



UK COMMISSION FOR
EMPLOYMENT AND SKILLS

Sector insights: skills and performance challenges in the energy sector

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Sector Insights: Skills and performance challenges in the energy sector

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Foreword

About the UK Commission for Employment and Skills

The UK Commission for Employment and Skills (UKCES) is a publicly funded, industry-led organisation providing leadership on skills and employment issues across the UK. Together, our Commissioners comprise a social partnership of senior leaders of large and small employers from across industry, trade unions, the third sector, further and higher education and across all four UK nations.

Our Vision is to create, with industry, the best opportunities for the talents and skills of people to drive competitiveness, enterprise and growth in a global economy.

Over the next three years our ambition is to see industry in the UK create “ladders of opportunity” for everyone to get in and on in work. This means employers improving entry routes into the labour market for young people, ensuring the existing workforce has the skills businesses need to compete and individuals need to progress, and deploying those skills in a way that drives productivity and growth.

This is a collective agenda for employers working in partnership with government, trade unions, education providers, industry bodies and local organisations.

Our Research

Our research mobilises impartial and robust national and international business and labour market research to inform choice, practice and policy. Our aim is to lead the debate with industry to drive better outcomes for skills, jobs and growth. In order to achieve this, we produce and promote robust business intelligence and insights to ensure that skills development supports choice, competitiveness and growth for local and industrial strategies.

Our programme of research includes:

- updating robust **labour market intelligence**
- developing an understanding of what works in policy and practice through **evaluative research**
- providing research **insight** by undertaking targeted thematic reviews which pool and synthesise a range of existing intelligence.

Our research programme is underpinned by a number of core principles, including:

- relevance to our most pressing strategic priorities
- salience and effectively translating and sharing key insights
- international benchmarking and drawing insights from good practice abroad
- high quality analysis which is leading edge, robust and action orientated
- responsiveness to immediate needs as well as taking a longer term perspective.

We work in strategic partnership with national and international bodies to ensure a co-ordinated approach to research, and combine robust business intelligence with Commissioner leadership and insight.

The overall aim of this project is to examine the skills and performance challenges in the energy sector in the UK, with a specific emphasis on a selected number of key occupations. In addition, the research assesses employer engagement with and use of national occupational standards.

This project forms part of a wider suite of sector labour market intelligence (LMI) research undertaken by the UK Commission. The overall aim of the programme is to examine skills and performance challenges across a range of industry sectors of critical importance for the UK economy.

Sharing the findings of our research and engaging with our audience is important to further develop the evidence on which we base our work. Evidence Reports are our chief means of reporting our detailed analytical work. All of our outputs can be accessed at www.gov.uk/government/organisations/uk-commission-for-employment-and-skills

We hope you find this report useful and informative. If you would like to provide any feedback or comments, or have any queries please e-mail info@ukces.org.uk, quoting the report title or series number. We also welcome feedback on Twitter (@UKCES).

Lesley Giles

Deputy Director

UK Commission for Employment and Skills

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Executive Summary

Overview of the research

This project forms part of the Sector Insights research undertaken by the UK Commission for Employment and Skills (UKCES). The overall aim of the programme is to examine skills and performance challenges across a range of industry sectors of critical importance for the UK economy.

This report presents conclusions about the **energy** sector, focusing upon a selected number of key occupations in order to yield in-depth insights:

- engineer;
- technician;
- project/change manager;
- sales and marketing manager;
- overhead lines worker.

Key findings

In 2013, the energy sector contributed 3.3 per cent of the UK's GDP, directly contributing £25 billion to the UK economy, with a further £71 billion in indirect contributions. In 2013, 6.2 per cent of the industrial workforce was employed in the sector, equating to 169,000 people. Despite a recent decline in productivity, it remains one of the most productive sectors in terms of GVA per employee.

The UK energy sector is evolving rapidly. Key drivers of change such as policy, the emergence of new technologies and the transition to a low carbon economy are prompting radical changes in energy consumption, management and storage.

The outlook for the energy industry as a whole is mixed, with sub-sectors facing different challenges. For example, the electricity sector is forecast to grow (underpinned by substantial investment into smart metering), as is the renewables sector (particularly offshore wind). Conversely, falling oil prices have been a catalyst for recent job losses in the oil and gas sector.

