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The voice of wind & marine energy

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Working for a Green Britain

Employment and Skills in the UK Wind & Marine Industries

February 2011

energy&utilityskills

RenewableUK is the trade and professional body for the UK wind and marine renewables industries. Formed in 1978, and with 650 corporate members, RenewableUK is the leading renewable energy trade association in the UK. Wind has been the world's fastest growing renewable energy source for the last seven years, and this trend is expected to continue with falling costs of wind energy and the urgent international need to tackle CO_2 emissions to prevent climate change

In 2004, RenewableUK expanded its mission to champion wave and tidal energy and use the Association's experience to guide these technologies along the same path to commercialisation.

Our primary purpose is to promote the use of wind, wave and tidal power in and around the UK. We act as a central point for information for our membership and as a lobbying group to promote wind energy and marine renewables to government, industry, the media and the public. We research and find solutions to current issues and generally act as the forum for the UK wind, wave and tidal industry, and have an annual turnover in excess of four million pounds.

Energy & Utility Skills (EU Skills) is the Sector Skills Council (SSC) for the gas, power, waste management and water industries, licensed by Government and working under the guidance of the UK Commission for Employment and Skills (UKCES). Employer-led, our purpose is to ensure that our industries have the skills they need now and in the future.

The energy and utilities sector is fundamental to the success of the UK economy and is crucial to the way modern society functions. It is critical to facilitate an adequate supply of competent people to develop, maintain and enhance the sector.

A skilled workforce is vital for meeting the challenges of an increasingly competitive global economy and particularly during this tough economic climate, where skills are the key lever for successful competition.

Our commitment is to raise employer engagement, demand and investment in skills, to ensure that we have authoritative labour market information for all of our industries and to develop National Occupational Standards (NOS) to ensure that qualifications meet employer needs.

Working Together

Throughout 2010 EU Skills have been working with RenewableUK on developing a clearer understanding of the skills issues related in the wind and marine energy industries.

By combining the resources of the two organisations we have been able to explore skills from the perspectives of both the large asset owners and the wider supply chain. The open relationship has allowed both organisations to expand their understand of the industries' skills needs, with two significant outcomes: first the creation of the Wind Turbine O&M Technician qualifications and the associated Wind Turbine Apprenticeship and secondly the joint commissioning of this independent research in to employment in the wind and marine industries. We hope to develop this working relationship further during 2011 to enhance the value added to the stakeholders of both organisations.

Contents

Acknowledgement

The sponsors and research team are grateful to all 253 businesses that supplied data for this empirical analysis.

Forewords

The first part of our study on employment in the United Kingdom's wind, wave and tidal energy industries, presented here, offers the most authoritative and robust estimate of the current employment levels according to each sector RenewableUK represents, and each relevant skill profile.

Following from previous studies, most notably the one completed by Bain & Company in 2008, this report clearly identifies a substantial increase in the number of people employed in the wind, wave and tidal energy industries.

There are two remarkable facts about this increase in employment. Since 2008, quarterly GDP growth has, at best, topped 1%. At worst, we have had six consecutive quarters of negative growth, culminating in a 4.9% annual GDP contraction in 2009. And we are not out of the woods yet; as the most recent statistics for Q4 2010 show, after four quarters of growth the economy has shrunk again by 0.5%. Against this backdrop our sector has bucked the trend in a spectacular way; we have managed to nearly double the number of full-time-equivalent employees in the large-scale wind sector.

The second fact is that the increase in jobs has, to a large extent, mirrored the increase in electricity contributions from renewable sources, chiefly wind, to the grid. Latest statistics show that renewables have contributed over 27% of all electricity consumed in Scotland in the third quarter of 2010, with wind equalling all other renewable technologies put together. In the UK as a whole, the situation was similar: the total share of renewable electricity was 8.6%, divided in equal parts between wind and all other sources, compared to 2008 when the total share of electricity from wind was around 2%.

This is not the end of the story, however. Since the survey work that this study is based on was undertaken, additional wind capacity has come on stream, so that now 3.9GW of onshore and 1.3GW of offshore wind projects are generating electricity. Even more remarkably, a further 1.3GW of onshore wind is under construction and 2.8GW of offshore wind is either being built or fully contracted to do so. The growth in these technologies as well as small wind systems and marine is set not just to continue but accelerate, further driving employment. We will be reporting on modelling of future employment in the second half of this work, to be published soon.

It has long been the opinion not just of RenewableUK and our members, but of all informed parties following the growth of renewables in the UK and worldwide, that acting decisively on reducing carbon emissions and diversifying our energy supply will bring a double bonanza of increased green energy yields and economic growth. The latter is realised as the growth in the number of green collar jobs and an overall increase in business and economic benefits to the country as a whole. Certainly, recent supply chain activity in the UK, also profiled in this report, seems to offer ample supporting evidence.

Taken together, these undeniable facts make a compelling case for increasing our base of installed renewable energy devices. This report clearly demonstrates a link between sector activity and employment gains. Creating a policy framework that ensures that our wind, wave and tidal resources are fully utilised will create jobs and stimulate economic activity, at a time when we need it most.

Maria McCaffery
Chief Executive, RenewableUK

I am delighted to present this important piece of research on the skills needs of the UK's wind and marine energy industries.

EU Skills works in collaboration with employers and stakeholders and plays a lead role in co-ordinating the skills-related activities of the wind and marine energy sector through the cross-sector, cross-Government, Low Carbon Skills Steering Group and through the National Skills Academy for Power.

Evidently, the growth of the wind and marine energy sector over recent years has been considerable. This rapid growth, coupled with the highly skilled nature of the wind and marine energy workforce, means that many employers are currently suffering the effects of a lack of available skills and experience when recruiting. These shortages are most severe in managerial and engineering disciplines; with a clear need for Science, Technology, Engineering and Mathematics (STEM) skills. Exacerbating this problem will be the increasing demand from other sectors of the UK economy for these skills.

