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Strategic Skills Needs in the Low Carbon Energy Generation Sector

A report for the National Strategic Skills Audit for England 2010

Executive Summary 16
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Analysis › Understanding › Insight › Expert advice

Introduction

The aim of this study is to provide an assessment of the skills needs in the low carbon energy generation sector to 2020 in support of the National Strategic Skills Audit for England 2010, undertaken by the UK Commission for Employment and Skills. For the purpose of this exercise the sector comprises wind, marine, microgeneration, carbon capture and storage, and nuclear sub sectors. This report presents the findings of the assessment which, while discussed in further detail below, are that:

- The sector is currently relatively small scale in terms of direct jobs, but has a great deal of potential for growth;

- Current and projected shortages of skills in the sector, particularly in relation to STEM subjects (Science, Technology, Engineering and Mathematics), means that the low carbon sector will need to compete for STEM graduates with industry as a whole;

- Wind and nuclear will be the most important sectors in driving growth between now and 2020, but barriers such as access to financing and planning are significant;

- Marine and carbon capture and storage are unlikely to contribute materially to employment in the period to 2020, but are more likely to come to fruition post-2020;

- The extent to which new jobs will necessarily be generated throughout the value chain in the medium-term varies by sub sector. In the wind and nuclear sectors, it is likely that there will be relatively large numbers of jobs created in construction and installation, given the ambitious plans for installing new capacity to 2020. However, there is less likelihood of significant numbers of manufacturing jobs;

- There is considerable potential to exploit skills transfer from other industries such as the upstream oil and gas industry to low carbon energy generation, which will also help to minimise the potential impact of a decline in employment within carbon intensive energy generation or nuclear power;

- There is no clear evidence that technical jobs in the sector will change markedly over the next decade – rather, differences are likely to emerge by degree;

- There is a lack of official national statistics on the low carbon sector and the on-going debate over what constitutes a 'green job'; and

- Government will play a critical role in how it seeks to stimulate demand with incentives, but also in how it can remove barriers that could otherwise hinder growth.

The impetus for the Audit came from the policy document, New Industry, New Jobs, published by the then Department for Business, Enterprise and Regulatory Reform in April 2009. New Industries, New Jobs identified low carbon as one of six priority sectors for development. This document was followed in July 2009 by the Low Carbon Transition Strategy which noted that the global market for low carbon and environmental goods and services (LCEGS) was already worth £3 trillion in 2007/08 and that the UK is in a strong position to develop its base in this sector. The latter strategy also sets out the main planks of a more activist approach to developing skills in low carbon as a whole. Given the potential importance of this sector to the economy, this report provides a timely response to the current debate into the UK's strategic skills needs.

Our study is part of a wider exercise designed to contribute towards the UK Commission's overall response to strategic skills, the National Strategic Skills Audit for England 2010. This Audit, which is supporting current Government-led developments around industrial and skills activism, is comprised of a number of strands, including:

- **A national assessment:** to provide a strategic national overview and assessment of immediate and emerging priority skills needs in both existing and emerging industries. This will also include a regional assessment, providing a consistent and comparable skills assessment across the UK;

- **Priority sectors assessments:** to provide an assessment of the skills needs of key, selected priority sectors; and

- **Horizon scanning:** to provide an assessment of what the future may hold by scanning the horizon, exploring important emerging issues and developments and bridging policy-making in the short and long term.

Scope of research

The low carbon energy generation sector encapsulates an increasing number of different technologies. This research has focused on five sub sectors:

- Wind;

- Marine and tidal;

- Carbon capture and storage;

- Nuclear; and

- Microgeneration.

The research has taken into consideration, where possible, the value chain or supply chain of activities that are relevant to each area. This typically involves research and development; manufacturing; installation and construction; and operation and maintenance.

Where activities have implications for indirect employment further down the chain – for example component manufacture for wind turbines – we have, given the scope of this research, drawn out qualitative implications rather than given quantitative estimates.

