacturers and vessel operators. Criteria for construction ports were then used in Step 4.
3. Questionnaire-based interviews with key members of the ports industry including harbour authorities, port owners and operators.
4. Shortlist of potential port locations suitable for offshore wind construction using criteria for water depth, quayside, land area and vessel access.
5. Contact with regional and devolved enabling bodies (such as the English Regional Development Agencies) to identify potential waterside development sites not currently used as ports.
6. Discussion with port owners and regional and devolved enabling bodies to explore the use of ports for offshore wind and to develop potential solutions to match the UK Government targets.

## 2.2. UK Offshore Wind Market

In 2008, the UK became the largest offshore wind generator in the world with an installed base of 598MW, equating to almost 40% of the global market. It is anticipated that the UK will hold this share at least until 2015. Figure 2.2.1 shows the projected growth of the UK offshore wind market to 2020.

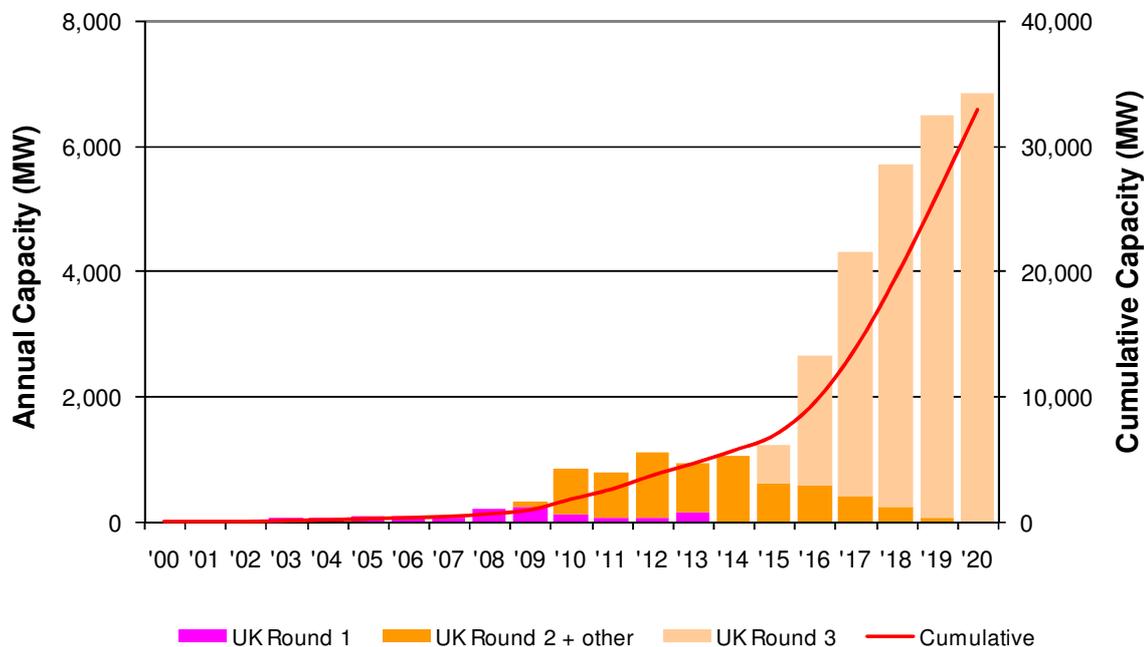


Figure 2.2.1 – Projected UK Offshore Wind Capacity.  
Source: BWEA UK Offshore Wind: Moving up a gear (2007) and BVG Associates

The Crown Estate has made areas of seabed available for offshore wind development in three rounds, announced in December 2000, July 2003 and June 2008. Round 1 consisted of 18 demonstration projects in 13 locations. In Round 2, The Crown Estate made 15 sites available with a potential capacity of over 7GW. DECC undertook a Strategic Environmental Assessment (SEA) to assess the feasibility of a further 25GW of offshore wind, which was published on 26 January 2009 (<http://www.offshore-sea.org.uk/site/index.php>). Any further rounds are likely to expand significantly the UK's offshore wind capacity, with many of these new sites in deeper water or further from shore. This report's analysis is based on a potential 33GW of installed capacity by 2020. BVG Associates recognises that a number of factors will affect the degree to which this potential is realised, including the availability of UK port capacity.

## 2.3. UK Ports and Governmental Responsibility

In the UK, unlike on the Continent, ports are generally privately owned, with a few large owners and operators controlling the major ports. The UK ports industry is therefore driven by market forces rather than by government or regional policy. Most investment to support the development of ports as construction bases will therefore come from the private sector, with some scope for public sector support in some areas.

While transport falls within the remit of the Department for Transport, ports policy is now shared between the Department for Transport, the Scottish Executive, the Welsh Assembly and the Department for Regional Development in Northern Ireland. In Northern Ireland and Scotland, primary responsibility lies with the devolved administration. Throughout the UK, ports are a key part of the economic development policies by development agencies, through the six Regional Development Agencies with coastlines in England, Invest Northern Ireland, the Welsh Assembly and Scottish Enterprise.

The development of low carbon electricity generation, and harnessing the potential economic benefits from this activity, is a priority for the UK's development bodies and the ports have a significant role in

realising their ambitions. The focus of this study on ports for offshore wind recognises that many of the issues faced are common to all parts of the UK and the value in collective action in addressing them.

#### **2.4. Public Development Bodies**

Regional Development Agencies of England, the devolved administrations of Scotland, Wales Northern Ireland and other similar regional enabling bodies have an important role in identifying and marketing port locations and potential turbine production sites in the UK, in line, for example, with One North East's support of Shepherd Offshore.

They also play a pivotal role in providing initial and ongoing support to enable an attractive enough proposition to be put forward to secure local investment and inward movement of a wind player.

