OXFORD ECONOMICS

Analysis of the Employment Effects of the Operation and Maintenance of Offshore Wind Parks in the UK

A Report for Vestas Offshore

Final Report
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OXFORD ECONOMICS

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Executive Summary

- The purpose of this study is to provide a robust assessment of the employment impact of the **operation and maintenance** of offshore wind farms, of both those operated by Vestas and in the UK as a whole in 2010, and in 2020 based on projections for capacity development in the UK.
- Vestas Offshore is one of the major players in the UK's offshore wind industry, accounting for almost 50 percent of the market. By giving Oxford Economics, one of the world's leading providers of economic analysis, full access to its financial accounts and leading personnel, Vestas Offshore and Oxford Economics have produced a highly accurate analysis of the employment impact of operation and maintenance of offshore wind in the UK – an area that has seen limited research globally.
- This report considers permanent operation and maintenance jobs, as these are long-term jobs, with turbine life-spans reaching over 20 years. However many more jobs in manufacturing and installation will be created as the UK increases its offshore wind capacity.

Current UK offshore capacity of just over 1GW supporting nearly 500 jobs from operations and maintenance activities alone…

- The operation and maintenance activities of the UK's current 1GW capacity of offshore wind farms is estimated to directly support 290 highly skilled jobs in the UK, with employment taxes raising £5 million for the UK Exchequer.
- Offshore wind operations and maintenance activity purchases £13 million worth of goods and services from the UK-based supply chain and when combined with the purchases made by those employed directly and in the supply chain spending their wages is estimated to sustain an additional 160 jobs.
- Therefore, in total the UK's offshore wind farms support 450 UK jobs. However, the job creation effects of capital purchases related to offshore operations and maintenance, such as boats and port facilities, are not considered in this analysis

...with the jobs supported often highly skilled and in areas where deprivation is higher than national averages

- Employment directly supported by offshore operation and maintenance activities is often highly skilled and located away from urban centres in areas where job creation is generally weaker and deprivation higher.
- The average income received by those working in offshore operations and maintenance is often significantly higher than the average earnings in the areas where the jobs are located. Consequently, further creation of operations and maintenance jobs will raise average earnings in these areas.

Current proposals will see the UK's offshore capacity grow rapidly…

- In order for the UK to fulfil its renewable's obligation, the UK's offshore wind capacity must increase at minimum to 14GW by 2020.
- If UK offshore wind capacity reached this level, offshore operation and maintenance activities are estimated to directly support over 2,500 jobs.
- The total employment effect of the operation and maintenance of an offshore capacity of 14GW in 2020 is estimated to be around 4,600 jobs, with 1,100 jobs indirectly supported in the supply chain and almost 1,000 jobs supported in the rest of the economy.

… to a maximum of 47.5GW where over 20,000 full-time jobs would be supported…

- The additional capacity of offshore wind farms currently under construction or proposed under the Rounds 2 and 3, and other development phases would give the UK an offshore capacity of 47.5GW.
- With an offshore capacity of 47.5GW, UK offshore operations and maintenance activities would directly support an estimated 11,700 jobs.
- To support these activities, a further 3,900 jobs would be supported in the supply chain, and an additional 4,500 jobs would be supported in the wider the economy. In total, offshore operations and maintenance is estimated to support more than 20,000 jobs under the 47.5GW capacity scenario.

… however a restricted development phase could cost the UK 12,500 of these 'green' jobs

- The consensus within the UK wind energy industry is that offshore capacity is likely to reach 20.5GW by 2020.
- In this case a potential 7,500 highly skilled 'green' jobs would be 'lost', compared to the 47.5GW scenario.
- A further 5,000 potential jobs would not be realised in the rest of the economy, including supply chains, as only an additional 3,200 jobs would be supported in supply chains and the rest of the economy.

Table ES1: UK Offshore O&M Employment Effects 2020

	2020 Scenario		
	High Scenario	Low Scenario	Likely Scenario
MW Capacity	**47,500**	**14,100**	**20,500**
Direct employment	11,720	2,500	4,000
Indirect employment	3,910	1,130	1,660
Induced employment	4,490	980	1,570
Total Employment	**20,120**	**4,610**	**7,230**

Source: Oxford Economics

But the overall employment impact would be much greater

- The true employment impact of increasing the UK's offshore capacity goes beyond just operation and maintenance employment – the scope of this report. In reality, the construction and installation of additional offshore capacity will support a significant number of jobs, both directly in construction and manufacturing, and indirectly in supply chains and the rest of the economy.
- Therefore, any shortfall in the level of capacity installation will result in employment effects beyond those documented in this report.

Looking further ahead…

- The recently published *Offshore Valuation* report sets out possible pathways for developing the UK's offshore resources in the period up to 2050. The report states in scenario 2 that the UK's offshore capacity could reach 169,000MW in 2050, of which 149,500MW is delivered by offshore wind.
- If this capacity is delivered, it is estimated that direct O&M employment in the UK could reach 34,000 in 2050. Based on our estimates for the multipliers in 2020, a further 24,000 jobs could be supported in the supply chain and economy as a whole in 2050.

1 Introduction

1.1 Purpose of the study

The purpose of this study is to provide a robust assessment of the employment impact of the operation and maintenance of offshore wind farms in the UK in 2010 and 2020. It has been prepared by Oxford Economics - formerly Oxford Economic Forecasting - one of the world's leading independent providers of economic analysis, advice and models.

1.2 Study approach

To achieve the purpose of this study, it is necessary to examine the many channels through which the operation and maintenance of the UK's offshore wind farms makes a contribution to the UK economy. This contribution includes the following employment impacts:

- **Direct impact** – employment in the operation and maintenance (O&M) of the UK's offshore wind farms themselves.
- **Indirect impact** – employment supported down the supply chain to the O&M of the UK's offshore wind farms, as a result of purchases of goods and services from UK suppliers.
- **Induced impacts** – employment and activity supported by those directly or indirectly employed in offshore O&M spending their incomes on goods and services in the wider UK economy. This helps to support jobs in the industries that supply these purchases, and includes jobs in retail outlets, companies producing consumer goods and in a range of service industries.

This study will determine the size of these impacts given the current offshore wind capacity in 2010 and for 2020, using projections of probable capacity.

It is worth emphasising that this report is only considering the employment effect of O&M of the UK's offshore wind capacity. Increasing the UK's offshore capacity will generate jobs through the design, manufacture, and construction phases, in addition to O&M. However, as the projected lifespan of each turbine is approximately 20 years jobs in O&M are secure in the long term, whereas employment generated by the other phases will fluctuate significantly with the production of new wind farms, and will tail off dramatically once construction is complete. Therefore, the employment impacts reported in this study only reflect the permanent employment impact of UK offshore wind, and understate the overall employment impact.

Consequently, the results produced within this study are not directly comparable with those produced in other, often cited reports (such as Bain & Co. (2008) and European Wind Energy Association (2008)) as these consider the total employment impact of additional wind capacity, including design, manufacture, construction and operation.

1.3 Report structure

The report is structured as follows:

- Chapter 2 provides an overview of the current state and potential development of the UK's offshore wind generating capacity;
- Chapter 3 quantifies the employment impact of the operation and maintenance of the UK's offshore wind farms in 2010, and places these results in a UK context, and examines three possible scenarios for the development of the UK's offshore wind capacity over the next decade, determining the employment impact for each; and
- The final chapter, Chapter 4, takes the potential offshore capacity in 2050 presented in the recent *Offshore Valuation* report, and provides indicative estimates for operation and maintenance employment in 2050.
- The Annex at the end of the study presents the documentary sources used in this study.

1.4 Acknowledgements

Oxford Economics' gratefully acknowledge the help that we received from all the individuals and organisations that assisted with this report. Particular thanks must go to all Vestas Offshore staff at the Kentish Flats wind farm for their assistance.

Box 1.1: 'Round 2.5' extensions

In May 2010, The Crown Estate has announced capacity extensions to existing Round 1 and Round 2 offshore wind farms. The expansion, known as Round 2.5, will add a further 2,000MW to the UK's offshore capacity; 1,700MW will be located in new sites affiliated with existing wind farms, and 340MW will be housed in existing sites.