This situation is not necessarily due to a lack of training or qualifications, but rather the experience and context that underpin the skills of the individual. Upskilling and re-skilling will be critical to delivery and can be achieved relatively quickly, but the experience required to carry out these roles effectively and unsupervised will take significantly longer. Skills from redundant workers could support these skills requirements; there is therefore a need to consider transferable skills from other sectors, as well as recruiting through non-traditional entry routes.

This report confirms research carried out by the Low Carbon Skills Steering group in 2009 that many of the developing low carbon technologies are not new industries requiring new skills and that the most effective solutions will be ones that deliver the required blend of skills which already exist across a range of sectors, setting them within the context of wind and marine energy generation.

This is clearly a rapidly changing landscape that requires Government and employers, through EU Skills and the National Skills Academy for Power, to work together to ensure that we maintain an understanding of the evolving picture and develop solutions that will deliver the right people, with the right skills, at the right time. Taking such a collaborative approach is the only real solution to ensuring that the UK's wind and marine energy sector is able to meet its medium and long term skills from the domestic labour market.

Tim Balcon
Chief Executive, Energy & Utility Skills

Executive Summary & Conclusions

RenewableUK and EU Skills jointly commissioned Cambridge Econometrics (CE), the University of Warwick Institute for Employment Research (IER) and IFF Research to conduct a study of current and future employment and skills associated with the development of the UK wind and marine energy industries. This report communicates the findings of the first phase of research, focused on identifying current employment and skills in 2010 and reflecting on how employment has grown as the wind and marine energy industries have developed over recent years.

This report's findings are principally based on primary data collected from 253 companies with business activities in the wind and marine energy sector. The first part of this publication provides a snapshot of current employment and skills. The survey data was analysed and weighted to estimate employment trends for the sector across the UK. The research concludes that around 10,800 full-time-equivalent employees (FTEs) were working in the wind and marine renewable energy industry at the start of the 2010 fiscal year.

The breakdown of employment by technology reflects the maturity of the different technologies and markets studied, as well as the relative strengths of the UK industry in the global market for renewables. Of the 10,800 FTE employees the majority, 56%, are associated with large-scale onshore wind (turbine output of over 100kW), followed by 29% in offshore wind, whilst 7–8% of the overall workforce are employed in small-scale wind and around the same proportion in wave and tidal energy.

The survey also explores the current skills needs of businesses in the sector and probes into the underlying reasons for current skills shortages. The research reveals that the wind and marine energy sector is characterised by a highly skilled workforce compared with the UK economy as a whole. The sector is particularly dependent upon people working in managerial, professional and associated professional occupations that are associated with high-level skills and qualifications (typically degree level and above). The evidence also points to around one quarter of employers having experienced recruitment problems over the past 12 months, mainly in filling these high-skilled roles. This dependency upon higher-level skills is a consequence of where the industry is in terms of its maturity. Much of the business activity in the sector at the moment is in the area of product and systems design and planning and development of new sites. These activities bring with them a requirement for degree-level or higher skills.

The final section of this publication is authored by RenewableUK. Comparing the research findings of IER, IFF and CE to a study of similar scope that Bain & Company published in 2008 has enabled us to provide an analysis of large-scale wind industry development and employment trends.

The comparison of the two reports would suggest that between 2007 and 2010 some 4,400 new FTEs joined businesses to work directly in large-scale wind energy related industrial activities. Overall, employment in large-scale onshore and offshore wind has increased from 4,800 FTEs to 9,200 FTEs in three years. This overall growth masks the fact that as offshore wind has taken off, the percentage growth in offshore wind employment is considerably greater than that of onshore wind recruitment in the last three years.

The comparison of the two studies suggests that total generation capacity in the UK, annual build and installation rates, local content and planning policy are all key factors in determining how many UK FTE opportunities have been generated by the large-scale onshore and offshore wind industries. Other factors that may play a role are also discussed.

Methodology

Overview

The approach developed for this study builds on a review of previous research into employment in low-carbon energy. To analyse current employment, RenewableUK identified, as contacts for the research, 561 companies assumed to be operating, in a direct capacity, in the wind and marine energy sector. Of those surveyed, responses from 253 companies were received, representing a good response rate of 45%. Data from the survey were then used to inform a view on the current state of employment and skills in the sector.

Key Definitions

What do we mean by 'FTEs'?

This study reports on full-time equivalent employees (conventionally abbreviated to FTEs). The standard definition for FTEs is a measure of employment which attempts to correct for variations in part time employment. In practice this meant asking survey respondents the total number of people who regularly work more than 30 hours a week, plus half the total number of people who work less than 30 hours a week. Therefore, it is important to note that one FTE may translate into more than one person employed.

What types of employment does this study report on?

Our approach provides a focused analysis of the number of 'direct FTEs' associated with the wind and marine energy sector:

- Direct FTEs are those employed in renewable-specific activities. In relating this to the survey responses, this meant including all employment in companies which responded that their main activity was in the wind and marine energy sector.

This analysis does not report current 'indirect' or 'induced' employment:

- Indirect FTEs are those jobs created because of increases in output in the sectors that supply the renewable energy sector. This definition represents the jobs required to supply products and services to the wind and marine energy sector.
- Induced FTE jobs are created across the economy as a result of the increases in income (and therefore spending) which arise from the direct and indirect jobs.

Which technologies were the focus of this study?

The 'wind and marine energy sector' in this study refers to four technology groups:

1. Large onshore wind (all economic activity relating to turbines over 100kW).
2. Small-scale wind systems (all economic activity relating to turbines less than 100kW).
3. Offshore wind.
4. Marine energy (all economic activity relating to wave and tidal technologies).

What industrial activities are employees in the sector engaged in?

The renewables sector is not easily identified within the Standard Industrial Classification (SIC) system used in the UK to distinguish different kinds of economic activity. For example, the SIC system does not explicitly separate the manufacture of wind turbine components from other types of engineering manufacturing, or the generating of electricity from various fuels, be they fossil, nuclear or renewable in nature. Following on from the Bain & Company approach, we have sought to disaggregate the wind and marine energy sector into five broad categories of industrial activity:

1. Planning and Development: all economic activity related to the planning and development of wind and marine energy sites.