### 3. Ports for Offshore Wind Farm Development

The efficient delivery of offshore wind generation requires port facilities for a number of activities, for which manufacturers and developers have significantly different needs. For the purposes of this report, we have defined these as follows:

**Manufacture:** this involves the assembly of nacelle components and manufacture of towers and blades. Typically manufacturers would be looking to source key large components local to the facility to reduce transport costs. This represents up to 40% of wind farm CAPEX and could have a significant value to regional businesses.

**Construction:** this involves the pre-assembly of components supplied by a wind turbine manufacturer, which typically include all elements of the turbine (ie. blades, rotor, nacelle and tower) except the foundations. This work typically contributes around 1% of CAPEX.

**O&M:** ie. the provision of services to commissioned wind farms. These have not been considered in this report.

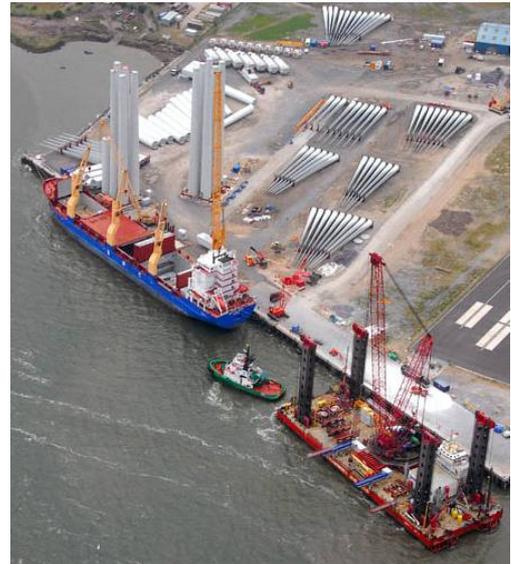


Figure 3.1 - View of the Port of Mostyn  
Courtesy of Siemens Wind Power

An overview of port functions is presented below.

#### Manufacture

Due to market growth and the large size of turbines, wind turbine manufacturers are increasingly looking towards European portside turbine assembly facilities. Road transportation is becoming less viable for completed nacelles and offshore turbines by definition need to be shipped by sea at some point for installation. Port requirements relating to wind turbine and component manufacture are outlined in Section 3.2. There is significant sense in manufacturing large components (such as castings) close to turbine manufacture also.

#### Foundation Production

Whether steel monopiles, concrete gravity bases, or jacket or tripod structures, all offshore wind foundations are very large and once produced can only be transported by water. Significant expansion of production capacity is required to meet future demand; hence it is likely that new coastal locations for foundation manufacture will be established. Compared with set-up times relating to other elements of the value chain, foundation manufacturing facilities can be set up relatively quickly.

#### Project Construction

Generally, foundations and cables are installed before final installation of turbine topsides. It is this final activity that is most sensitive to sea and wind conditions and hence typically is carried out between April and October.

If a distant port is being used for pre-assembly of turbines (i.e. a port local to turbine production), the crane jack-up barge used for installation lifts needs to be self-powered and able to travel relatively fast. If the port is local, then the crane jack-up barge need not be self-powered.

The most commonly used installation process to date involves delivery of towers, blades and nacelles to a construction port close to the wind farm. Here, they are pre-assembled ready for transportation by jack-up barge, to the wind farm site. Due to the large number and size of turbine parts, large areas of open storage and pre-assembly space are required for construction. Because of the weights, a high quay load bearing capacity is also necessary.

From a local construction port, three turbine installation methods have been used to date:

1. Fitting the hub and two blades to the nacelle in the port and transporting the nacelles to site in a 'bunny ears' configuration along with towers (either horizontal or vertical in sections). The tower is then installed, followed by the nacelle with two blades attached and then the final blade.
2. As above but mounting the complete rotor or all three blades individually on site.
3. Assembling the complete turbine at the port (including tower) and then transporting the complete turbine vertically to the wind farm site, before lifting on to the foundation.

In time, other processes will be used, including on-land commissioning and transportation to site already attached to the foundation (e.g. gravity base or suction bucket).

### 3.1. Construction Port Requirements

Individual phases of a construction project may be operated by a specialist offshore contractor, the wind farm developer or by the wind turbine manufacturer offering a turnkey service. Port stevedoring and operation may be managed by the port owner or the site occupier.

Typical activities during the topside installation phase include:

- Unloading in-bound components from supply vessels, e.g. towers, hubs, blades and nacelles;
- Laying down products to ensure their availability when weather and vessel availability allows construction to proceed;
- In batches for a small number of turbines at a time:
  - Assembling of tower sections and loading on to the installation vessel, which may involve vertical and/or horizontal loading, hence the high air draft requirements;
  - Fitting two blades to each nacelle where the 'bunny ears' configuration is used (as shown in Figure 3.1.1) or fitting all three blades to the hub, with rotor horizontal;
  - Preparing and loading of nacelles on to the installation vessel; and
  - Preparing and loading of remaining blades on to the installation vessel.

While they vary between wind turbine manufacturers, typical requirements for a construction base with the capacity to handle 100 turbines a year:

- At least 80,000 m<sup>2</sup> (8 hectares) suitable for lay down and pre assembly of product;
- 200–300 m length of quayside with high load bearing capacity and adjacent access;
- Water access to accommodate vessels up to 140m length, 45m beam and 6m draft with no tidal or other access restrictions;
- Overhead clearance to sea of 100m minimum (to allow vertical shipment of towers); and
- Sites with greater weather restrictions on construction may require an additional lay-down area, up to 300,000 m<sup>2</sup> (30 hectares).

Other requirements relating to cranes and load bearing points are relatively easily achieved through local engineering works. Ideally, sites should have good land-side transportation access to facilitate their use also in transportation for onshore wind farm construction.

Table 3.1.1 shows the ports used for the pre-assembly of UK offshore wind farms to date. In some cases, the same port was used during foundation installation.

Table 3.1.1 - Construction Ports Chosen for UK Offshore Wind Projects.