Designed to fill a capacity gap between Round 2 and Round 3, and ensuring a seamless pipeline for the supply chain, the extensions are due to commence in 2014, with completion expected by 2016. By affiliating the new sites with existing wind farms, the extensions will benefit from synergies with the existing projects, with the potential for the sharing of construction crews and vessels, as well as electrical systems, construction bases, ports and onshore facilities.

Unfortunately this announcement fell between the completion of data analysis and the finalisation of this report, and therefore is not included in the analysis presented herein.

2 Offshore wind power in the UK

Box 2.1: Key points – UK Offshore Wind

- The possibility of catastrophic increases in global temperatures as a result of greenhouse gas emissions, coupled with the increased need for energy security in the future, present a compelling case for replacing traditional forms of energy generation with energy from renewable sources.
- As a part of an EU-wide target of sourcing 20 per cent of all energy from renewable sources by 2020, the UK has set itself a goal of generating 15 per cent of its energy needs from renewables.
- Wind power is the most advanced and cost effective of the major forms of renewable power generation, and the UK's offshore wind resource make offshore wind an attractive option for fulfilling the UK's renewable energy commitment.
- Following two development phases (Rounds 1 and 2), by the end of 2010 the UK will possess an offshore wind capacity of 1,041MW, spread across 12 sites.
- To ensure that offshore wind provides its share of the energy required to meet the UK's renewable's target, offshore capacity must increase to 14,000MW by 2020. However, a third development phase of offshore wind (Round 3) saw proposals for an additional 32,200MW of capacity to be developed. Together with other proposed developments, this could result in the UK's offshore wind capacity reaching 47,500MW.

2.1 The Need for Wind Power

2.1.1 The importance of renewable energy

The publication of the Stern Review in 2007 highlighted the need for both the UK and the World to act to curb the emission of greenhouse gases, by reporting that there was between a 77 and 99 per cent chance that the global average temperature could rise by 2℃ within the next 50 years. If the annual flow of emissions continues to grow at the current rate the level of greenhouse gases in the atmosphere in 2035 will be double pre-industrial levels, and will treble by the end of the century, giving a 50 per cent chance of a 5℃ increase in the global average temperature by the beginning of the next century.

The generation of power is the single largest emitter of greenhouse gases, accounting for 24 per cent of global emissions in 2000 (Stern 2007). Therefore any emission-free method of power generation available represents an attractive choice for reducing the threat of lasting and irreversible climate change.

In addition to the need for reduced emissions, a further push factor away from traditional methods of power generation in the UK is the issue of energy security.

The UK's Renewable Energy Strategy, published in 2009, reports that by 2020 a greater share of the UK's power generation will be dependent upon imported fossil fuels as the UK's North Sea oil and gas reserves are depleted. Becoming reliant upon imports for energy could place the UK in a vulnerable position, with supply likely to become heavily influenced by international relationships and subject to the possibility of significant price fluctuations.

By reducing the share of power generated using fossil fuels through the introduction of renewable power sources, the UK can both, reduce its emissions of greenhouse gases, and ensure future energy security.

In response to the common concerns shared by the UK and Europe over climate change and energy security, 2007 saw the EU set an EU-wide target for 20 per cent of all energy to be generated from renewable sources by 2020 (EU 2007). This target, which was made legally binding in 2009 (EU 2009), sees sharing the effort by EU member nations through the adoption of individual targets. The UK set a Renewables target of 15 per cent for 2020 – the largest percentage increase of all members (DECC 2009b).

2.2 UK Offshore Wind in 2010

Since the commissioning of the first offshore wind farm at Blyth, Northumberland, in 2000, the UK's offshore generating capacity has increased rapidly to 1,041MW in 2010 (Chart 2.1). This growth is the result of the implementation of the first phase (known as Round 1) of the development of the UK's offshore wind industry. Round 1 saw the awarding of 18 sites at 13 locations, 7 of which are due to be operational by the end of 2010.

DECC estimate that in 2008 offshore wind accounted for just under 0.5 per cent of the UK's generating capacity (2009a, 2009b). At the same time the UK became the largest offshore wind market, by capacity, replacing Denmark.

In addition to Round 1, a second call for bids to develop offshore wind farms in the UK was held in 2003. Known as Round 2, the second development phase incorporates 15 sites around the UK, which will utilise larger turbines, include a greater number of turbines, and be located further from the shore. Table 2.1 shows the wind farm sites in, or expected to be, operation in 2010.

Chart 2.1: UK Offshore Wind Capacity

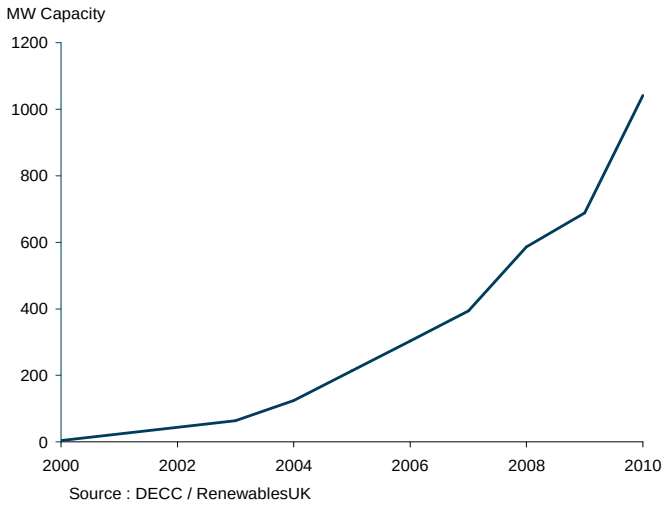


Table 2.1: UK Offshore Wind Farms 2010

Location	Capacity MW
Barrow	90
Beatrice	10
Blyth Offshore	4
Burbo Bank	90
Gunfleet Sands I	108
Gunfleet Sands II	65
Kentish Flats	90
Lynn & Inner Dowsing	194
North Hoyle	60
Rhyl Flats	90
Robin Rigg	180
Scroby Sands	60
2010 Total	1,041

Source: Renewables UK

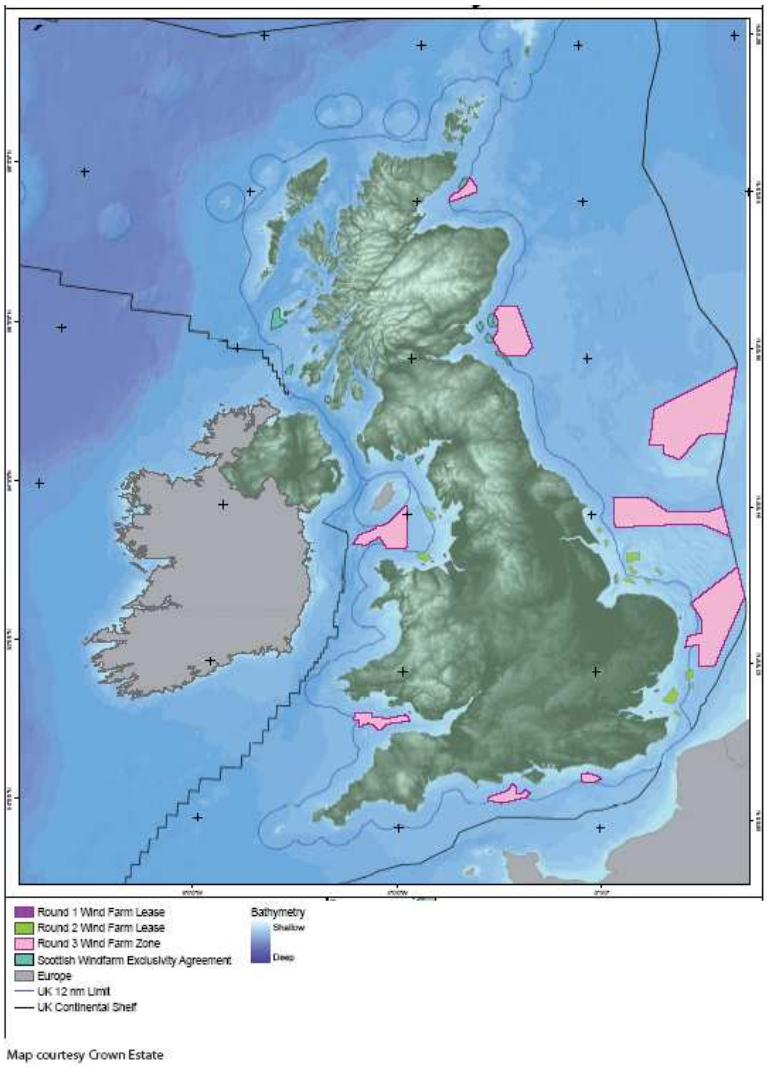
2.3 UK Offshore Wind in 2020

To reach the target of 15 per cent renewable's target by 2020 it has been suggested that the UK needs to install an additional 13,000MW of offshore wind capacity (DECC 2009b), increasing installed rated capacity up to 14,000MW. This represents a considerable increase in capacity compared to 2010; however, it is not the limit of proposed capacity increases.