2. Design and Manufacture of wind and marine energy equipment (but not generic components such as ball bearings) includes companies involved in:

a. Technology R&D.
b. The assembly and retail of complete devices (complete wind, tidal and wave power generation units).
c. The manufacture of components (nacelle cover, nacelle, blade, rotor hub, tower etc).
d. The manufacture of all other electrical and civil/maritime structures affiliated with a renewable energy plant.
e. The manufacture and assembly of main units related to balance of plant (foundation, substation, cables, etc).

3. Construction and Installation which includes:

a. The construction of civil/maritime components of wind/marine farms including 'balance of plant'.
b. The installation of 'device' and electrical components of 'balance of plant'.

4. Operation and Maintenance which includes:

a. Companies that are owners and get involved with the operation of sites.
b. Companies whose services are called upon for maintenance and servicing of devices and electrical components 'balance of plant'.

5. Support Services and Other, which includes a wide range of specialist services:

a. Technical consultancy.
b. Environmental consultancy.
c. Specialist legal services.
d. Specialist financial services.
e. Specialist transport services.
f. Specialist insurance services.

Detailed Methodology

The purpose of the survey was to identify the total number of people employed in the sector, and in the component activities; and to gain an indication of the demand and supply of skills in the sector

The survey was undertaken by IFF Research between 30th September and 27th October 2010. It involved 253 telephone interviews with employers operating in the wind and marine energy sector. Respondents were requested to supply information about their businesses as at the close of the 2009 financial year. A small-scale pilot exercise was undertaken prior to fieldwork to test the questionnaire, and a number of revisions were made as a result. The sample of employers was provided by RenewableUK, and 561 companies were emailed informing them of the survey and its purpose. These companies were also asked to fill in a data sheet which contained most of the information required in the survey. This gave the companies some time to look up the information and helped ensure more accurate responses during the telephone interview itself.

The sample, made up of the 253 companies that were successfully contacted, is a subset of the population of renewable energy businesses identified. To draw conclusions about employment in the industry as a whole, the sample needs to be weighted to account for missing data and non-responses. A sample survey provides an approximation of the characteristics of a known population. The particular difficulty the study faced is that, as a nascent industry, relatively little current information is available about the population of employers in the sector. This makes correcting for any response bias, and grossing up to the population of employers, somewhat challenging.

A three-stage-approach was adopted to correct for non-response and gross up to representative population estimates:

1. Organisations which had not responded to the survey were contacted and asked to supply information about the number of people they employed.
2. Where information could not be obtained from non-respondents an assumption was made that the workforce amongst this group of organisations would have the same distribution of employment by size as respondents. This might introduce a degree of bias into the results depending upon the actual characteristics of non-respondents, but in the absence of information about the population the assumption is neutral. This exercise provided a weighting factor which could be applied to the survey data to gross up to the population estimates; this factor was 2.4.
3. The survey data were weighted to reflect the known distribution (by technology) of companies in the RenewableUK database. This is important as there is a need to correct for differential response. From the RenewableUK company database it is known how many organisations are engaged in the four types of technology that this study focuses on.

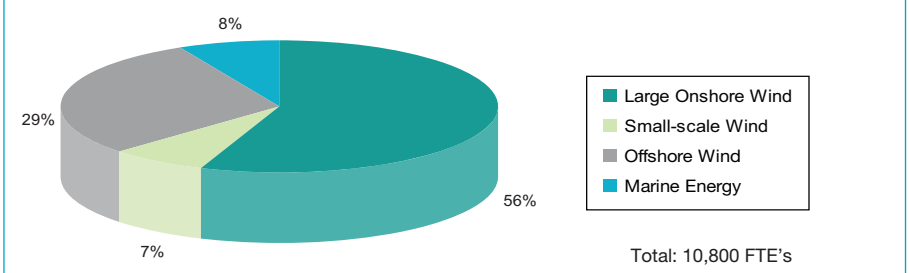
Results

Overview of Current Employment

Based on results derived from the survey, the wind and marine energy sector is estimated to directly employ around 10,800 FTEs across approximately 500 organisations that can be directly affiliated with some aspect of sector-specific industrial activities.

Of the 10,800 direct FTEs, the majority (56%) are associated with large-scale onshore wind, followed by 29% in offshore wind, whilst 7% of the overall workforce are employed in small-scale wind and around 8% are employed in wave and tidal energy.

Summary Chart: Direct Employment Across Wind & Marine Energy (2010)



Total: 10,800 FTE's

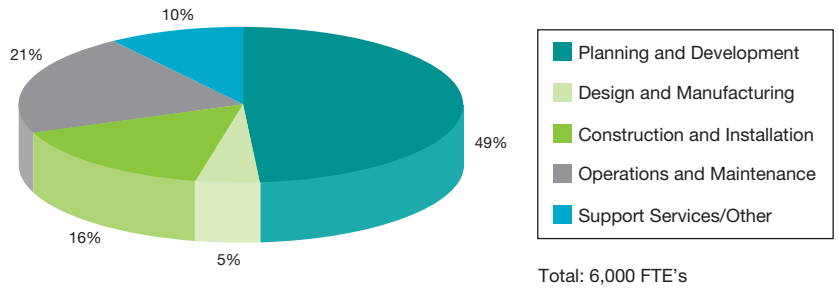
Large Onshore Wind

Since the first wind farm in the UK was built at Delabole in 1991, onshore wind energy has established itself as a mature, clean generation technology. The UK has an excellent onshore wind resource, with wind speeds particularly good in Scotland, Northern Ireland and Wales. As at the start of 2010, the UK had about 3.5GW of installed capacity from more than 247 onshore wind schemes in the UK[1], which generated 7,564GWh in 2009[2]. Turbine size has steadily increased over the years and the average new turbine has a capacity of 2.5MW. However, the large-scale onshore wind turbine market (defined as turbines of more than 100kW in capacity) is dominated by manufacturing companies operating in Germany, Denmark and Spain, where growth in these countries' domestic markets created substantial manufacturing opportunities, and in doing so created substantial economies of scale that made turbines manufactured in these countries very competitive in European export markets.