Wind Farm	Completion	Construction Port
Blyth Offshore	2000	Blyth
North Hoyle	2003	Mostyn
Scroby Sands	2004	Lowestoft
Kentish Flats	2005	Felixstowe
Barrow	2006	Belfast
Beatrice Demonstration	2006	Nigg, Cromarty Firth
Burbo Bank	2007	Mostyn
Lynn and Inner Dowsing	2008	Esbjerg
Rhyl Flats	2008	Mostyn
Robin Rigg	2008	Belfast and Mostyn



Figure 3.1.1 - View of Belfast's Harland & Wolff Facilities  
*Courtesy of Harland & Wolff*

### 3.2. Manufacturing Facility Requirements

As well as the need to establish construction bases for offshore turbines for installation in UK waters, there is also an important opportunity to attract turbine and component manufacturing to the UK to supply the offshore wind market. The wind industry needs more turbine production and component manufacturing facilities and it is essential that any new facilities set up to service offshore wind are located on the coast. Even for onshore turbines, due to the increasing size of wind farms and the geographical spread of locations, it is advantageous in terms of flexibility and logistics cost to locate new facilities coastally.

A number of wind turbine manufacturers have stated clearly that they would not choose to establish turbine assembly facilities in the UK unless there were also sources of supply of key components also in UK. In terms of value added, the component manufacturing facilities also are much more significant than simply turbine assembly. This means that the UK needs to establish a key component supply base in parallel to attracting turbine manufacturers to set up an assembly plant in the UK.

A number of turbine manufacturers have a strategy to establish on a single new coastal site their own turbine assembly facilities alongside key component manufacturing facilities. Depending on the range of products and scale of operations, these could employ up to 5,000 people on each site.

The requirements for such sites are:

- Located on North Sea or English Channel to enable export to Continental projects as well as supplying to UK offshore projects;
- Up to 500 hectares of flat area for factory and product storage;
- Direct access to dedicated high load bearing deep water quayside (minimum 500m length); and
- Ease of landside logistics and access to skilled workforce.

Another opportunity is to establish key component manufacturing facilities in UK where the components can be used directly on offshore wind farms without requiring transportation to the turbine production location. This scenario is relevant for foundations, towers and blades, for example, with specific port and space requirements for each.

### 3.3. Vessel Technology Influencing Port Requirements

Advances in vessel technology may open up further options in offshore wind farm construction methods which in turn will influence port requirements. In Figure 3.3.1 we can see the options for supply from a manufacturing site (M) to either directly to the wind farm (WF) or via the construction port (C).

The first scenario (a) is the model underpinning the assumptions made in this report (recognising that that manufacturing may in future also take place at the construction port).

In scenario “b” the development of high speed jack-up vessels makes the use of construction ports that are further away more financially viable. This could result in projects being serviced from the turbine manufacturing site and not needing a more local UK construction port.

Cost-effective solutions are being sought from the oil and gas sector and elsewhere which will allow lower cost vessels to be used to transport the components to the crane jack-up which will remain at the wind farm site, hence can be used more efficiently (see scenario “c”). This involves overcoming the challenge of transferring the components from a ‘shuttle’ vessel to the crane jack-up while compensating for ‘shuttle’ vessel heave. Employing this process would negate the need for any construction port

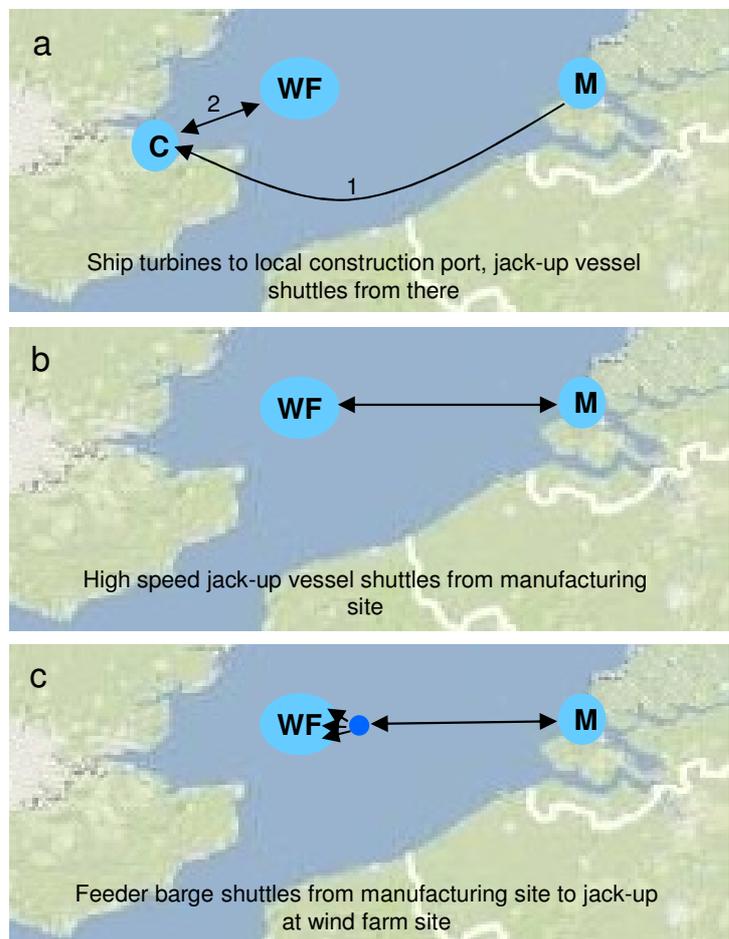


Figure 3.3.1 Supply Route Scenarios.

#### Operation & Maintenance

Once a wind farm is operating, the maintenance of the wind farm is usually carried out from a nearby port. These ports house the maintenance crew and vessels needed to respond to wind farm faults, plus storage and repair facilities. As wind farms get larger and further out to sea, the use of helicopters and offshore accommodation facilities for this function is likely to become more common.