This research, based on 91 interviews with key informants and employers, reveals skills shortages across a range of key occupations. Interviewees report a limited supply of skilled and experienced workers, caused by:

- strong competition for skills between sub-sectors, other sectors and countries;

- uptake of the most sector-relevant STEM qualifications not meeting employer demand;
- poor visibility of (and consequently interest in) the energy sector as a career prospect among young people and potential new entrants from other industries;
- an ageing workforce.

The skills mix required by sector employers is expected to evolve in the future, to include soft skills, technical skills such as data analytics, as well as knowledge of new technologies as they emerge.

Occupational standards and qualifications need to keep up with rapid sector developments, to ensure the workforce has the necessary skills. The sector has a strong culture of in-house training, partly because of a shortage of relevant courses delivering sector-specific skills and knowledge that employers need. However, an increasingly mobile workforce, often working on short-term contracts, has meant that some employers are reluctant to invest sufficiently in formal training and up-skilling of some members of the workforce.

Employers typically use occupational standards as a framework for establishing and assessing competency within their workforce. However, existing standards are sometimes seen as too generic. Employers are more likely to be interested in higher-level occupational standards that are easy to access and use, although some would like more sub-sector specific context.

Addressing workforce skills and challenges is important for the productivity and profitability of the UK's energy businesses, energy security and ability to compete in a global marketplace. Whilst there are good examples of innovative solutions being adopted by individual employers, there is a need for the sector to work in collaboration to address the problems. The Energy and Efficiency Industrial Partnership (EEIP) is a useful model for supporting such collaboration.

Suggested actions

There are a number of actions which could be taken to improve the responsiveness of skills supply across the energy sector. These include:

Policy and funding

- Make funding available for schemes to train people in key occupations with major skills shortages
- Support and fund a collaborative approach enabling employers to work collectively in addressing sector challenges using the EEIP to facilitate change

Standards and qualifications

- Enable higher-level occupational standards to be quickly developed that reflect sub-sector needs and plug existing gaps in coverage
- Encourage collaboration between academia and industry so that qualifications are tailored closely to meet employer needs and reflect context of different sub-sectors.

Recruitment and development

- Cascade skills and knowledge from member of the workforce on the verge of retirement via internal mentoring
- Enable cross-fertilisation between sub-sectors to channel flow of skills rather than losing people from the energy sector to other industries as a result of peaks and troughs in workforce demand
- Improve careers information, particularly to enhance sector visibility for young people and potential new entrants from other industries.

1 Introduction

1.1 Background to the report

The UK Commission for Employment and Skills (UKCES) is a publicly funded, industry-led organisation providing leadership on skills and employment issues across the UK. Together, its Commissioners comprise a social partnership of senior leaders of large and small employers from across industry, trade unions, the third sector, further and higher education and across all four UK nations. Its vision is to create, with industry, the best opportunities for the talents and skills of people to drive competitiveness, enterprise and growth in a global economy.

Innovative and insightful research is central to UKCES's role as a prime source of knowledge on how skills drive enterprise, create more and better jobs and deliver economic growth. Its programme of sector research includes a series of Sector Skills Insights reports, (published in 2012), which focus on skills needs in specific sectors; and a rolling programme of sector-specific studies. The first round of these covered the role of technology in driving high level skills in the digital, off-site construction, aerospace and automotive industries. The second addressed skills and performance challenges in the logistics and wholesale and retail sectors. The third round examines sector skills and performance challenges, with an emphasis on the mix of skills needed in specific occupations, as well as employer awareness of and engagement with National Occupational Standards (NOS).

This report focuses on the energy sector. It:

- synthesises evidence on the sector's labour market to identify the outlook for jobs and skills;
- identifies major trends affecting the sector and how the mix of skills needs is likely to change over the next decade in response to these;
- investigates employers' perceptions of the skills needs of specific occupations, and the challenges employers have in meeting those needs;
- discusses current awareness of, engagement with and interest in National Occupational Standards (NOS) in developing the sector's workforce;
- draws out the implications for skills supply and workforce development.