6,000 direct full-time-equivalent employees in the UK's large-scale onshore wind industry

Our survey responses suggest that employment in large-scale onshore wind currently stands at around 6,000 FTEs. Given the expected growth in capacity over the next few years it is perhaps unsurprising that nearly half of these FTEs, 2,900 are in Planning and Development (see Figure 1). A further 1,200 FTEs are employed in Operations and Maintenance, whilst almost 1,000 FTEs are employed in Construction and Installation. The market for Design and Manufacturing is dominated by imports, but nevertheless we estimate from the survey responses that there are around 300 FTEs in Design and Manufacturing in large-scale onshore wind.

Figure 1: Direct Employment in Large Onshore Wind (2010)



Total: 6,000 FTE's

1 RenewableUK, April 2010, UK Wind Energy Industry Database.
2 Department of Energy and Climate Change, July 2010, Digest of UK Energy Statistics 2010 (DUKES).

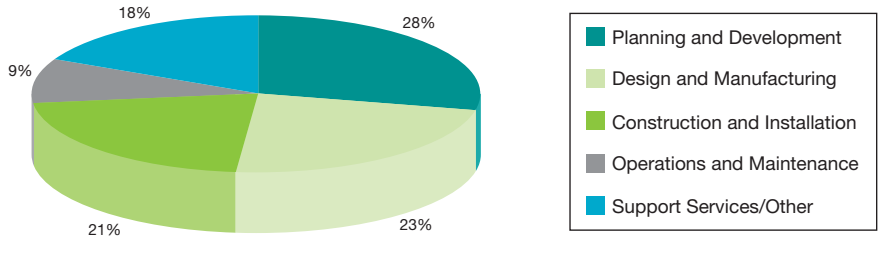
Small-scale Wind Systems

The small-scale wind systems sector is taken to cover economic activity associated with wind turbines, with a capacity in the range of 0–100kW. According to RenewableUK's latest market report[3], the UK has a globally competitive manufacturing industry for small-scale wind systems, and 7.24MW of capacity was deployed in 2008, increasing to 8.64MW in 2009. The total installed UK capacity reached 28.7MW at the end of 2009. Since 2005, almost 14,000 small wind systems have been deployed in the UK. Benefiting in part from a weaker sterling, UK manufacturers also enjoyed a 45.5% growth in export-market revenues in 2009. In 2009, more small wind systems were exported by UK manufacturers than were installed in the UK. This growth in exports has come from across the sub-20kW range of small wind systems, with significant increases in the sales of micro wind turbines (0–1.5kW). Growth in the US market in particular served to boost UK sales.

800 full-time-equivalent employees are working directly in small-scale wind systems in the UK

Of the 800 FTEs that our survey suggests are affiliated with small-scale wind, more than one quarter are employed in Planning and Development activities. Half are employed in either Design and Manufacturing or Construction and Installation. Notably there is a relatively high proportion of FTEs in Design and Manufacture because of the strength of UK exports. In contrast to large-scale onshore wind employment there are, per megawatt of capacity, far fewer jobs in Operations and Maintenance in small-scale wind (see Figure 2). This is a reflection of the nature of the technology and its deployment, in which few, if any, employees are required to be permanently on site in order to operate and maintain the systems. It is likely that a contractor-based workforce will be established, which can service multiple sites as and when circumstances require it.

Figure 2: Direct Employment in Small-scale Wind Energy (2010)



Total: 800 FTE's

3 RenewableUK, April 2010, Small Wind Systems - UK Market Report.

Offshore Wind

The UK potentially has the largest offshore wind resource in the world, with relatively shallow waters and strong winds extending far into the North Sea. The first large-scale offshore wind farm in the UK, North Hoyle, was commissioned in December 2003, and the second, Scroby Sands, one year later in December 2004, followed by the UK's then-largest offshore wind farm, the 90MW Kentish Flats in 2005.

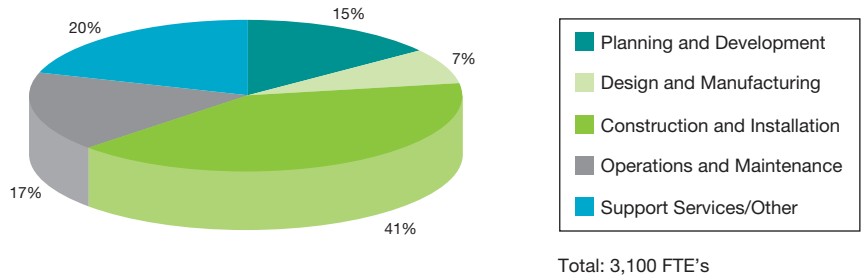
Government policy is arguably the biggest influence on the extent and speed of deployment of offshore wind technologies. Progress has certainly been made in providing developers with sites to develop, with nearly 50GW now in the system. This includes 2GW of extensions to existing Round One and Two sites, which are important in order to ensure that there is stability in project delivery between the end of Round Two and the start of the Round Three build. Such stability is important in building up the skilled and experienced workforce needed for the high volumes of build in the run up to 2020 and thereafter. The industry is now looking to government and other stakeholders to ensure fully fit-for-purpose regimes for consenting, grid connection and financial support are in place, so that these developments can be swiftly turned into completed projects.

Offshore wind is expected to make the single biggest contribution towards the UK Government's target of 15% of energy from renewable sources by 2020, and the UK offshore wind industry is now the largest in the world. As at the start of 2010 nine offshore wind farms had been built around the UK coastline, equating to 688MW[4] of installed capacity, which generated an estimated 1,740GWh in 2009[5].

3,100 full-time-equivalent employees are working directly in UK offshore wind

In terms of jobs, our survey suggests that there are some 3,100 FTEs employed in offshore wind (see Figure 3). Compared to onshore wind there are proportionally fewer employment opportunities in Planning and Development; this is likely to be a result of far fewer sites, although sites are both larger and technically more difficult to deliver than onshore sites. With this in mind, it is therefore unsurprising that a large proportion of employment is in Construction and Installation (41%). Design and Manufacturing's share of employment is small (7%), as many turbines are still imported, but with expected growth in the 5–6MW domestic turbine market, and UK leadership in offshore wind, this is potentially set to change. We estimate that there are currently around 500 FTEs employed in offshore wind Operation and Maintenance activities, representing about 17% of total employment.