In 2008, the Crown Estate[1] launched a third phase in offshore development with the Round 3 process. Round 3 represents a significant increase in the scale of offshore development in the UK with its nine zones equating to a potential capacity of 32,200MW – four times the cumulative capacity of Rounds 1 and 2. Aside from the Round 3 zones being considerably larger than those included in Rounds 1 and 2 (five of the zones have a potential capacity of over 2,000MW), the development also introduces wind farms a considerable distance from the UK coastline (at its closest, the proposed Dogger Bank zone is 200km away).

In addition to Round 3, a further 6,400MW of offshore developments have also been proposed in Scotland's territorial waters. Figure 2.1 shows the locations of all proposed offshore developments. If all proposed developments are completed by 2020, the UK's offshore capacity will have increased to 47,500MW (Chart 2.2).

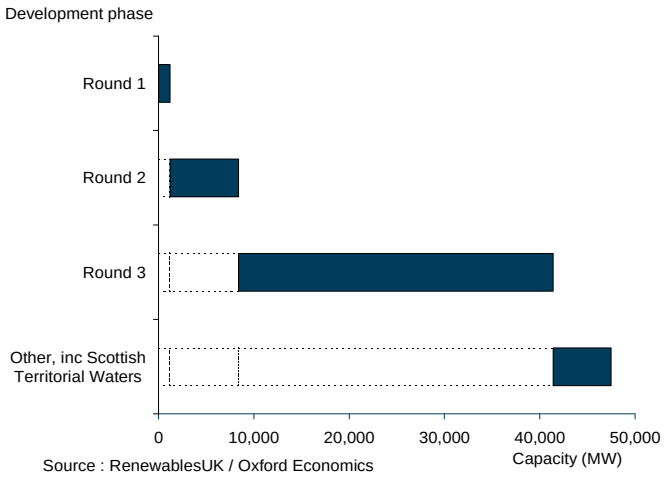
Figure 2.1: Proposed offshore wind developments by 2020



Map courtesy Crown Estate

[1] The landlord and steward of the seabed around the UK.

Chart 2.2: UK's Potential Offshore Wind Capacity by 2020



Source : RenewablesUK / Oxford Economics

Using alternative scenarios for projected offshore capacity for 2020, together with the 2010 capacity of 1,041MW, this report now estimates the employment impacts on the UK of offshore O&M activities.

3 The Employment Impact of the Operation and Maintenance of Offshore Wind Farms

Box 3.1: Key points – O&M Employment Impact

- The operation and maintenance of the UK's 1,041MW offshore capacity directly supports 290 jobs in 2010. Of this total 46 per cent is associated with the sites operated by Vestas Offshore. Offshore operation and maintenace activities in 2010 supports a further 160 UK jobs in the supply chain and the economy as a whole.
- The vast majority of the jobs directly supported are highly skilled, with technicians required to have the ability to perform a variety of complex and demanding tasks.
- The jobs supported by offshore operation and maintenance activities are long-term, reflecting the 20 year lifespan of turbines, and are often located in some of the most deprived areas of the UK, where the number of unemployed is often above the national average.
- If the UK were to install all of the currently proposed capacity by 2020, the operation and maintenance of the UK's 47,500MW are estimated to directly support 11,720 jobs. To enable this activity a further 3,910 UK jobs would be supported in the supply chain, and 4,490 would be supported in the wider economy.
- If increases in the installed capacity were restricted to a point where the UK's offshore capacity only reached the minimum required to meet its Renewables obligation (14,100MW) by 2020, offshore operation and maintenance activities are estimated to support 2,500 jobs directly, and a further 2,110 UK jobs in both the supply chain and the wider economy.
- The UK's wind industry believes that the most likely outcome for UK wind capacity by 2020 would be an installed capacity of 20,500MW. If this were the case, direct offshore operations and maintenance employment is estimated to reach 4,000, and a further 3,200 jobs in the wider economy.

3.1 Introduction

Having outlined the size of the UK's offshore wind market in the previous section, this chapter sets out the methodology and assumptions used to estimate the direct, indirect and induced employment effects of offshore wind O&M activities before presenting the results of this analysis for 2010 and 2020. This section also discusses the skills associated with O&M jobs, the likely location of employment supported by O&M activities, and additional benefits that

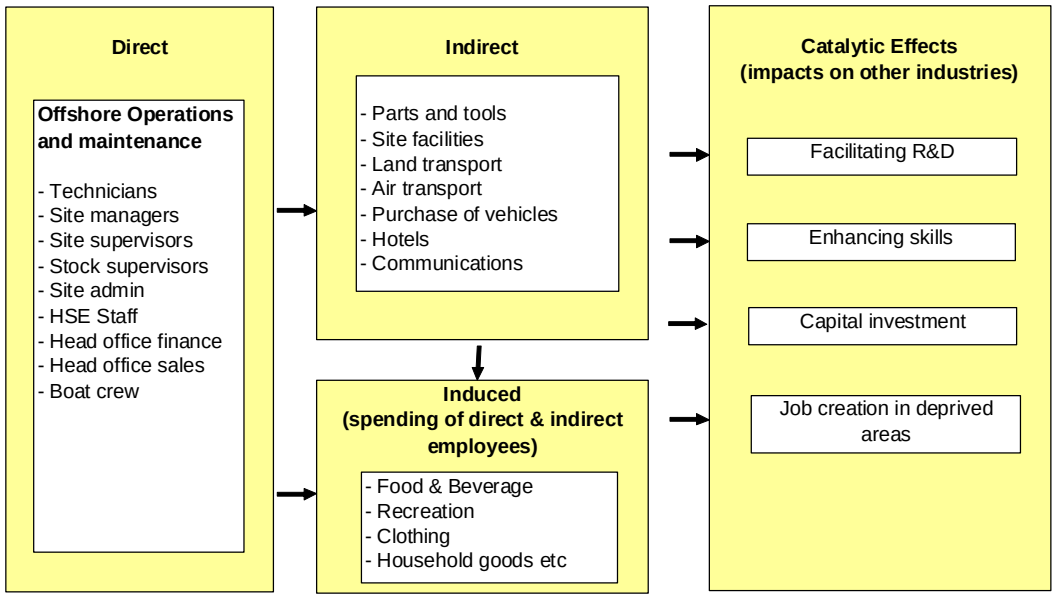
increases in offshore O&M could bring. Finally, the estimated results are compared to those produced by other studies.

3.2 Methodology

When estimating the employment impact of O&M activities in the offshore wind sector, it is necessary to look beyond considering those employed directly within the industry. The purchases required to conduct O&M of offshore turbines supports additional economic activity in the supply chain, which generates UK jobs, known as the indirect employment impact. Finally, those employed either directly or indirectly as a result of offshore O&M make purchases that stimulate further economic activity and supports additional jobs, known as the induced employment impact (see Figure 3.1).