#### 4. Required Construction Port Availability

Before assessing construction port capacity in the UK today, this section looks at the anticipated requirements of the offshore wind industry to 2020.

Table 4.1 and Figure 4.1 show the number of offshore wind turbines and associates capacity (MW) expected to be installed off UK during Rounds 1, 2 and 3 of The Crown Estate's leases from 2009. The regional distribution is based on seabed availability and the relative economic viability of different zones. Technological developments and changes in location and understanding about specific sites will inevitably affect the breakdown. Typically, ports are selected for projects around two years before wind farm installation starts. The possible Round 3 zones are indicated on the map in purple and are subject to confirmation by The Crown Estate following DECC's Strategic Environmental Assessment (SEA) process. On the basis that 25GW will be installed, Round 3 may lead to the installation of up to 7000 turbines, depending on the size of the turbines deployed. Up to 2,500 turbines are expected to be installed during Rounds 1 and 2.

These figures exclude offshore wind projects in Scottish and Northern Irish territorial waters and Irish and Continental waters, where it is anticipated that over 70 projects will be installed during this period. The figure of 4,500 turbines in Table 4.1 is based on known turbine numbers installed or selected for Round 1 and 2 projects (using 2, 3, 3.6 and 5MW turbines). For Round 3 projects it has been assumed that the average size of turbines in 2015 will approach 5MW, increasing to around 6MW by 2020.

Action to increase port capacity to meet the requirements of Round 3 developments will equip UK ports with the capability to handle all future marine and offshore energy developments. Investment now will bring long-term benefits to the UK port industry.

Table 4.1 - Number of Offshore Wind Turbines Expected to be Installed off UK (split by year and coastal region), excluding projects in Scottish and Northern Irish territorial waters.

Source: BWEA UK Offshore Wind: Moving up a gear (2007) and BVG Associates

Coastal Region	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
Southern North Sea	160	130	140	290	180	150	100	230	360	450	510	520
North East	0	0	20	0	0	0	20	80	140	190	220	220
Scotland East	0	0	0	0	10	10	30	70	100	130	150	160
Scotland West	0	0	0	0	0	0	0	0	0	0	0	0
Irish Sea	110	20	30	20	120	140	40	60	80	110	130	130
Bristol Channel & Wales West Coast	0	0	0	10	0	0	30	70	100	110	80	80
South Coast	0	0	0	0	0	0	10	20	30	40	50	50
<b>Total</b>	<b>270</b>	<b>150</b>	<b>190</b>	<b>320</b>	<b>310</b>	<b>300</b>	<b>230</b>	<b>530</b>	<b>810</b>	<b>1030</b>	<b>1140</b>	<b>1160</b>

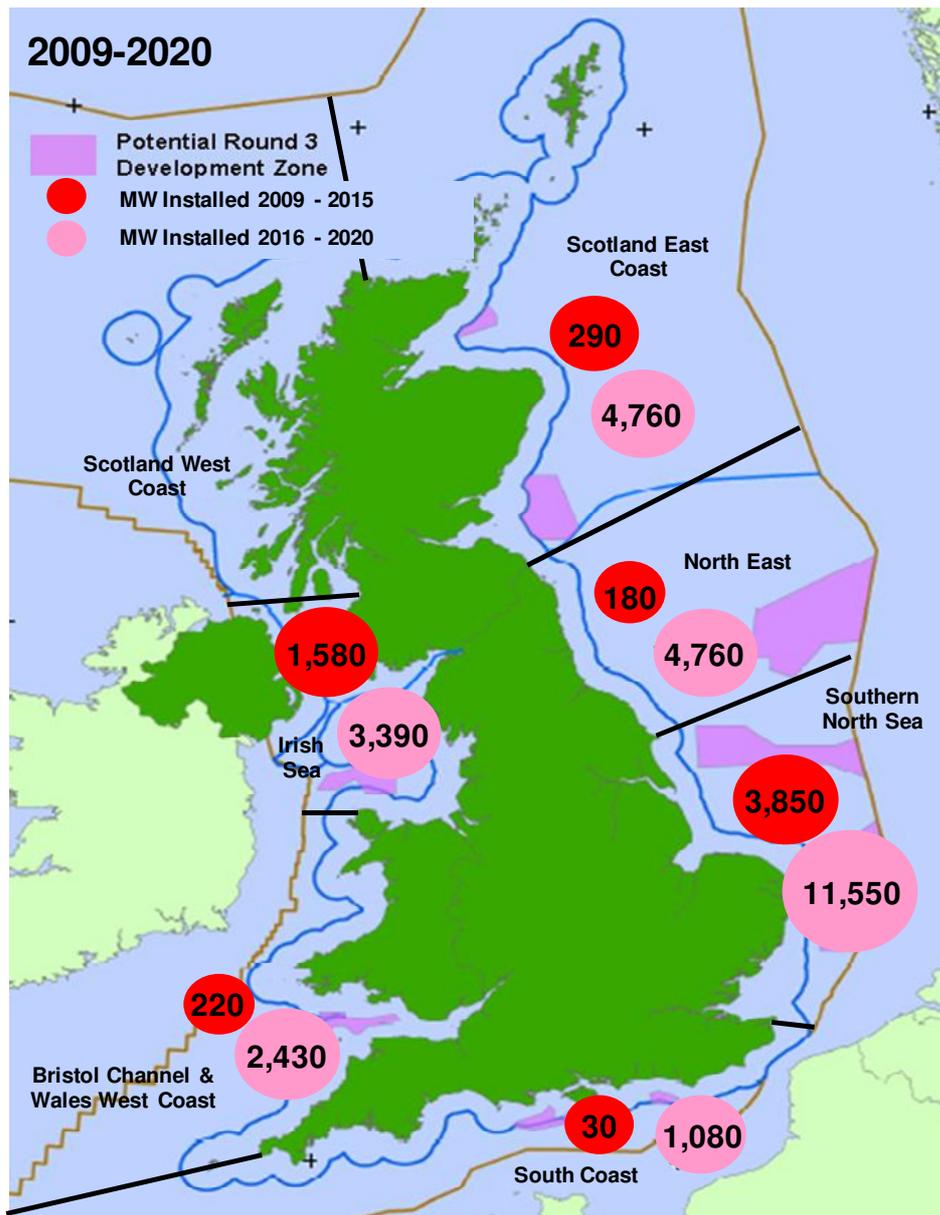


Figure 4.1 – Offshore Wind Capacity (MW) Expected to be Installed off UK (split by coastal region), excluding projects in Scottish and Northern Irish territorial waters.