The research has also taken into consideration relevant international trends and opportunities, and the implications for different regions within the UK, where appropriate.

Objectives of this study

The objectives of this study into low carbon energy generation can be summarised as follows:

- develop an overview of the economic, social and technical drivers of change for the chosen sectors and a discussion of why the sector is so important to the economy;

- develop an in-depth analysis of global and national trends in skills and employment within a selected sector; including skills insight and foresight and labour market impact. This needs to give consideration to the priority skills within the sector; and

- consider future challenges and trends for the sector, outline possible alternative sector scenarios and implications and consider how they impact on the labour market and skills.

Our approach

Our study is based on in-depth research, analysis and scenario development to help UK Commission understand the future skills needs of the low carbon energy generation sector. It provides both a qualitative and quantitative view of these requirements, and how they may evolve in the long-term. In conducting our analysis, we have drawn on the existing literature and national data on skills in the energy sector and consulted widely with the relevant Sector Skills Councils (SSCs), trade associations, employers and PwC's renewables and energy teams.

Key findings on current employment and skills

The low carbon sector accounts for less than a fifth of the UK's energy generation. Most of this is derived from nuclear power generation with renewables representing only 6% of the overall total. In contrast, and despite the many natural advantages enjoyed by the UK (particularly in relation to wind and marine), almost a third of European countries surveyed by Eurostat generated more than 20% of their energy from renewables.

At present, on-shore wind is the most established renewable technology in the UK. Large power companies have, however, diversified their energy portfolio, and now also invest in marine and biomass. The overall value of the low carbon energy generation market in the UK (excluding nuclear) has been estimated as £31.5bn by

Innovas (2009) of a global total of £3 trillion, though these figures include indirect sales.

Energy from renewable sources is now high on the Government's agenda as it strives to cut CO2 emissions in line with its 2020 targets. This has resulted in the publication of the Government's *UK Renewable Energy Strategy* in 2009 which has the ambition of generating 30% of electricity from low carbon sources by 2020.

The low carbon energy generation sector is a relatively small sector in terms of direct employment. We estimate that approximately 30,000 are directly employed by the sector, of which 24,000 work in nuclear energy. The remaining 6,000 work in renewables sectors, primarily wind.

In general, the energy workforce is highly skilled, with almost 40% of staff educated to NQF Level 4 or 5, compared to the UK average of around a third. However, the level of qualification varies considerably across occupations and a substantial majority of energy employers report skills shortages in relation to technical, practical or job-specific skills.

Our analysis of the low carbon value chain suggests that while the UK is relatively strong in research and development and has some capability for installation and operation and maintenance, there is a relative weakness in manufacturing. Manufacturing capability was also a major concern among the industry stakeholders that we spoke to as part of this research.

Our research has confirmed that at present, there are persistent skills shortages across the sector. There are shortages in most engineering disciplines, both for highly qualified engineers and experienced technicians. There is also unmet demand for project managers with qualifications in engineering and more specialised areas such as geology, marine engineering and aeronautical engineering (Table 1). There are also more generic skills needs in the sector including project management, leadership and management skills and business development/commercialisation skills.

Concerns around the number of school-age students opting for STEM subjects at GCSE and A-level, coupled with a reported shortage of teachers in STEM subjects in the UK (OECD, 2005), are likely to exacerbate the supply of STEM students unless steps are taken to make not only these subjects, but also related careers more attractive.

Evidence from a number of sources suggests that the profile of the low carbon energy workforce is not markedly different from the wider energy sector workforce in terms of age and gender – perhaps unsurprising in nuclear, but arguably more surprising with the renewable technologies. Several stakeholders suggested that the industry suffers to some extent from an image problem. This view was contradicted by others, however, who believe that the sector already has an attractive reputation amongst graduates. On balance, we have no doubt that efforts should be made to present the sector as

more attractive and exciting for both graduate and non-graduate careers.