To calculate the direct employment this study uses employment data supplied by Vestas Offshore for the 480MW of offshore wind capacity currently operated by Vestas Offshore which is 46 per cent of total UK capacity in 2010. In order to generate an estimate for the UK in total in 2010 we assume that these data are representative of all offshore wind farms currently in operation in the UK

Figure 3.1: Offshore O&M and its employment impacts



The estimates of indirect and induced employment supported by offshore wind O&M presented in this study are calculated using offshore wind O&M expenditure data provided by Vestas Offshore. These data provide estimates for the level of spending with UK based suppliers required to conduct O&M activities per MW of capacity. Data from the Office for National Statistics (ONS) then enables us to calculate how many UK jobs are supported by this expenditure. In order to calculate the jobs supported in the suppliers' supply chain (for example, in the operation and maintenance of an offshore wind farm the operating company might buy in services from a facilities management company (the

supplier) which will support jobs in that company but in turn the facilities management company will need to buy in goods and services supporting jobs in the suppliers' supply chain) we make use of input-output tables published by the ONS (ONS 2000)[2]. This supply chain multiplier calculation gives us the indirect impact. These same input-output tables then facilitate the calculation of the induced impact (i.e. the jobs supported through the spending of wages by direct and indirect employees).

The overall employment impact of offshore wind O&M activities is then calculated as the sum of the direct, indirect and induced employment impacts.

The impact of offshore wind is not limited to these direct, indirect and induced impacts. The activities associated with offshore wind can act as catalysts to the UK economy, including research and development (R&D), enhancing the UK workforce skill level, improving the economy's capital stock, and tackling regional deprivation. Not all of these *catalytic impacts* can be robustly valued in employment terms; therefore this study highlights the presence of these impacts without estimating employment values.

3.3 Employment in 2010

3.3.1 Key assumptions

To calculate the employment impact of offshore O&M in 2010, we have made a number of assumptions:

- employment levels of Vestas Offshore in the O&M of wind farms are representative of the labour requirement O&M activities for other offshore wind farms in the UK[3], included within this is an assumption that where Vestas Offshore sites utilise staff abroad (such as travelling technicians and central customer relations staff), other sites do so too;
- on the basis of discussion with those in the industry, the employment levels required do not move proportionally to capacity, but operate on a threshold basis. For example, once a wind farm reaches a certain size additional office-based staff are required (the threshold differs depending on the role, with those employed in central support roles able to manage the largest capacity);
- one exception to the previous assumption is employment of technicians, which is assumed to increase at 50 per cent of the increase of capacity (i.e. if capacity doubles, the number of technicians increases by half);

[2] Section 6.2 in the Annex provides some detail on Input-Output tables.

[3] As stated in section 3.2 Vestas Offshore accounts for 46 per cent of the UK's offshore wind capacity in 2010

- the employment supported by the subcontracting of various activities, including boats, is in effect direct employment and not part of the supply chain, as these could be conducted in-house; and
- the expenditure level and patterns of Vestas Offshore in the O&M of wind farms are representative of the rest of the UK offshore industry. Included within this assumption is the importation of all parts and machinery from manufacturers abroad. This is a key assumption and is based on the presence of servicing agreements between wind farm owners and the turbine manufacturers, by which manufacturers supply replacement parts directly from their production centres. Given that there are currently no major production centres in the UK, this is seen as a reasonable assumption.

3.3.2 Direct Employment

Using the various assumptions outlined above, it is estimated that in 2010 the O&M of offshore wind farms with a capacity of 1,041MW directly supports 290 jobs, of which 130 are associated with Vestas Offshore operated sites (Table 3.1). In addition to these jobs, it is estimated that a further 35 jobs are supported abroad as a result of UK-based offshore O&M.

Table 3.1 also presents an estimate of the employment taxation revenue[4] generated by those directly employed in offshore O&M. For the UK as a whole, offshore O&M activities generated £5.2 million in employment tax revenues; of this total Vestas Offshore is responsible for £2.3 million.

While employment creation is always a positive, the employment supported by offshore O&M provides additional benefits to the UK not captured in the basic numbers. First, while the jobs directly supported by offshore O&M in the UK vary in their role, incorporating both office-based and offshore technical staff, all possess significant skill requirements (Box 3.2 presents a description of some of the skill required by offshore technicians) and considerable investments in training by operators. Therefore, jobs created by offshore O&M add to the UK's skill base. Secondly, as wind farms are away from traditional employment centres, the jobs created tend to be located in more deprived areas (Section 3.3.5 examines the regional implications of O&M employment creation).

Table 3.1: Direct O&M Employment in 2010

	UK Total	Associated with Vestas Offshore
MW Capacity	**1,041**	**480**
Direct employment	290	130
Employment Tax revenue	£5.2m	£2.3m

Source: Oxford Economics

[4] These revenues include personal income taxes, and employee and employer National Insurance contributions.

Box 3.2: Jobs created in offshore O&M are high-skilled

Of the 290 people estimated to be employed in the O&M of offshore turbines, 40 per cent are technicians. Technicians are crucial to the continuing operation of offshore turbines and require an almost unique set of skills. In addition to possessing a technical background, technicians must be multi-disciplined and flexible, be able to work in extreme conditions and outside of normal office hours and environments.

In order to work offshore all employees must be trained in first aid, sea survival and numerous other areas. Some employees begin work already possessing these qualifications (stakeholders discussed in particular the arrival of workers from the offshore oil and gas sector), however considerable training is undertaken on courses while employed; representing significant investment in skills by offshore O&M providers.

The high level of skills required is reflected in the average annual income paid to technicians. At around £40,000, this places offshore technicians in the top 20 per cent of UK workforce incomes. In comparison to other high-skilled occupations, offshore technicians earn significantly more than the average teaching professional (mean income £32,000), and those in employed in skilled metal and electrical trades (£27,000), and skilled construction and building trades (£24,000). The level of income received by offshore technicians is comparable to the mean income level of business/public service professionals (£40,000).

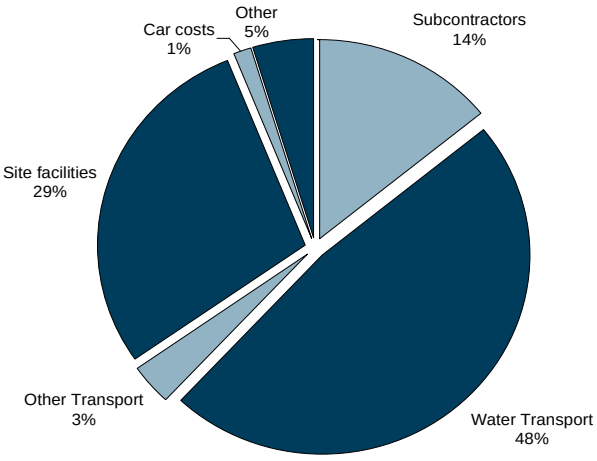
3.3.3 UK procurement spend

As outlined in the methodology section, the indirect employment effects of offshore O&M in the UK are calculated on the basis of expenditure per MW of capacity. Using data supplied by Vestas Offshore, it has been estimated that in 2010 £13 million will be spent on purchases required for the O&M of the UK's offshore wind farms. This equates to a spending level of £12,400 per MW of capacity. It should be noted that this figure includes imports purchased abroad.

The expenditures required for performing offshore O&M are assumed to be the same across the UK, with the data supplied by Vestas Offshore being representative of the industry. From this data it is possible to determine the level of spending on each category of supplies in the UK.

As Chart 3.1 shows, almost half of the spending made in offshore O&M in the UK is in the water transport industry. Site facilities claims the second largest share of expenditure, through the payment of rent on premises, and the various O&M activities performed by subcontractors account for 14 per cent of total expenditure. The Other category includes spending on land and air transport, hotels, communications, and retail products. Given the assumed importation of all parts, no expenditure on machinery is UK based.

Chart 3.1: UK procurement by industry



Source : Oxford Economics

3.3.4 Total Employment

As discussed above the ONS data enables us to calculate the employment supported in both the supply chain and as a result of the spending of wages of those directly and indirectly employed by offshore O&M activities.

As Table 3.2 shows, offshore O&M activity in the UK in 2010 indirectly supports 70 jobs; the O&M of the 480MW capacity associated with Vestas Offshore indirectly supports 30 jobs. The employment of 360 workers both directly and indirectly by offshore O&M activities generates additional consumer spending within the UK economy, which results in an induced employment impact of 90 jobs; the induced impact associated with Vestas Offshore's sites O&M activity is 40 jobs.

In total, the O&M of the UK's offshore wind farms supported 450 jobs in 2010; O&M activity associated with Vestas Offshore's sites supported 200 jobs in total.