While the actual distribution of turbines depends on the outcome of the SEA and Round 3, the distribution of projects is likely to be such that more than one port will be required to support installation in some regions. If UK ports do not provide sufficient space, then installation will be carried out from Continental ports. Competition is higher on the east coast where the distance to the Continent is not as great.

The use of Continental ports for UK offshore wind projects could mean increased project costs due to the increased steaming times and associated weather risks between the project pre-assembly location and wind farm. These costs would be further increased should current strength of the Euro persist. It would also mean the loss of economic benefit to the UK of this opportunity.

#### 4.1. Distribution of Required Construction Port Capability

The distribution of proposed Round 3 zones shown in Figure 4.1 is such that it is likely that UK will need facilities in locations not yet used for offshore wind.

Table 4.1.1 indicates the number of ports required to meet the demand from Round 1 and Round 2 projects as well as the projected 25 GW from Round 3 by 2020. The forecast build rate for Round 3 has been based on the feedback from developers and manufacturers about project timescales and

practical construction rates. No provision is incorporated for development within the territorial waters of Scotland, though the Crown Estate has received expressions of interest to develop such sites. Projects in Northern Irish territorial waters and Irish and Continental waters also are not considered.

Table 4.1.1 - Indicative Number of Ports Required by Region  
(based on a typical installation capacity of 100 turbines per year per port).

Coastal Region	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
Southern North Sea	2	2	2	3	2	2	2	3	4	5	6	6
North East	0	0	1	0	0	0	1	1	2	2	3	3
Scotland East	0	0	0	1	1	1	1	1	2	2	2	2
Scotland West	0	0	0	0	0	0	0	0	0	0	0	0
Irish Sea	2	1	1	1	2	2	1	1	1	2	2	2
Bristol Channel & Wales West Coast	0	0	1	1	0	1	1	1	2	2	1	1
South Coast	0	0	0	0	0	0	1	1	1	1	1	1
<b>Total</b>	<b>4</b>	<b>3</b>	<b>5</b>	<b>6</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>12</b>	<b>14</b>	<b>15</b>	<b>15</b>

## 4.2. Economic Value

For illustrative purposes, based on a constant estimated cost of £2.5m per MW of installed offshore wind capacity (approx. current cost) and the assumption that 1% of CAPEX cost is spent within construction ports, Table 4.2.1 summarises the estimated value of construction port activity relating to UK offshore wind farms to 2020.

Table 4.2.1 - Estimated Value of Construction Port Activity (£m)

Coastal Region	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
Southern North Sea	12	11	10	22	13	13	14	29	47	62	73	77
North East	0	0	1	0	0	0	3	10	19	26	31	33
Scotland East	0	0	0	0	1	2	4	8	13	18	22	23
Scotland West	0	0	0	0	0	0	0	0	0	0	0	0
Irish Sea	9	1	2	2	9	11	6	7	11	15	18	19
Bristol Channel & Wales West Coast	0	0	0	1	0	0	4	9	13	15	12	11
South Coast	0	0	0	0	0	0	1	2	4	6	7	7
<b>Total</b>	<b>22</b>	<b>13</b>	<b>14</b>	<b>25</b>	<b>23</b>	<b>26</b>	<b>30</b>	<b>66</b>	<b>108</b>	<b>143</b>	<b>163</b>	<b>171</b>

Thus the potential market for UK ports is worth in excess of £150m per year at peak installation rate, totalling over £800m up to 2020.

The fraction of CAPEX is based on feedback from wind farm developers and others. It includes land rental, stevedoring, harbour dues, cargo dues, pilotage, cranes and handling costs. Some vessel fees may also include hidden port costs within the charter rate. It is likely that vessel fuel and maintenance will also be procured in the construction port. The precise value is hard to capture due to different contracting arrangements for different projects.

These values do not include any ongoing O&M activity. Ports that have been used for wind farm construction are in a strong position to be used for O&M activities, which are expected to continue for at least 20 years for each project. Including the value of O&M services, the potential UK market is likely to approach £1bn.

## 5. Availability of UK Ports for Construction

As part of this study, BVG Associates has visited a large number of UK ports and held detailed discussions with owners and regional enabling bodies. As a result the potential capacity for construction and manufacturing in each coastal region was assessed and compared to the space required to handle the numbers of turbines projected in Table 4.1. Figure 5.1 shows that on a regional basis, the potential space identified comfortably exceeds the needs of the offshore wind industry. It should be noted in that in many cases land is likely to require development. Also, little land is vacant currently and the market-driven approach of UK port owners means that its availability for the wind industry is dependent on commercial factors.