There are no national statistics on employment in the low carbon energy generation sector. In part, this is due to the relative newness of the sector, but it also reflects its fragmented nature. Indeed, in the course of this study, there has been extensive debate around what exactly constitutes a 'green job'. We have, however, used a number of secondary sources to triangulate the number of jobs in our selected low-carbon sectors, with an informed estimate of a 30,000 working across the low-carbon energy generation sector. While this figure has been validated with industry representatives, there is a clear need to work towards a clearer definition of the sector and its workforce, as well as future data needs, if the Government is to focus on low carbon as a priority sector.

Future outlook for employment and skills

In our view there will be five primary drivers of growth for the low carbon – particularly renewables – energy generation sector;

- Governance;
- Technology;
- Economic factors;
- Consumer demand; and
- Environmental change.

We consider the first two of these to be the most important. Governance encompasses Government legislation, regulation and the incentives that are being used to shape the market place and encourage private sector investment and participation. The Government's legal obligation to reduce greenhouse gas emissions by 34 per cent by 2020 (compared to 1990 levels), it's Renewable Energy Strategy and the "New Industry, New Jobs" strategy plan provide the impetus for the substitution of fossil fuels as the main source of energy generation and for the overall growth of the market.

Technology, and the level of technological innovation, is also a key driver for renewables (nuclear can be considered a well-proven technology). Different renewable technologies are at different stages of development; wind is relatively proven, notwithstanding the need for larger scale wind farms further off-shore in deeper waters; but marine and tidal, and carbon capture and storage are at a much earlier stage of development. Microgeneration is somewhat mixed. The rate at which these technologies can be deployed will be a major determinant of future employment across these sectors.

However, there are barriers to growth in the sector, including:

- Access to finance;
- Planning consent;

- The current infrastructure; and

- Supply chain weaknesses.

Access to finance has been exacerbated by the credit crunch. There are also some issues with the existing system of Renewables Obligation Certificates (ROCs) that mitigate against successful raising of finance. While it is hoped that the new Infrastructure Planning Commission will alleviate some of the planning approval issues, serious concerns remain. Another issue relates to the current system of grid connection in the UK, which is currently based on a 'first come, first served basis'. In some cases, it can take several years to be connected to the grid.

We consider the growth of the sector to 2020 under three different possible scenarios in the following sections. From our scenarios we have concluded that while there is a general consensus that the sector and employment in the sector will grow, the barriers to growth are potentially significant. We have identified the main opportunities for growth in the UK.

- Wind and nuclear are expected to account for a significant proportion of the capacity installed or under construction in the UK in 2020, and are likely to have the most significant impact on employment and skills requirements in 2020.

- Marine and carbon capture and storage are two emerging areas in which the UK appears to have a strong position – with the potential

to become a global market leader. These technologies are at a much earlier stage of development than wind. While the scope of this study is to 2020, these technologies are unlikely to reach maturity before this date. It is clear, however, that if growth in these sub-sectors is to be achieved, consideration should be given now to developing the necessary pipeline in terms of employment and skills required.

- Small scale microgeneration is an important growth area in the Renewable Energy Strategy and deployment is expected to increase.

Under our scenarios, it is also likely that there will be markedly different levels of employment in different parts of the value chain.

- Growth in the wind sector will generate significant employment in construction and installation and in operation and maintenance of wind farms, but will also drive indirect employment for example in the high-voltage engineering required to connect new installations to the National Grid.

- Manufacturing jobs will be created in the period to 2020, particularly if the Government is able to encourage further investment from wind turbine manufacturers.

- The building of nuclear power stations will generate significant indirect employment in the construction industry. However,

depending on the rate of new build versus decommissioning, direct employment in nuclear operations and maintenance jobs may decline to 2020.