Table 3.2: Total O&M Employment impact in 2010

	UK Total	Associated with Vestas Offshore
MW Capacity	**1,041**	**480**
Direct employment	290	130
Indirect employment	70	30
Induced employment	90	40
Total Employment	**450**	**200**

Source: Oxford Economics

3.3.5 Regional aspect of employment

The O&M of offshore wind farms is beneficial to the UK economy through both the number of jobs it creates and the location of these jobs. The requirement for O&M employment to be based near to wind farms and the prime locations for

exploiting wind resources combine to create direct O&M jobs away from the traditional employment hotspots, and in some of the UK's most deprived areas.

Table 3.3 presents a package of metrics indicating measures of deprivation in the areas nearest to Vestas Offshore's UK wind farms. The first two columns of data compare each of the Local Authority District to UK averages for the number of Job Seeker's Allowance (JSA) Claimants as a percentage of the total population and the number of JSA Claimants per Job Centre vacancy, using February 2010 data. The next two columns present the Income and Overall Deprivation rankings from the Office For National Statistics' Index of Deprivation 2007 for England. Finally, the average earnings for residents for 2009 in the local area is reported.

The data show that only two of the sites (Barrow and Copeland) had a lower percentage of their population claiming JSA than the UK average; one site, Great Yarmouth, recorded a percentage score 2.8 percentage points higher than the UK average. Whilst the UK, on average, has 7 JSA claimants per Job Centre vacancy, four of the five sites reported a larger number of claimants for each vacancy, with Copeland recording almost twice the national average. Together these data suggest that the areas where Vestas Offshore has located wind farms have unemployment problems greater than those found at a national level.

This conclusion is echoed when the Index of Deprivation data are considered. Taken against 350 other Local Authority Districts, only one (Barrow) of the four English districts where Vestas Offshore has located wind farms is among the 50 per cent least-income deprived districts in England. However, when overall deprivation – a function of income, employment, health, education, housing, crime, and environment deprivation – is considered Barrow is the most deprived of the four districts, and the 29th most deprived district in England; only Copeland is within the 50 per cent least-deprived districts.

Finally, when the average earnings of an offshore technician (£40,000) are compared to those found in the local authorities where wind farms site are located it is clear that the jobs created by offshore O&M activities will raise earning levels in each of the areas.

Table 3.3: Measures of regional deprivation

Local Authority District (Wind farm)	JSA Claimants as % of population	JSA Claimants per Job Centre Vacancy	Income Deprivation Rank[1]	Overall Deprivation Rank[1]	Average annual income
Barrow (Barrow)	4.0%	4.8	179	29	£ 24,908
Great Yarmouth (Scroby Sands)	7.1%	10.2	119	58	£ 20,899
Medway (Kentish Flats)	4.7%	9.8	61	150	£ 26,806
Rhyl (North Hoyle)	4.6%	8.8	n/a[2]	n/a[2]	£ 22,464
Copeland (Robin Rigg)	3.7%	13.9	78	216	£ 32,516
UK Average	4.3%	7.0			£ 25,532

Source: ONS

Note:

1 - 1=Most deprived in Local Authority District in England; out of 354

2 - Wales not included in ONS Index of Deprivation

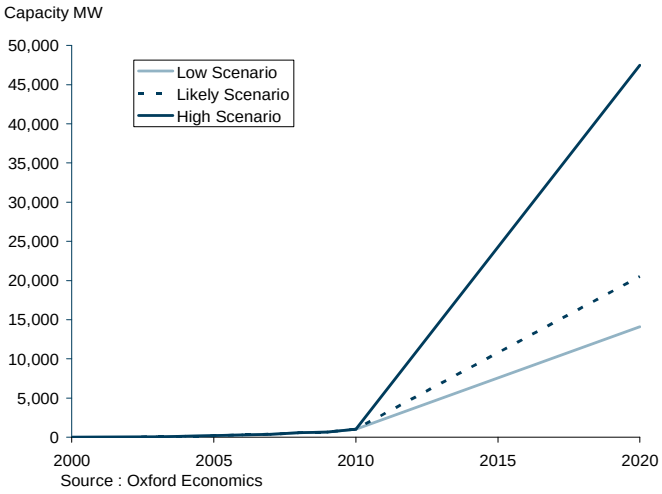
As well as creating direct O&M employment in these areas, a sizable proportion of the indirect and induced employment effect could be retained locally. The desire for local suppliers will ensure that some supply chain employment benefits will be local. And as all direct employees and most of the indirect employees will be local, their spending in the local economy will result in the induced employment effect being located in the districts nearest to wind farms.

3.4 Employment in 2020

3.4.1 Scenarios

With the completion of Rounds 1, 2 and 3, in addition to other offshore wind farm developments, by 2020 the UK could have an installed offshore capacity of 47,500MW. As Chart 2.2 shows, this represents a significant increase in the scale of offshore wind energy generation, and is reliant on delivery of over 4,500MW additional capacity per year until 2020. Given that this represents over four times the capacity installed in the seven years to 2010, this might be unobtainable within that timeframe. Consequently, this study has produced three different scenarios for the development of the UK's offshore wind capacity by 2020 (Chart 3.2).

Chart 3.2: Scenarios for 2020



- **High Scenario** – this scenario assumes that the proposed additional capacity is fully installed, leaving the UK with an offshore wind capacity of 47,500MW in 2020.

- **Low Scenario –** this scenario assumes that offshore wind development just fulfils its estimated share of the UK's Renewables target for 2020, limiting capacity in 2020 to 14,100MW[5].
- **Likely Scenario –** the final scenario represents what is believed by industry to be a likely outcome by 2020, with capacity growing to 20,500MW (RenewablesUK 2010)[6].

3.4.2 Key assumptions

As with the calculations for 2010, several additional assumptions must be made in order to determine the employment impact of offshore O&M in 2020:

- any wind farm developed outside of the UK's 12 nautical mile limit is deemed to be a long distance wind farm (see Box 3.5);
- the development of wind farms a long distance from the UK leads to a different approach to O&M employment in these sites. Instead of being land based, non-central O&M employment at these sites is based offshore and therefore operated with a 14 day shift pattern similar to oil-rigs. Consequently, all non-central employment at these wind farms is doubled;
- long distance wind farms are likely to operate with an accommodation platform similar to that at the Horns Rev 2 site in Denmark. These platforms require additional support employment (for example catering), which is estimated to be equal to 20 per cent of the number of offshore staff[7];
- to account for increasing price levels, it is assumed that costs increase in line with an annual 2 per cent increase in the Consumer Price Index, as forecast by the Oxford Economics Macroeconomic Model;
- productivity levels within the UK will grow in line with the sector forecasts from the Oxford Economics UK Industry Model[8];

[5] We have assumed for calculation purposes that this scenario none of the sites specified under the Round 3 proposals are developed; Dudgeon and Race Bank are also not developed. The methodology for selecting which zones would be developed in each scenario is based on achieving an installed capacity target, it is not a commentary on the likelihood of zone development. When a choice between two zones had to be made, the zone closest to the UK coast was selected.

[6] We have assumed for calculation purposes that this scenario all the wind farms not developed in the low scenario remain undeveloped, with the exception of the Round 3 Bristol Channel and Hornsea zones.

[7] Based on evidence from the UK hotel industry.

[8] The Oxford Economics UK Industry Model is a highly detailed economic model of the UK economy, running in parallel with the Oxford Economics Global Macroeconomic Model. Within this study, the forecast productivity increases between 2010 and 2020 for 49 different industries are used.

- the import of machinery, parts and tools falls from 100 per cent in 2010 to 30 per cent in 2020. This is as a result of the location of several manufacturing plants within the UK[9], and is presented by Bain (2008) in their central forecast; and
- jobs that were previously supported abroad by UK-based offshore O&M (such as travelling technicians and central customer relations staff) will be UK-based in 2020 as the industry grows (based on consultations with the industry).

Box 3.3: Long distance wind farms

Rounds 2 and 3 of the UK's offshore wind development include several zones which are considerably further offshore than any previously developed. The following wind farm zones are outside of the UK's 12 nautical mile limit, and are therefore considered to be long distance:

- Round 2: Dudgeon and Racebank (total potential capacity 1,180MW)
- Round 3: Dogger Bank, Firth of Forth, Hornsea, Irish Sea, Moray, and Norfolk Bank (total potential capacity 29,200MW).