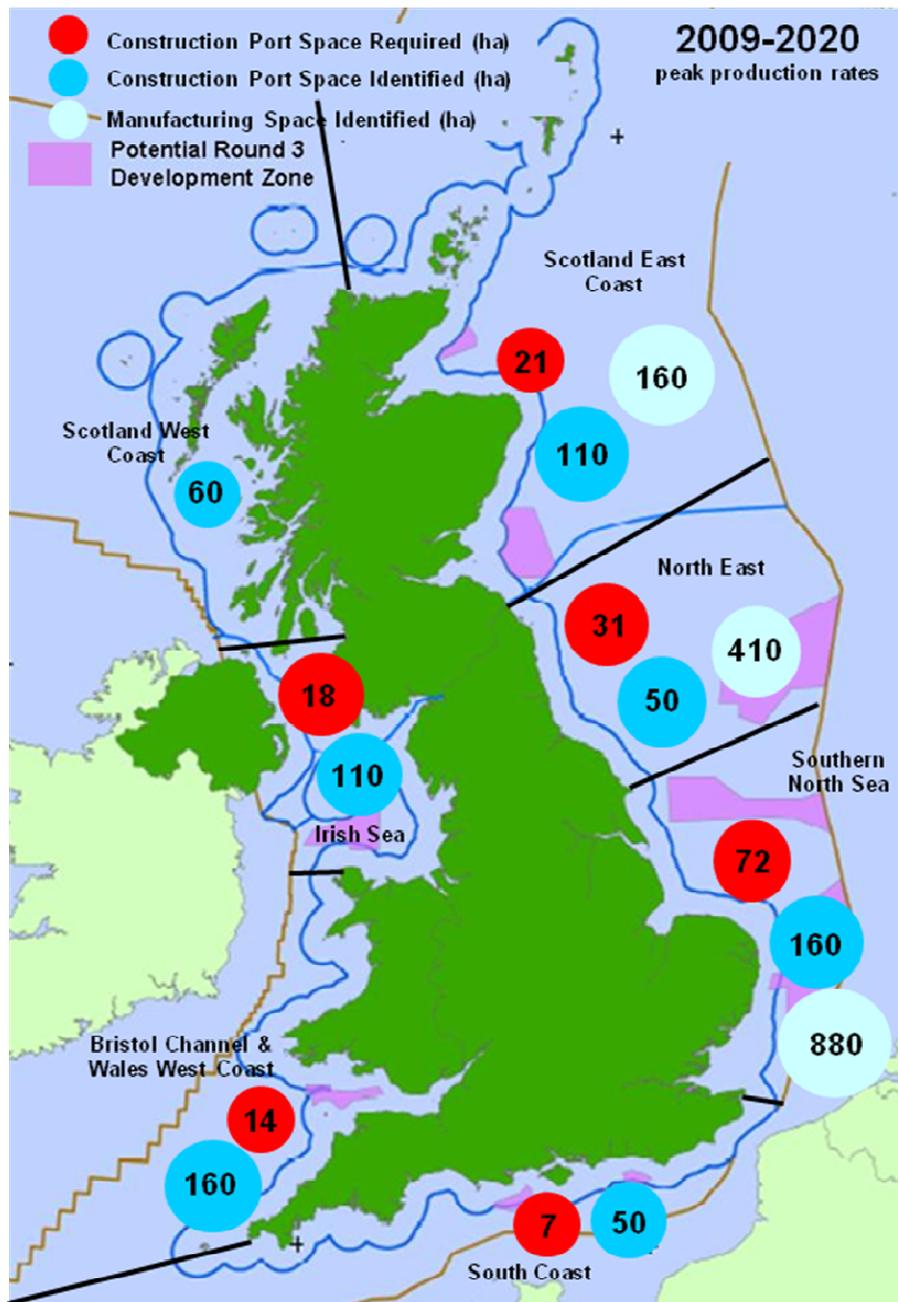


Figure 5.1 – The space identified at UK ports for offshore wind construction and manufacturing.

The calculations shown in Figure 1 are based on the availability at around 25 locations. These have been identified at this stage as either having the capacity to support offshore wind construction or the potential and commitment from owners to explore the necessary investment to meet manufacturers' and developers' requirements (see Figure 5.2). A significant change in port owners' attitudes was observed during the discussions and it is likely that further promising sites may become suitable in the near future.

Key	
1 Newhaven	11 Peterhead Bay
2 Ramsgate	12 Cromarty Firth (Nigg Bay and Highland Deephaven)
3 Medway (Sheerness and Isle of Grain)	13 Hunterston
4 Great Yarmouth	14 Belfast (Harland & Wolff)
5 Humber	15 Barrow-in-Furness
6 Hartlepool and Tees	16 Mostyn
7 Tyneside	17 Milford Haven
8 Methil (Fife Energy Park)	18 Swansea/Port Talbot
9 Dundee	19 Portland
10 Montrose	20 Southampton