While the workforce will need to be fed from STEM graduates, there is an experienced pool of workers in the UK off-shore oil and gas industry that have transferable skills that are applicable for example in the development and installation of off-shore wind farms, in marine installations, or in the storage of CO2 in off-shore North Sea oil and gas reservoirs. Therefore to some extent the growth in employment within low carbon energy generation could help to counteract a decline in more carbon intensive energy generation. Projections for the demand and supply of STEM graduates over the next decade demonstrate a significant shortfall in the numbers of engineers and scientists required to drive growth. In this context, the low carbon sector will need to compete for STEM graduates from industry as a whole.

There is also no clear evidence that technical jobs in the sector will change markedly over the next decade, with differences emerging a matter of degree, particularly in microgeneration. This will exacerbate the existing skills gaps and shortages outlined in Table 1. There is some likelihood, however, that a range of supporting roles may emerge: for instance, sales and marketing roles focused on communicating the benefits of low carbon to consumers and the general public.

It is also not clear whether many new jobs will emerge in the manufacturing sector, at least in the short-term. The closure of the Vestas turbine production plant in April 2009 represented a step back for low carbon manufacturing in the UK, but the outlook is brighter following Clipper's decision to establish a turbine blade manufacturing plant in the UK and the company has plans for another facility assembling gearboxes and nacelles. Furthermore, Siemens is now considering establishing a UK operation to take advantage of growth in the offshore market. The marine and carbon capture and storage sectors are at a much earlier stage of development and may represent better long-term opportunities for UK manufacturing.

Current vocational qualifications and training provision will have to adapt to the needs of low carbon employers and adult workers, particularly in light of the fact that a significant proportion of the current workforce will still be in place in 2020.

It should be noted, however, that while indirect employment is beyond the scope of this study, any growth in low carbon energy generation is also likely to lead to increased demand for associated technical consulting and financial services skills both in the UK and beyond. This demand will provide opportunities for indirect employment growth and will also impact on future skills provision.

Overall, there is still a level of uncertainty in the market for low carbon energy generation and much will depend on the effectiveness of the Government's measures to support the industry and to overcome the barriers to growth. These include: strengthening the links between businesses and further and higher education; investing in re-skilling the existing workforce; making the sector a more attractive place to work; facilitating skills transfer from other sectors and strengthening the value chain, particularly in regard to manufacturing.

Three possible scenarios for the low carbon energy sector

Our three scenarios are based on analysis of the findings from desk research and interviews with industry stakeholders and, in particular, the discussion of the drivers for change and the barriers to growth. It should be noted, however, that these scenarios present possible, rather than likely, high-level scenarios, and are dependent on a range of factors, including the state of the economy and energy and carbon markets. The actual outcome may well be more nuanced, with some sub-sectors moving ahead more rapidly, others facing delays.

It is clear that governance (by which we mean both Government support and regulation) will be one of the key forces in the development of the industry to 2020. Coupled with this will be the impact of innovation in the sector (a broad term, encompassing not only technological

developments, but also private sector responsiveness to the opportunities on offer and the emergence of new ways of working to exploit the UK's strengths in research and development).

Using these two key drivers, we have developed our scenarios based on a future which holds 1) Low Governance, Low Innovation; 2) High Governance, Low Innovation; and finally 3) High Government Support, High Innovation. The context for the scenarios could be considered as follows;

- for Scenario 1, financial and other constraints delay the scaling up of renewables, the development of new nuclear plants and demonstration and deployment of CCS. Renewable energy targets are missed and load growth is met through expansion of fossil fuel generation.

- for Scenario 3 – the other end of the spectrum – constraints and barriers fall away as the economy strengthens and the confidence to invest in long-term projects returns, the Government continues to put in place attractive incentives for consumers to invest in microgeneration and nuclear new builds proceed on schedule with no slippage.

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Executive Summaries present the key findings of the research and policy analysis generated by the Research and Policy Directorate of the UK Commission for Employment and Skills. More detailed analytical results are presented in Evidence Reports and all are accessible on the UK Commission's website **www.ukces.org.uk**.

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