Figure 3: Direct Employment in Offshore Wind Energy (2010)



Total: 3,100 FTE's

4 RenewableUK, April 2010, UK Wind Energy Industry Database.
5 Department of Energy and Climate Change, July 2010, Digest of UK Energy Statistics 2010 (DUKES).

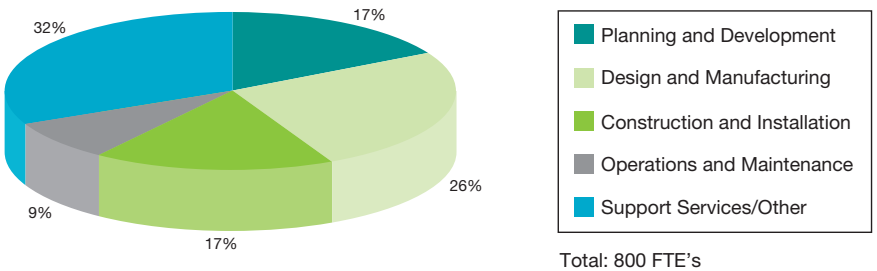
Marine Energy

The UK has an abundance of wave and tidal resources; ocean waves are created by the interaction of winds with the surface of the sea, and because of the UK's position on the north-eastern rim of the Atlantic it has some of the highest wave power levels in the world[6]. Recent years have seen exciting progress in the UK's wave and tidal energy industry with testing of full-scale prototype devices at sea and the installation of the first grid-connected deep-water energy device and tidal stream devices. There is significant activity in the R&D of innovative technologies as well as some devices maturing into the pre-commercial stage. At the end of 2009, the UK had around 2.4MW of wave and tidal energy capacity installed[7].

Over 800 full-time equivalents are employed directly in UK wave and tidal energy

The findings of the survey suggest that just over 800 full-time equivalents are employed directly in marine energy. Figure 4 shows that for this sector, the largest proportions are employed in Design and Manufacture (25%), and in Support Services and Other activities (32%), which we expect to be in R&D roles. Employment in Construction and Installation (16%), and Operations and Maintenance (9%) is relatively modest, and this reflects the nascent nature of the technology – much of this employment will be based on pilot plants rather than fully commercial operations.

Figure 4: Direct Employment in Marine Energy (2010)



Total: 800 FTE's

6 Department of Energy and Climate Change, July 2010, Digest of UK Energy Statistics 2010 (DUKES).
7 Department of Energy and Climate Change, July 2010, Digest of UK Energy Statistics 2010 (DUKES).

Company Structures, Skills and Hard to Fill Vacancies

In addition to obtaining data on employment levels, the survey also asked about the nature of businesses in the sector, the skills of their employees and companies' ability to fill vacancies.

Organisations in the wind and marine sector are generally small

Generally, organisations employ small numbers of FTEs in the renewable sector, with just less than three-quarters employing 24 or fewer people in wind and marine energy. There is not much variation by technology type, with 72% of employers operating in the onshore wind sector employing 24 or fewer employees and 68% in wave and tidal. The size structure of employers in the offshore wind sector is slightly skewed more towards larger organisations, with 60% employing 24 or fewer employees.

Overall, 38% of survey respondents said they were part of a larger company; this was particularly high in the wave and tidal sector, in which 47% of organisations said they were part of a larger parent, and lowest in small onshore wind (18%). Where companies reported that they were part of a larger organisation, 45% said that company had its headquarters in the UK, 41% in the rest of the European Union (EU) and 11% in North America.

The wind and marine energy sector has a highly skilled and qualified workforce

The results reveal that the renewables sector has a highly skilled and qualified workforce relative to the workforce in the economy as a whole. It is estimated that around 59% of the workforce is employed in managerial, professional and associated professional occupations (i.e. occupations normally requiring a degree or equivalent qualification) compared with around 40% in the economy as a whole[8]. In the wave and tidal sector, 79% of the workforce is estimated to be employed in managerial, professional and associated professional occupations, compared to 63% in the onshore sector and 47% in the offshore sector. This suggests that the offshore sector is more dependent upon people working in skilled trades (36% of the workforce compared to 23% of the overall workforce in the renewable energy sector).

The dependence of the sector upon relatively highly skilled and qualified labour can result in it being vulnerable to labour supply problems

Over the past 12 months, 26% of employers reported that they had had hard-to-fill vacancies (HtFVs). For the purposes of comparison, in 2009 just 3% of employers across all sectors in England reported having HtFVs[9]. The difficulties reported in our survey were mainly due to a shortage of applicants with the required experience (43% of companies with HtFVs), whilst 29% reported a lack of applicants with the required skills and 14% reported a lack of applicants with the required qualifications. Therefore, it is a lack of experience and skills, rather than of qualifications, which is causing recruitment difficulties for employers.

Interestingly, relatively few employers reported that HtFVs resulted from the wages being offered (2%) or as a result of competition from other sectors (4%). This suggests that the main cause of HtFVs in the wind and marine energy sector is skills shortages rather than considerations related to the relative terms and conditions of employment compared with other sectors of the economy.

There are some variations in labour supply issues by sub-sector

Hard-to-fill vacancies in large and small-scale onshore wind

Across the large- and small-scale onshore wind industries, 23% of employers reported HtFVs over the past 12 months (see Table 1). Overall, where employers had HtFVs there were, on average, 2.4 HtFVs. In onshore wind, 86% of employers with HtFVs reported that these resulted from a shortage of applicants with the skills, experience or qualifications required (i.e. skills shortages). Occupations in which recruitment problems were experienced in the onshore wind sector include project managers/developers, engineers (mainly electrical), electricians, technical sales people, ornithologists and ecologists. There were subtle differences between large- and small-scale wind energy companies' experiences regarding shortages. Where employers were engaged in large-

8 Wilson, R.A.,K. Homenidou and L. Gambin, 2008, Working Futures 2007-2017.
9 UKCES, 2010, National Employer Skills Survey for England 2009.

scale onshore wind, 25% reported that they had experienced HtFVs over the past twelve months compared with 21% of those in small-scale onshore wind. Amongst those employers who had experienced HtFVs, 89% of those engaged in large-scale onshore wind reported that these had resulted from a shortage of applicants with the qualifications, experience or skills required, compared with 82% in small-scale onshore wind.