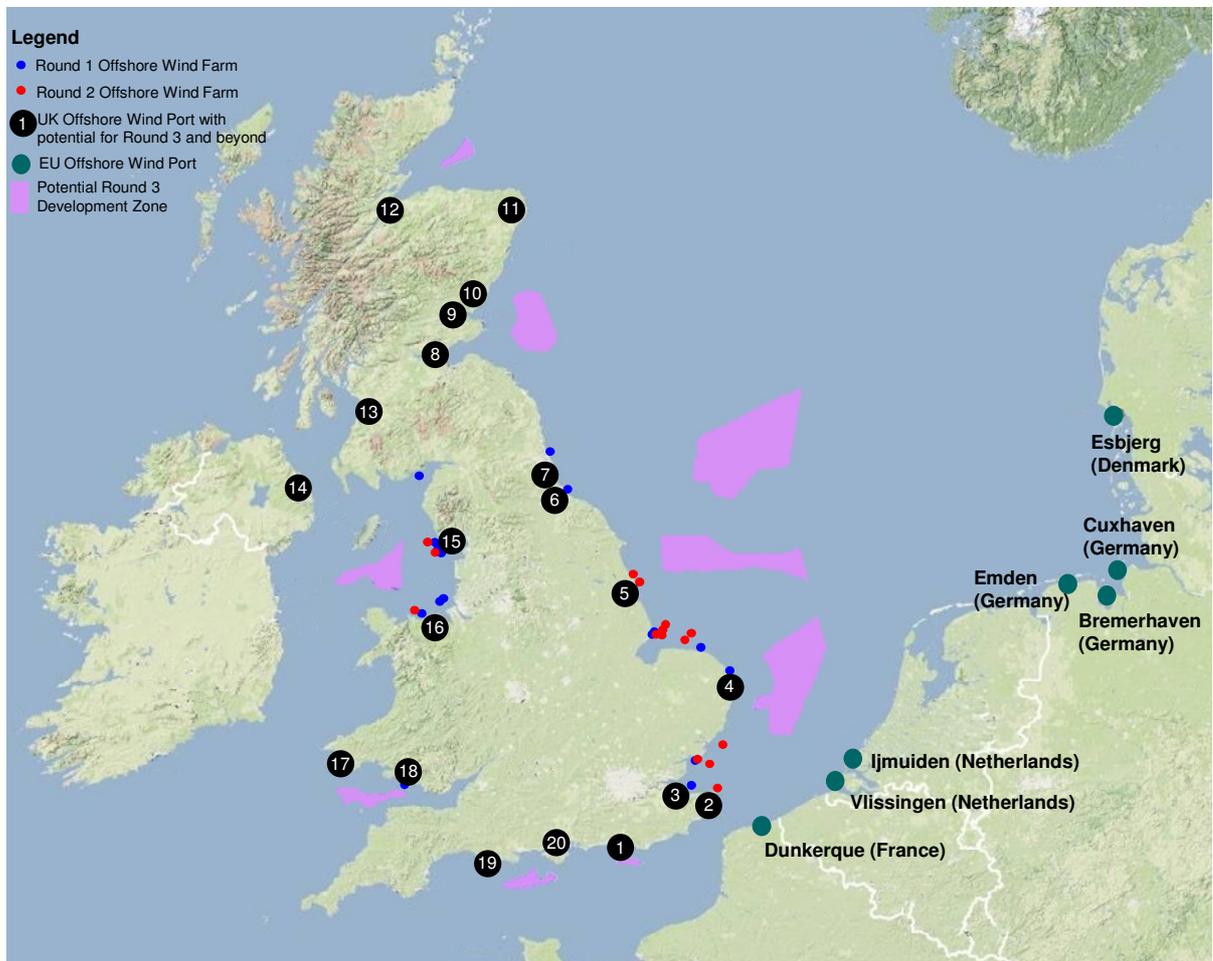


Figure 5.2 - UK Offshore Wind Farm Sites and UK and Continental Ports.

## **6. Continental Competition**

The high concentration of wind industry players in Denmark and Germany means that there is an increased awareness among Continental port owners of the opportunities and demands of the wind industry. In many locations, ports are owned by municipal authorities or councils. Key competitors for the UK offshore construction are indicated in Figure 5.1.

Several ports, notably Esbjerg, Bremerhaven and Cuxhaven, run high profile marketing campaigns to attract wind industry activities. These had large stands at the Husum Wind exhibition in September 2008, for example. UK ports by contrast were represented only by Harland & Wolff as part of the UK Renewables stand.

There is a perception within wind players that Continental ports can offer more attractive deals for inward investors through regional arrangements than UK ports. These may include infrastructure developments benefiting several port users. Esbjerg municipality has recently announced an offer to Siemens Wind Power for 20 hectares of development land within the port and 200 hectares for manufacturing.

Continental ports, particularly those in France and Holland, are close to the UK southern North Sea sites, making them viable construction base options for these projects.

## 7. Stakeholder Perspectives

This section summarises interviews held with a wide range of stakeholders.

### 7.1. Wind Industry Perspectives

Representatives of the wind industry were interviewed to understand the issues they are facing and perceptions on the subject of UK construction ports.

A common reflection in discussions was the obvious difference in the scale of activity and timescales for Round 3 projects. Smaller Round 1 projects have demonstrated technology and capability, but not capacity. Round 3 demands a significant increase the volume and throughput of construction activity, even over Round 2. This is driving the frequency of vessel operations, size of land area and economics of operation to support, say, the installation of 100 turbines a year from one construction port.

#### Wind Turbine Manufacturers' Perspectives

- Manufacturers perceive that Continental port owners receive greater national and local government support. These ports are seen actively to be marketing to the wind industry.
- Major manufacturers are sensitive to the desire to see UK jobs created for UK wind projects. They see that there is an opportunity for the UK to attract manufacturing and construction activity for UK projects where this has previously not been the case.
- Manufacturers expressed frustration at not being able to find available capacity in UK for UK projects. In the absence of viable UK alternatives, several projects have been assigned to foreign ports.
- They advised that in general, UK port owners are unwilling to invest in infrastructure to enable them to enter the market without firm contracts.
- They consider that locations that supported Round 1 projects are often too small or in the wrong place to support projects for Rounds 2 and 3.
- They have a favourable view of the UK construction ports that they have used.
- Without particular allegiance to UK, they openly recognise that the use of Continental a port for construction potentially removes the extra handling stage of shipping via a UK construction port and therefore may have a cost advantage. The trade-off will be the extra steaming distance between construction port and wind farm site. They recognise that the development of technology for transfer at sea could significantly change this balance to the disadvantage of ports that do not have associates turbine or key component manufacture.
- In a number of cases, wind turbine manufacturers without an offshore wind track record advised that they expected that for some time their scope of supply would be to the quayside at their turbine production facility. They did not anticipate getting involved with sourcing construction ports or deciding on construction logistics.
- Having visited port facilities, manufacturers have been pleasantly surprised by the opportunities provided by UK ports.