3.4.3 Direct Employment

Estimates for the direct employment under the three 2020 scenarios are presented in Table 3.4.

Under the high scenario, with a UK offshore wind capacity of 47,500MW, it is estimated that O&M activities will directly support 11,720 jobs in 2020, and generate over £250 million in employment taxes. By comparison, if the UK were to only install the minimum offshore capacity to meet its 2020 Renewables target of 14,100MW, this would fall to 2,500 jobs and under £60 million in tax contributions. Under an outcome deemed by the industry to be most likely, where capacity reaches 20,500MW by 2020, 4,000 jobs are estimated to be directly supported by offshore O&M activities, contributing £90 million to the UK Exchequer.

Table 3.4: Direct O&M Employment Scenarios for 2020

	2020 Scenario		
	High	Low	Likely
MW Capacity	**47,500**	**14,100**	**20,500**
Direct employment	11,720	2,500	4,000
Employment Tax revenue	£256.2m	£57.3m	£89.9m

Source: Oxford Economics

[9] As stated in Vestas' announcement of 28 April 2009, Vestas will consider investing in new manufacturing capacity in the UK if this market develops into a strong and stable market.

Box 3.4: Results comparison

Having estimated the direct O&M employment impact of the three scenarios for UK offshore capacity development it is worthwhile highlighting the findings from other studies. Given the different size of the farms examined, the best metric for comparison is the number of O&M jobs supported by for each MW of installed capacity. For 2010 and the three scenarios estimated in this study these values are:

- 2010 – **0.28** jobs per MW;
- High scenario – **0.25** O&M jobs per MW;
- Low scenario – **0.18** O&M jobs per MW; and
- Likely scenario – **0.19** O&M jobs per MW.

The fall in the number of jobs supported per MW is due to probable operational procedures as indicated by industry stakeholders, resulting in employment not increasing at the same rate as capacity. However, the level of decline appears to be related to the size of the installed capacity in each scenario; as capacity increases, the number of O&M jobs supported per MW increases.

However, it is unclear from the other studies what is included as a direct O&M job (whether a job is direct or indirect is largely a "make or buy" decision), therefore it is also useful to compare those jobs supported indirectly by O&M. When those jobs supported in the supply chain are also considered, the jobs per MW figures for 2010 and the scenarios rise to:

- 2010 – **0.35** jobs per MW;
- High scenario – **0.33** O&M jobs per MW;
- Low scenario – **0.26** O&M jobs per MW; and
- Likely scenario – **0.28** O&M jobs per MW.

Results from other UK studies:

- **Bain & Co**. (2008, for RenewablesUK) examined the total employment impact (from design and construction, through to O&M) of three different scenarios ofonshore and offshore wind development in the UK by 2020. In the only scenario for which detailed results are available (in BWEA 2010) an offshore capacity of 20,000MW in 2020 will result in 6,734 O&M jobs. Giving an O&M employment per MW figure of **0.34**.
- **The Carbon Trust** (2008) report examined the employment impact of an offshore capacity of 29,000MW by 2020, estimating that between 7,000 and 9,000 O&M jobs would be supported directly, depending on the level of UK involvement, equating to **between 0.24 and 0.31** O&M jobs per MW.
- A 2009 study for the **National Skills Academy for Power** examines the employment impact of increasing offshore capacity to 17,000MW by

2020, and estimates that 1,994 O&M jobs would be supported as a result. Consequently, the O&M jobs per MW figure produced is **0.12**.

Results from European studies:

- The European Wind Energy Association (2009) quotes the **Global Wind Energy Council's** (2008) figure of **0.33** O&M jobs per MW of capacity.
- **Ladenburg et al**. (2005) examine the employment impact of both the Horns Rev and Nysted wind farms in Denmark. Using input-output analysis of O&M expenditure of Horns Rev, they estimate that 51 O&M jobs are supported by the farms 160MW capacity, giving a figure of **0.31** O&M jobs per MW. However, for the bigger wind farm at Nysted (165.6MW), the wind farm operator states that only 18 operations jobs will be supported – equalling **0.11** jobs per MW.

Results from USA studies:

- In 2003 **Global Insight** conducted an employment impact assessment of the Cape Wind wind farm off of Cape Cod. They estimated that the 420MW capacity would support 50 O&M jobs, or **0.12** O&M jobs per MW.
- Finally, **Flynn and Carey** (2007) estimated that a 480MW wind farm off the coast of South Carolina would support between 50 and 80 O&M jobs. This provides a range of between **0.10 and 0.17** O&M jobs per MW.

From reviewing the literature it is clear that there is a wide range of estimates of the number of O&M jobs supported by a MW of offshore capacity, against which the results from this analysis sit slightly below the average.

The probable reason for the wide range of estimates is definitional differences between studies. For example, in Ladenburg et al.'s (2005) estimation of Horns Rev's direct O&M employment they have included employment in the manufacture of spare parts, any scrappage activities, and the insurance industry, resulting in a high O&M jobs per MW figure. However the reports by Global Insight (2003) and Flynn and Carey (2007) do not include these areas as direct O&M employment, leading to considerably lower O&M jobs per MW values.

Like Global Insight, and Flynn and Carey, this study has not considered any employment associated with the manufacture of spare parts, scrapping and insurance to be indirectly related to offshore O&M.

3.4.4 UK procurement spend

The total expenditure required to support offshore O&M activities in 2020 differ with each scenario, as a result of the location of wind zones developed.

- In the high scenario, it is estimated that the annual expenditure required for offshore O&M will equal £946 million, equivalent to £19,900 per MW of capacity. Of this total 97 per cent will be UK-based expenditure;

- under the low scenario, annual expenditure to support offshore O&M is estimated to reach £200 million, or £14,200 per MW of capacity. This study estimates that 95 per cent of this expenditure will remain within the UK; and
- estimates of annual support expenditure for offshore O&M under the likely scenario equate to £337 million, or £16,400 per MW of capacity. It is estimated that 96 per cent of the goods and services purchases by this spending will be sourced from within the UK.

The pattern of UK industries receiving expenditure is similar across all of the scenarios, however the proportion of spend received by each differs with the scenarios. Table 3.5 presents the top four expenditure categories for each scenario.

The key differences between the scenarios are the higher shares held by water transport and subcontractors in the high scenario compared to the other scenarios. These differences are due to the higher expenditures on these items as a result of locating wind farms a long distance from shore. As the high scenario has considerably more long distance wind farms than the other scenarios, the share of expenditure allocated to these supplies will be higher (and consequently spending shares on other supplies will be lower).

Table 3.5: UK procurement spend in 2020, top four expenditure categories

	2020 Scenario		
	High	Low	Likely
Water Transport	52%	43%	46%
Site Facilities	19%	25%	23%
Subcontractors	15%	13%	14%
Machinery and equipment	8%	11%	10%

Source: Oxford Economics

Box 3.5: Additional capital investment impacts

Although it is beyond the boundaries of this study, it is worth noting that an increase in demand for goods and services supporting offshore O&M activities will also impact upon the capacity of the supply chain. Perhaps the clearest example of this is in the provision of water transport services.

As the number and size of wind farms increases, so does the demand for specialist boats to enable both construction and O&M activities. In order to meet this demand the providers of water transport services must purchase additional boats. These capital expenditures stimulate further economic activity in the supplying boatyards, their supply chains and in the wider economy through induced impacts. Current demand for additional boats has reach a level at which boatyard capacity has been reached and discussions with industry stakeholders indicated that they had encountered significant waiting times when enquiring about purchasing new boats. This additional boatyard activity will not cease once offshore capacity is maximized, as operational boats will require regular servicing.