Hard-to-fill vacancies in offshore wind

In the offshore wind sector, 26% of employers reported HtFVs with, on average, each employer with HtFVs reporting 2.9 such vacancies. Again, HtFVs were reported mainly with respect to the recruitment of managerial, professional and associated professional jobs. Skills shortages were reported as the reasons for HtFVs by 88% of employers in offshore wind. Recruitment problems occurred mainly in the following occupations: project managers (degree level), engineers (electrical, wind power), technical sales people/commercial managers, offshore EIA (environmental impact assessment), ornithologists and ecologists.

Hard-to-fill vacancies in marine energy

In the wave and tidal energy sector, 37% of employers reported that they had experienced HtFVs over the previous 12 months. On average, employers with HtFVs saw 2.9 such vacancies over this period. Typically, these vacancies related to the recruitment of people into managerial, professional and associated professional jobs. Where employers had HtFVs, 89% said they related to skills shortages (i.e. a shortage of applicants with the skills, experience or qualifications required). HtFVs in the wave and tidal energy sector were mainly in specialist skills that are not directly transferable, such as hydrodynamic modelling, aerodynamic mechanical engineering, hydrographic surveying, environmental consultancy, subsea design, ornithology and ecology.

Table 1: Recruitment Challenges and Skills Shortages in the Renewable Energy Sector

	Onshore wind	Offshore wind	Marine energy	All firms
Employers reporting HtFVs (%)	23	26	37	26
Average number of HtFVs where employers report HtFVs	2.4	2.9	2.9	2.5
Average number of HtFVs for all employers	0.5	0.7	1.1	0.6
Estimated Number of HtFVs	203	141	84	295
Employers with HtFVs reporting that they related to managerial/professional occupations (%)	53	68	71	57
Employers reporting that HtFVs due to skill shortages (%)	87	88	89	86

Recent Trends in the UK Wind Energy Industry Employment 2007–2010

An analysis of industry development and employment trends over time is desirable to help us understand what factors can influence direct employment in the UK. This section of the report has been written by RenewableUK to compare the results of the current work with previous research into employment levels in the UK wind industry.

In 2007, a total of 4,800 FTE employees worked 'directly' in the UK wind industry[10] whilst 9,200 FTEs are reported for 2010

In 2008 Bain & Company published an analysis of employment in the UK wind energy industry on behalf of RenewableUK (formerly known as BWEA). The study reported that in 2007 a total of 4,800 FTEs were employed in the UK wind energy industry. The authors suggested through logic and a review of the literature that technology deployment rates, the degree of local content and UK export shares, learning rates and labour intensity values along the wind energy project life cycle are key factors in determining UK employment. At that time, the UK wind industry had achieved 2.2GW of installed capacity, predominantly from onshore wind, and was heavily reliant on imported machinery. Whilst large parts of the wind industry value chain had already become firmly established in the UK (development, technical consulting, construction and installation), the majority of turbines were being imported from the continent. The wind energy market was going through rapid development, with growth in installed capacity averaging ~35% per annum during the five years preceding the study.

The findings of the 2008 research offer a useful reference point for an analysis of how the workforce has developed between 2007, when Bain & Company collected data, and 2010. Comparing two data points, and referencing them against RenewableUK's records[11] on industry development, allows us to comment on what factors are likely to be key determinants for UK employment with far greater certainty.

As the Bain & Company report focused solely on onshore and offshore wind, a comparison of employment in small-scale wind and marine energy is not possible. Furthermore, to make a useful comparison, some differences in the methodology used by Bain & Company and this study need to be noted (see Table 2).

Table 2: Key Differences in Methodology Between the 2007 (Bain & Company) and 2010 (IER & CE) Studies

	Bain & Company	Cambridge Econometrics and IER
Definition of 'employees'	The survey was limited to companies 'directly' involved in wind related business activities. Therefore figures are interpreted as the equivalent of 'direct employment' only.	Reported 'direct employees' as a well-defined category.
Data Collection and Analysis	The 2007 employment figures are modelled on the basis of a relatively small sample: 37 telephone interviews, 84 electronic survey responses. A different weighting methodology is used to estimate total employment.	The findings are derived from the most comprehensive primary data collection effort to date, based on 253 companies' telephone survey responses and a follow-up of 162 companies that did not respond to the survey to capture information about how many people they employed (of these 137 responded).

10 Bain & Company, 2008, Employment opportunities and challenges in the context of rapid industry growth.
11 RenewableUK, April 2007 - April 2010, UK Wind Energy Industry Database.

Overview of Key Developments

The comparison of the two studies enables us to study what factors determine how many UK FTE opportunities have been generated by the large-scale onshore and offshore wind industries (2007–2010)

Despite discrepancies in some aspects of methodology, the overall research questions are similar and thus the comparison of the two studies suggests the factors listed in Table 3 play a key role in determining UK FTE employment.

Given the short timeframe of the longitudinal analysis, some of the factors suggested by Bain & Company have remained relatively constant. Even if changes to the factors have been introduced, they have not yet yielded immediate impacts on projects between 2007 and 2010, and thus no clear conclusions can be drawn as to whether or not they are significant in determining employment potential.

Overall, employment in large-scale onshore and offshore wind has increased by 91%

The comparison of the two reports would suggest that between 2007 and 2010 some 4,370 new FTEs joined businesses to work directly in large-scale wind energy related industrial activities. This overall growth masks the fact that as offshore wind has taken off, the percentage growth in offshore wind employment is considerably greater than that of onshore wind recruitment in the last three years. The next section details our conclusions on what factors might have contributed to growth in both onshore wind related employment and the increase in the number of direct offshore wind FTEs.