#### Offshore Wind Farm Developers' Perspectives

- Developers also expressed frustration in finding capacity for project construction. This is an issue arising early in the development of projects, as location selection drives economic assumptions used in the financial modelling. For this reason, construction ports need to be designated, even if not actually contracted, early in the project.
- Developers only plan to use ports they *know* will be available. Developers include the assessment a suitable port in their Front End Engineering Development (FEED) feasibility study for the project and make decisions on ports typically two years ahead of construction. Constructors are required to designate the construction port at the time of tendering.
- While each project has unique organisational arrangements, in general turbines are either supplied on a turnkey basis or project contractors manage the installation process. Developers

advised that the construction port is only finally contracted after the relevant prime contractor has been secured.

- Smaller Round 1 projects were less hindered by port capacity constraints as they could be accommodated by smaller ports. Such ports are now considered unsuitable for larger projects.
- Developers would like port owners to understand better the long-term opportunities that offshore wind provides and to be less focused on the trade off against other port activities.
- They said that lack of availability of additional land area has frequently been a major limitation for operational ports.
- Developers recognise that significant timescale slippages resulting from past delays in the offshore consenting process discourage port owners from investing.
- Developers advised that operations and maintenance ports have been found without difficulty.

### **Supply Chain Perspectives**

- With the exception of suppliers of blades, towers and foundations, feedback from the first and second tier suppliers is that they do not consider themselves to be constrained by the availability of suitable ports. Most components can be delivered by road to turbine production facilities, currently all on the Continent.
- Blades and foundations for large turbines are manufactured on waterside locations and loaded directly on to delivery vessels to the construction port. Due to the cost of land transport, new tower manufacturing facilities also tend now to have coastal locations.

### **Construction Vessel Operators' Perspectives**

- There are varying opinions on the value of self-propelled jack up vessels. Vessels capable of higher speeds may bring more potential for Continental ports and improve the response to weather windows.
- Quayside loading is significantly easier with overhead gantry cranes. The cost of quay construction to achieve this is significantly higher.

## **7.2. Port Owners' Perspectives**

Port owners were also interviewed to explore the issues they are facing and perceptions on the use of UK ports for offshore wind construction. A list of interviewees again can be found in Appendix 2.

- Port owners generally are aware of the wind industry although most have only been involved importing onshore wind turbines. From this experience, they are familiar with turbines in the range 1 to 2MW.
- In running commercial operations, local port managers focus on maximising utilisation and revenue from land and quay assets. This includes shipping movements, cargo dues and stevedoring income.
- Historically port owners have been willing to invest where there is a viable business case, for example container terminal capacity.
- Many port owners are dismissive of the land area being requested by wind industry players. Few have this area of land available. They welcomed the opportunity to discuss and understand why such large sites are being requested. It may be that in time, dialogue may lead to innovative solutions to decrease land area requirements.
- Port owners see wind industry players as reluctant to commit to contracts or tenancies which would allow specific investment in terms of quayside or land development for the long term. Most have so far only experienced Round 1 projects where commitment to ports was project-based only.
- Port owners are keen to engage with the wind industry to both understand the challenges and the opportunities.
- Several possible locations for manufacturing or construction facilities have been found which are not in routine use as ports today. These locations are best characterised as waterside land

with development potential. Landowners of these sites do not have the same commercial drivers as port owners and operators.

- Port owners are encouraged by the Department of Transport to maintain master plans for each port location. With a few exceptions, these plans do not yet include consideration of offshore wind construction.

## 8. Conclusions and Recommendations

For the 2020 target to be delivered, significant investment needs to be made in construction ports. Even if some projects are constructed from Continental ports, each country facing the North Sea has its own offshore wind commitments to achieve and Continental ports may not be available to meet the UK's need.

At least six locations distributed around the UK need to be available for use from 2014 onwards. These locations will need to be offered to the developers by 2011 at the latest, to be factored in to developers' project plans.

Failure to make construction ports available will affect the commercial attractiveness of projects as well as making achievement of 2020 targets dependent on Continental ports. Apart from the loss of economic activity in the UK, Continental ports may well be encouraged to support their own national projects as a priority over UK projects.

BVG Associates recommends to DECC that the following steps be undertaken, in order of priority, to accelerate the provision of ports in the UK suitable for offshore wind construction:

### 1. Government Role

UK Government and the devolved administrations should provide support to ensure that ports capacity is available to meet the requirements to deliver offshore targets. Market forces alone will not deliver capacity in time.

### 2. Ports Prospectus

A prospectus of potential construction and manufacturing sites for offshore wind should be produced. This should include sites already designated for development by regional and devolved enabling bodies and will demonstrate a holistic UK approach to addressing needs for offshore construction.

### 3. Developers and Consortia Contact

DECC should engage with The Crown Estate and Round 2 developers then with consortia preparing bids for Round 3 zones to ensure that full understanding of UK capability and commitment is available as early decisions about project delivery are made.

### 4. Ports Workshop

Workshops should be held involving offshore developers, turbine and foundation manufacturers, offshore contractors, port owners and potential investors. The findings of this report will be shared and discussed.

### 5. Wind Industry Dialogue

DECC should maintain close dialogue with wind turbine manufacturers and first tier suppliers in order to maximise the dialogue about UK capability. This includes early dialogue with those turbine manufacturers yet to declare public interest in offshore wind.

### 6. Support in Marketing to Wind Industry

DECC should help regional and devolved enabling bodies and port owners market their ports' capabilities to developers. In particular this should include projects where developers have not yet announced designated construction ports.

### 7. Site Development

Work should be undertaken with land owners and the regional and devolved enabling bodies to, identify and develop additional sites in areas requiring more alternatives, in particular the east coast of England. The scope of this work should include both construction ports and manufacturing facilities.

### 8. Economic Assessment

The value economic assessment of ports activity for offshore wind construction should be further explored.

### 9. Competitor Assessment

DECC should assess the competition to the UK ports from Continental competition and identify market differentiators.

### 10. Port Master Plans

Ports that have the potential for offshore wind construction should be encouraged to include these opportunities in their master plans to aid development planning.