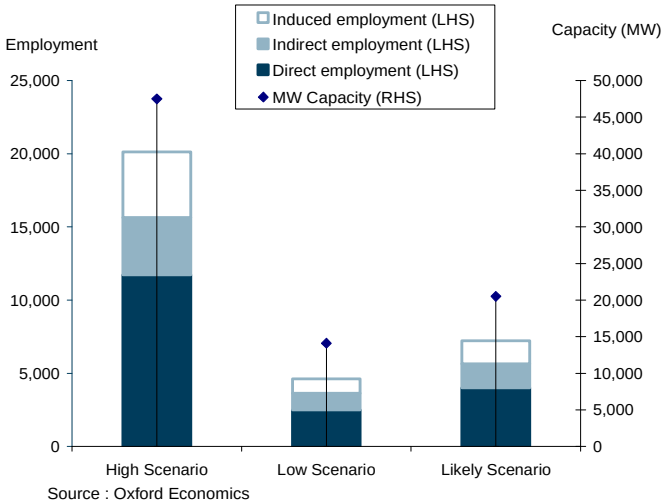
The purchase of boats is not the only form of capital expenditure that will increase as the installation of additional wind farm capacity. The Carbon Trust highlights in its 2008 report the importance of port development in order to capitalize on the benefits possible from conducting O&M activities. Port development represents significant capital investment (the Eastport harbour development at Great Yarmouth is costing £50 million), and enables benefits beyond those associated with offshore wind farms to be accrued.

3.4.5 Total Employment

In a similar manner to the calculations for 2010, it is possible to estimate the indirect and induced employment effects for each scenario, the results of which are presented in Chart 3.3.

- By conducting offshore O&M activities on an installed capacity of 47,500MW, the high scenario sees 3,910 jobs supported in the UK supply chain, and a further 4,490 jobs supported in the rest of the economy through the induced effect. Offshore O&M activities in this scenario are estimated to support 20,120 jobs in total in the UK in 2020.
- In the low scenario, with only 14,100MW of installed capacity, purchases made for O&M activities from the UK supply chain will support 1,130 jobs. The additional income received by those employed either directly or indirectly by offshore O&M are projected to support a further 980 jobs in the UK economy. In total the offshore O&M of 14,100MW of capacity in 2020 is estimated to support 4,610 jobs.

Chart 3.3: Total O&M Employment impact in 2020



Source : Oxford Economics

- The final, most likely scenario sees UK installed offshore capacity equalling 20,500MW in 2020. In this case purchases from the UK supply chain are expected to support 1,660 jobs, with a further 1,570 jobs supported in the wider economy. In total, offshore O&M activities in this scenario are estimated to support 7,230 jobs in 2020.

4 Indicative O&M employment estimates for 2050

Box 4.1: Key Points

- According to *The Offshore Valuation*, the UK's offshore renewable energy capacity could grow to 169,000MW by 2050, utilising 29 percent of the UK's practical offshore resource.
- Of this capacity, 116,500MW will be in the form of fixed wind turbines, and 33,000MW will be delivered by floating wind turbines, a new technology. The remaining capacity will be delivered by wave, tidal stream and tidal range facilities.
- We estimate that the direct operations and maintenance (O&M) jobs associated with the 149,500MW of offshore wind capacity in 2050 could number around 34,000. A further 24,000 jobs would be supported in the supply chain and throughout the rest of the economy.
- **However, given the uncertainty about such things as future changes to O&M procedures, the O&M of floating wind turbines and productivity savings from having larger turbines these results should only be considered as indicative.**

4.1 Introduction

This chapter presents some indicative employment forecasts for the operations and maintenance (O&M) of offshore wind in 2050 based on the capacity projections made in *The Offshore Valuation*. The O&M employment estimates should be seen as indicative given uncertainties in the longer term over changes in O&M procedures, the operation of new technologies and the employment impacts of larger turbines.,

4.2 The Offshore Valuation

4.2.1 Introduction

In May 2010, the Offshore Valuation Group[10] published *The Offshore Valuation: a valuation of the UK's offshore renewable energy resource*. The report shows the potential scope for further development in the UK's offshore energy capacity through fixed turbines, floating turbines, wave, tidal range and tidal stream, and its net present value. *The Offshore Valuation suggests that by 2050 the UK*

[10] An informal collaboration of government and industry organisations with the aim of valuing the UK's offshore renewable energy resource.

could be a net exporter of electricity to mainland Europe, by utilising 29 percent of the practical offshore resource and maintaining an offshore capacity of 169,000MW[11].

4.2.2 Offshore wind in 2050

Offshore wind plays a central role in achieving the level of capacity presented by the report, as fixed wind is identified as the cheapest form of offshore renewable energy and floating wind (see Box 5.2) the second cheapest. Fixed wind capacity is projected to reach 116,500MW by 2050 (100 percent of the practical resource) and floating wind capacity will be 33,000MW (9 percent of practical resource) (Chart 4.1). Together fixed and floating wind will account for 88 percent of the UK's offshore renewable energy capacity.

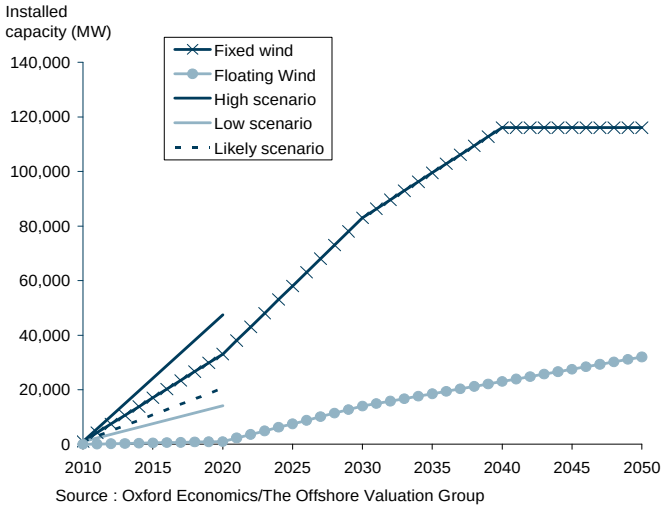
Box 4.2: Floating Wind Turbines

The Offshore Valuation places significant emphasis on the installation of floating wind turbines. Unlike fixed wind turbines, which are limited to shallow waters by their need to be secured to the seabed, floating turbines can operate in areas of much greater depth (up to 700m) through the use of three mooring cables tethered to the seabed. Consequently, the use of floating turbines opens up a much larger area for renewable exploitation than possible through the use of fixed turbines only; *The Offshore Valuation* estimates the fixed wind practical resource at 116,500MW and the floating wind resource at 350,000MW.

There are, however, uncertainties about floating wind turbines. At the time of writing (June 2010) the Hywind Pilot off the coast of Norway is the world's only operational floating turbine, and is currently in the middle of a two-year trial.

[11] *The Offshore Valuation also presents 2 additional scenarios for 2050, with offshore capacity of 78,000MW and 406,000MW.*

Chart 4.1: Offshore wind capacity to 2050[12]



Source : Oxford Economics/The Offshore Valuation Group

Chart 4.1 displays the forecasted deployment profile for fixed and floating wind to 2050, as outlined in *The Offshore Valuation.* Also included within the chart for illustrative purposes are the three capacity scenarios explored (high, low and likely) in the main body of this report.

The final level of capacity in 2050 for fixed wind will be delivered as a combination of the 47,500MW of wind farms already approved, 61,000MW of new sites, and 8,000MW of efficiency gains within the already approved sites. These efficiency gains are derived from increasing the level of MW capacity per km^2. All of the future floating wind capacity will be delivered by new sites.

4.3 Estimating offshore O&M employment in 2050

4.3.1 Key Assumptions

The approach used to estimate the offshore O&M employment in 2050 is the same as that used to generate estimates in 2020, and readers are directed to the methodology section of the main report for further information on the approach taken. However, several new assumptions must be made:

- as there are no robust data for the O&M of floating wind turbines it must be assumed that the O&M activities required for floating turbines are the same as for fixed turbines;
- as the size of turbines, and therefore power density, measured by MW per km^2, increases, the activities and employment required for O&M do not change;

[12] Growth rates up to 2050 are taken from *The Offshore Valuation.*

- it is assumed that between 2020 and 2050 there is no change in O&M procedures that impacts upon the level of employment required to conduct O&M activities; and,
- to estimate the total employment impact of O&M of offshore wind capacity in 2050, we have used the employment multipliers calculated for 2020. While these multipliers will not fully reflect the status of the O&M supply chain and the rest of the economy in 2050, they do enable the presentation of an indicative total employment estimate.