Table 3: Summary of Key Factors Thought to Affect UK Employment in Wind Energy

Key Factor	Factor thought to significantly affect employment related to the following economic activities:
Total generation capacity (cumulative installed capacity)	Operation & Maintenance
Annual build and installation rate (Indicated by annual deployment capacity - MW that are announced as operational in the given year AND Annual construction activity - MW still under construction in the given year)	Construction & Installation
Local content and UK export shares	Design & Manufacture
Planning policy	Planning & Development (with knock-on effects for all other economic activities)

Onshore Wind: employment growth 2007-2010

The comparison of the reports would suggest that, by 2010, direct FTE employment in large-scale onshore wind energy has increased by 48% relative to 2007

Some 2,000 FTE employment opportunities have arisen in the wake of the onshore wind industry's development.

The relatively short timeframe studied here means that, in the case of onshore wind, certain factors such as technology development, access to finance and planning policy (relating to onshore wind projects) have not undergone significant changes. Therefore it cannot be assumed that for the three years 2007–2010 they have been 'key drivers' behind changes in onshore industry employment. Equally, this does not mean that they are not significant factors in determining employment potential.

RenewableUK suggests the following key drivers could be behind the development of the onshore wind workforce

The total generation capacity of onshore wind has nearly doubled

This is a key driver behind the rapid rate of increase in Operation and Maintenance-related FTE employment.

Over the past three years, the annual build and installation rate for onshore wind has increased overall

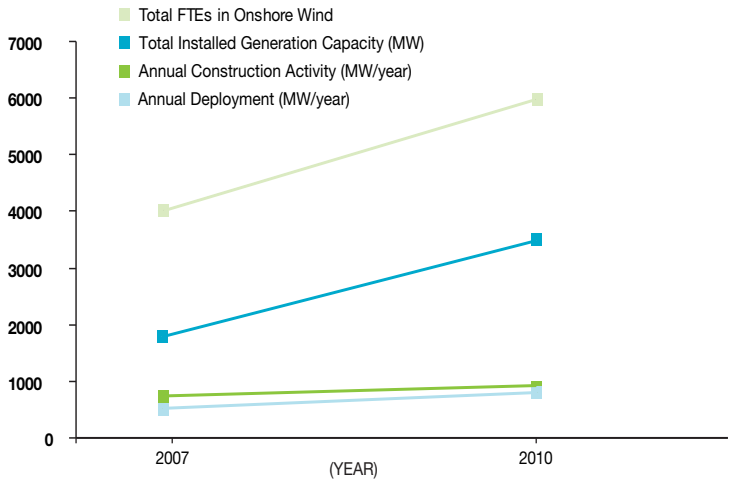
RenewableUK's records indicate that the annual rate of deployment of onshore wind has accelerated at an average of 48% per year, whilst annual construction activity increased from 740MW to 920MW per year. Construction and Installation-related FTE employment increased by almost a third in the same period.

It must be noted that build and installation rates do not follow a smooth development trajectory over time because of the project-based nature of the industry. Indeed, the annual rate of onshore wind energy deployment dipped in 2008, but then surged in 2009 when Europe's largest onshore wind farm, Whitelee, became operational. Policy factors also influence annual build and installation rates. For example, RenewableUK suggests that uncertainty over the introduction of banding to the Renewables Obligation following the 2007 Energy White Paper may have been in part the cause for the slowdown observed in that fiscal year. Notably, once the policy had been established, stable growth in deployment followed.

The UK onshore wind industry remains reliant on European imported goods

On the other hand, UK-based direct FTE employment in onshore wind technology design and development has decreased over the three-year period. The closure of the UK's largest single onshore wind technology manufacture and assembly site in 2009 was a contributor to the overall decline in onshore wind design and manufacture employment over the three-year period. Looking ahead, it would seem that design and manufacturing employment related to large bulky components (that are costly to transport from overseas) may pick up as companies see the UK market for onshore wind as being stable and sufficient in growth to warrant localising facilities. The case study overleaf illustrates an example of potential new onshore wind energy employment at a turbine tower manufacturing site that was announced in January 2010.

Figure 5: Onshore Wind - 'Cumulative Installed Offshore Wind Power'



Onshore Case Study: Mabey Bridge

Just over a year on from the announcement it was to build a £38m wind turbine tower manufacturing plant, engineering firm Mabey Bridge is poised to open the doors on the new factory near Chepstow.

"We have about 60 people employed at the new plant and recruitment is ongoing... At full capacity we could employ upwards of 200 people..."

Alex Smale, UK director at Mabey Bridge, said the company has finished most of the construction work and is well on with installing manufacturing equipment.

"We are about a month from finishing the development, which will give us capacity to make up to 200 towers, and there's potential for further development on the site to increase capacity further," he explained.

Production work has already begun at the site and the company will start delivering towers in early April as part of its framework agreement with wind turbine firm REpower.

"We have about 60 people employed at the new plant and recruitment is ongoing," said Smale. "At full capacity we could employ upwards of 200 people at the towers factory."

The company is currently in talks with a number of other wind turbine manufacturers and is confident that the successful manufacture of the first towers at the plant will allow it to demonstrate the effectiveness of its new facility to other potential clients.

However, Smale admits that the market remains highly competitive with a number of manufacturing plants in northern Europe experiencing over capacity – a scenario he argues the government could address by resolving the ongoing planning and financing challenges faced by many UK wind farm developers.

Offshore Wind: employment growth 2007-2010

The comparison of the reports would suggest that between 2007 and 2010 direct FTE employment in offshore wind energy has more than quadrupled to 3,150 FTEs

The relatively short timeframe studied here means that in the case of offshore wind certain factors such as technology development, access to finance and access to grid have not undergone significant changes. Therefore it cannot be assumed that for the three years 2007–2010 they have been 'key drivers' behind changes in offshore industry employment. Equally, this does not mean that they are not significant factors in determining employment potential.

RenewableUK suggests the following key drivers could be behind the development of the offshore wind workforce:

Total operational offshore wind capacity has more than doubled in three years

At the close of the 2007 fiscal year just five offshore wind projects were operational, with a total capacity of 304MW. Just three years later, nine projects with a total capacity of 680MW were operational. The same period has seen the number of Operation and Maintenance-related FTEs more than double.

Overall, the offshore wind industry has seen an accelerated annual build and installation rate since 2007

The annual rate of deployment of offshore wind has increased at an average of 32% per year, whilst annual construction activity has increased from 470MW to 1,470MW per year.
The most significant increase in direct offshore wind related employment was recorded in Construction and Installation. The number of FTE employees has near-quadrupled between 2007 and 2010.

Construction and Installation activities were limited for offshore wind in 2007. The Round One projects had nearly all been consented, but were moving to build only slowly, whilst Round Two sites were only just emerging from the consenting system. A total of four relatively small sites were under construction in that particular year. In comparison, in April 2010 nearly 690MW of offshore capacity had been installed and a further 1,470MW of projects were recorded to be under construction.

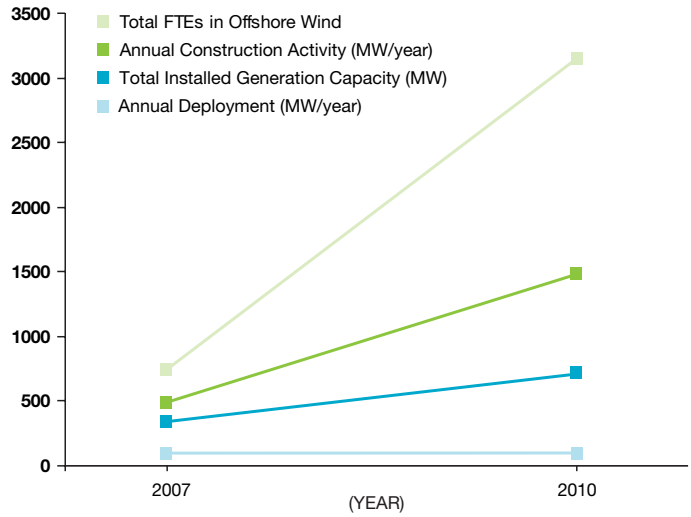
New Crown Estate leasing Rounds have massively increased new projects for Planning and Development

There has been a near fourfold increase in the number of direct FTEs involved in offshore wind Planning and Development over the three-year period of study. This is logical given the massive increase in sites awarded for development by The Crown Estate during this time. Developers are working on 2GW of extensions to Rounds One and Two projects (so-called 'Round 2.5'), a further 5.7GW of sites in Scottish Territorial Waters and 32GW in Round Three. Altogether, this is about five times the total of sites given out in Rounds One and Two, and therefore the increase in employment in Planning and Development is to be expected.

Offshore wind manufacturing employment is set for growth

Whilst the overall proportion of offshore wind design and manufacturing employees remains small, significant recent announcements from numerous investors, including turbine manufacturers Siemens, General Electric and Gamesa, show that employment in offshore wind manufacturing is set to increase rapidly in the coming years. Companies such as Burntisland Fabrications and JDR Cables have secured contracts to supply offshore wind farms, and the case study below further illustrates the potential for employment creation, with the establishment of new manufacturing facilities in 2011.

Figure 6: Offshore Wind - 'Cumulative Installed Offshore Wind Power'



Offshore Case Study: Tees Alliance Group

Engineering firm TAG Energy Solutions evolution from a provider of North Sea oil and gas platforms to a developer of foundation technologies for offshore wind turbines has continued apace over the last twelve months.

"The company's focus is now on securing its first contract, with talks underway with a number of offshore wind farm developers."

The company is expected to open a new manufacturing plant at its Teesside headquarters by the summer.

Stuart Dawson, Construction Director at the firm, said the company has already started recruiting for the new plant, which is scheduled to be commissioned in May and will ultimately employ up to 120 people when operating at full capacity as well as a further 200 to 300 working on related outside assembly work.

The project was financed with a £1.5m grant from DECC, a further £1.5m from the One North East Regional Development Agency and undisclosed sum raised through a private financing round.

Dawson said the company's focus is now on securing its first contract, with talks underway with a number of offshore wind farm developers. "We are fairly bullish about our prospects, but we won't be celebrating until we have the first contract," he said. "The interest is there and we are targeting a number of Round 2 and 2.5 projects, while also talking to potential clients on round 3. We would like to have first contract announced before completion of facility."

However, he admitted that despite TAG ES investment in building a UK supply chain for the industry, the sector remained highly competitive.

"The fear is still there that the UK could miss out," he said. "We are competing with companies from Europe and Asia and pricing is very aggressive. When Round 3 starts there will be enough work for everyone, but at the moment that is still several years away and we will need to be highly competitive to win business."

Looking Ahead

How might employment and skills issues change as the sector goes forward?

Whilst this report focuses on present-day employment and skills, it is to be followed up shortly by a second report aimed at modelling future employment prospects for the wind and marine energy sector to 2020. The follow-up report will present a bespoke Input–Output model designed and developed by Cambridge Econometrics and The Institute for Employment Research to analyse potential wind and marine energy employment as the industry evolves over time. This model incorporates the key findings of the research on present-day observations.

About the authors

Cambridge Econometrics (CE) specialises in the application of economic modelling and data analysis techniques to the needs of clients in business and government. It is a leading independent economic consultancy, with a full portfolio of economic intelligence services. CE was established in 1978 to provide commercial access to research in the University of Cambridge, in particular to the work carried out in developing the Cambridge Multisectoral Dynamic Model of the British economy (MDM).

Since its founding, CE has provided one of the most detailed industrial forecasting services available for the UK economy. The work of the company has now expanded to cover regional and local forecasts for the UK, forecasts for Europe, and energy-economy-environment analysis and forecasts for the UK and Europe, as well as modelling work for individual clients. Our clients represent a wide variety of businesses, and central and regional government bodies and our expertise has been employed over a wide range of economic modelling issues.

Over the past years a significant proportion of the company's work has been in the area of European economic modelling. This has come about through the development of the E3ME model, a sectoral-based econometric input-output model for Europe, with economy-energy-environment (E3) interactions, which has been used in a wide array of projects for Commission Services.

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