Given that offshore wind is a relatively new technology it is clear that these assumptions become less reliable the further into the future we look. The authors recognise this and therefore concluded that the estimates presented below should been seen as indicative.

4.3.2 Methodology

To estimate the total O&M employment impact of offshore wind in 2050 it is necessary to estimate the employment effects of three different tranches of the projected capacity for 2050, and a different method is used for each:

- the existing capacity proposals (47,500MW) – the employment estimates presented for 2020 are used, unchanged;
- the increased capacity of existing proposals due to efficiency gains (8,000MW) – as capacity increase is the result of efficiency gains, no additional employment is created; and,
- new fixed and floating wind farm sites (94,000MW) – using the data provided in the Annex of *The Offshore Valuation*[13], it is possible to estimate the O&M employment at each zone in the same manner as used in the main body of this report. However, a further adjustment must be made to these employment figures to reflect increases in efficiency in 2050. To make this adjustment, the power density of every proposed zone in 2050 is compared to the average power density in 2020, and any gain in power density in each zone is translated into a corresponding fall in O&M employment. Once this adjustment is made to all of the zones, the employment effect is estimated.

The total estimate of O&M employment in 2050 is the sum of the employment effects of the three tranches.

4.3.3 Results

Table 4.1 presents the estimated O&M employment in 2050 under *The Offshore Valuation's* forecast for offshore development. It must be noted that these estimates should only be seen as indicative.

[13] This information includes the distance of a zone from shore, and the projected capacity.

In addition to the direct 11,700 O&M jobs attributable to existing offshore development proposals, the development of 61,000MW capacity in new fixed wind turbine zones will lead to the creation of 14,400 O&M jobs in 2050, giving a total fixed wind O&M employment in 2050 of 26,100.

Floating wind zones are estimated to deliver 33,000MW of offshore capacity by 2050. In doing so, floating wind will support 7,800 O&M jobs.

In total, the 149,500MW of offshore wind capacity projected under *The Offshore Valuation's* forecast for offshore development could support an estimated 33,900 long-term O&M jobs in 2050.

Table 4.1: O&M employment projections for 2050

Tranche of capacity	MW Capacity	O&M employment	O&M jobs per MW
Fixed Wind			
Existing proposals 2050 capacity[1]	55,500	11,700	0.21
New zone developments	61,000	14,400	0.24
Total Fixed Wind	*116,500*	*26,100*	0.22
Floating Wind			
New zone developments	33,000	7,800	0.24
Total Offshore Wind	**149,500**	**33,900**	**0.23**

Source: Oxford Economics/The Offshore Valuation Group
1= Includes 47,500MW existing proposed capacity, plus 8,000MW capacity increase from efficiency gains

Table 4.2 presents our indicative estimates of the total employment impact of O&M in 2050. With an offshore capacity of 149,500MW in 2050, over 11,000 jobs within the supply chain would be supported. These, in addition to direct jobs, would support a further 13,000 jobs in the rest of the economy. Consequently, the total employment impact is estimated to reach 58,200 jobs.

Table 4.2: Total employment projections for 2050

	2050
MW Capacity	**149,500**
Direct employment	33,900
Indirect employment	11,300
Induced employment	13,000
Total Employment	**58,200**

Source: Oxford Economics

5 Conclusion

To meet its targets for increasing the share of electricity generated by renewable sources, the UK must substantially increase its offshore wind capacity. In line with this need, three development phases for offshore wind farm zones have been conducted and the UK's offshore capacity could potentially rise to 47,500MW by 2020; offshore capacity in 2010 is 1,040MW.

Based on employment and procurement data from Vestas Offshore (representing almost 50 per cent of the total UK capacity in 2010), it is estimated that 290 people are directly employed in the O&M of the UK's offshore wind farms in 2010, contributing over £5 million to the UK Exchequer. These jobs are highly skilled and are often located in the most economically deprived areas of the UK. When the effect of O&M activities is examined on the supply chain and the wider economy the total UK-based employment supported by offshore O&M increases to 450 in 2010.

Whilst the UK offshore capacity could increase to 47,500MW by 2020, the scale of the increase required means that the interaction of several factors, including grid, planning and finance, will determine whether this ambition will be delivered. Consequently this study adopted three potential scenarios for offshore capacity, with 47,500MW, 14,100MW, or 20,500MW of installed capacity by 2020.

- If capacity reaches the maximum currently proposed, 47,500MW, by 2020, it is estimated that direct offshore O&M employment will reach 11,720 in 2020, with employment tax revenues of over £250 million generated. The total employment effect in this scenario is 20,120 jobs supported.
- The second scenario considered assumes that capacity increases to 14,100MW, the minimum level required to meet the UK's Renewables target. Under this scenario it is estimated that 2,500 people will be employed directly in offshore O&M, contributing almost £60 million to the UK Treasury, and a further 2,110 jobs will be supported in the rest of the economy. In other words, by not installing all of the proposed capacity the UK is potentially losing out on at least 9,000 highly skilled jobs.
- The final scenario examined in this report is one considered the most likely by the industry, with capacity reaching 20,500MW. The O&M activities required for this level of offshore capacity would directly support 4,000 workers, generating £90 million in employment taxes, and support an additional 3,200 throughout the rest of the UK economy. Therefore, with extra stimulation in order to install all of the proposed capacity by 2020, the UK would gain an additional 7,500 highly skilled permanent jobs directly within offshore O&M and a further 5,000 jobs in the rest of the economy.

It should be noted that this study has only examined the employment impact of offshore O&M activities. In reality the construction of the proposed additional capacity of offshore wind farms will support significantly more jobs in the UK, both directly in construction and manufacturing, and indirectly in supply chains and the rest of the economy.

Looking further ahead, if the development of the UK's offshore resource follows the path set out in *The Offshore Valuation,* direct offshore O&M employment could reach 34,000 in 2050, with a further 24,000 jobs supported in the rest of the economy.

In conclusion, the key findings of this study are that while the employment impacts of O&M of the UK's offshore wind might currently be small, the location and skill requirements of this employment is extremely beneficial to the UK. Furthermore, over the next ten years these impacts are likely to increase by up to 40 times the current level. If, in a worst case scenario, the UK were to only install the minimum offshore wind capacity required to meet its renewable energy obligations the number of jobs supported by offshore O&M activities will increase tenfold against 2010 levels, but the potential of thousands of highly skilled jobs supported in the UK will be lost.

6 Annex

6.1 Sources

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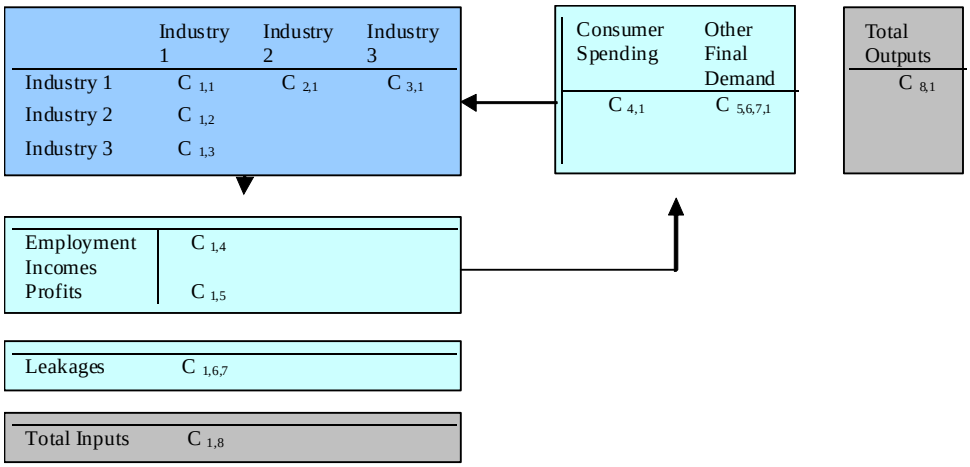
6.2 Input-Output Models

An input-output model gives a snapshot of an economy at any point in time. The model shows the major spending flows from "final demand" (i.e. consumer spending, government spending investment and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector – the supply chain in other words); how much of that spending stays within the economy; and the distribution of income between employment incomes and other income (mainly profits). In essence an input-output model is a table which shows who buys what from whom in the economy.

A simple Input-Output model



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