In order to identify common skills issues across sectors, the projects in this third round of the sector insights programme share a common methodology where appropriate. This includes: a review of existing literature and data from the UK Commission's Employer Skills Survey, Employer Perspectives Survey, and Working Futures labour market projections; and consultations with sector bodies and sector employers. The focus on five key occupations represents a change from past UKCES sector studies, and reflects UKCES's interest in assessing market demand for National Occupational Standards, as well as an opportunity to build on previous sector research and delve deeper into the operation of specific sector labour markets.

1.2 Research methodology

This research has used a mixed-method approach combining collection and analysis of primary and secondary data. A comprehensive literature and data review initially synthesised available evidence about the sector outlook, trends affecting jobs and skills, and key drivers of change.

Primary research subsequently explored some of the emerging findings from the desk-based work, and provided validation of the selection of key occupations in scope, via 21 depth telephone interviews with key informants across the sector.

These key informants included representatives from highly informed industry stakeholder bodies, and spanned all four UK nations and all relevant sub-sectors. Informants included representatives from:

- professional bodies;
- trade federations;
- Sector Skills Councils (SSCs);
- National Skills Academies (NSAs);
- universities.

Findings from this first phase were combined with primary data collected through the second phase of the research, which spanned 70 depth telephone interviews with employers, again covering the range of sub-sectors (18 in Electricity; 17 in Nuclear; 18 in Oil and gas; and 17 in Renewables) and all four UK nations. A mix of HR, training, and operational representatives were consulted in order to yield detailed insights about skills needs, how these might evolve, other workforce issues and potential solutions, and their views in relation to occupational standards.

Additional deeper insights were provided through the development of case studies, in addition to a further four telephone interviews with key informants (one per sub-sector). These were used to test and refine the final analysis and key conclusions.

1.3 Report structure

Chapter Two provides information about the energy sector, the sub-sectors¹ covered by this research, and how policy and other developments are affecting the outlook for jobs, skills and training.

Chapter Three covers the five key occupations selected for detailed analysis, career pathways and progression routes, including barriers and enablers for progression.

Chapters Four and Five cover current and future skills and performance issues across the energy sector, and ways in which employers are aiming to tackle these. Chapter Six considers energy sector employers' awareness and use of occupational standards, as well as their views on potential future standards.

Chapter Seven sets out the research conclusions and recommendations.

¹ These are electricity, power, nuclear, oil and gas, and renewables.

2 The energy sector in the UK

Chapter summary

This chapter describes the energy sector and sub-sectors, and covers drivers of change including policy and legislation, as well as social, economic, environmental and technological factors.

The energy sector is a key contributor to the UK economy, directly employing just over six per cent of the workforce and providing 3.3 per cent of GDP. The workforce is predominantly male, and the age profile is higher than the national average, contributing to an ageing workforce.

There is strong commitment to training and development across the sector on an ongoing basis, and the qualification levels are higher than the national UK average.

Rapid change driven by policy, the economy and new technologies, is affecting the outlook for jobs, skills and training in different ways depending on the sub-sector.

In particular, the emergence of new technologies is likely to directly affect job creation opportunities, as well as offer potential for up-skilling the workforce to respond to the shift to a low carbon economy.

The extent and type of change in the sector promoted by new technologies is less clear over the long-term, as this is largely dependent on the type of developments such as energy storage systems, whether fracking is widely adopted or not, and the extent of investment and uptake into smart grids and renewables capacity.

2.1 The vital role of energy

The energy sector is arguably one of the fastest changing industries in the UK. It comprises radically different sub-sectors, with coal production in decline at one end of the spectrum², and renewable technologies experiencing rapid growth at the other end (Renewable Energy Association, 2012). Technological advances and behaviour changes are transforming not just the energy that is used, but also the way in which we use it. The industry is increasingly being moulded by the commitment to a low carbon society, with policy and market drivers pushing for energy efficient consumption, and cleaner fuels.

Energy is at the heart of virtually everything we do, and within businesses, the cost and availability of energy directly or indirectly influences a wide range of factors such as procurement, risk management, investment decisions and resourcing. Governments take strategic policy decisions that are heavily influenced by the need for energy security.

Understanding the sector's outlook for skills, training and other recruitment and development challenges, is critical to providing a sufficient supply of appropriately skilled and knowledgeable workers.

2.2 Characteristics of the energy sector

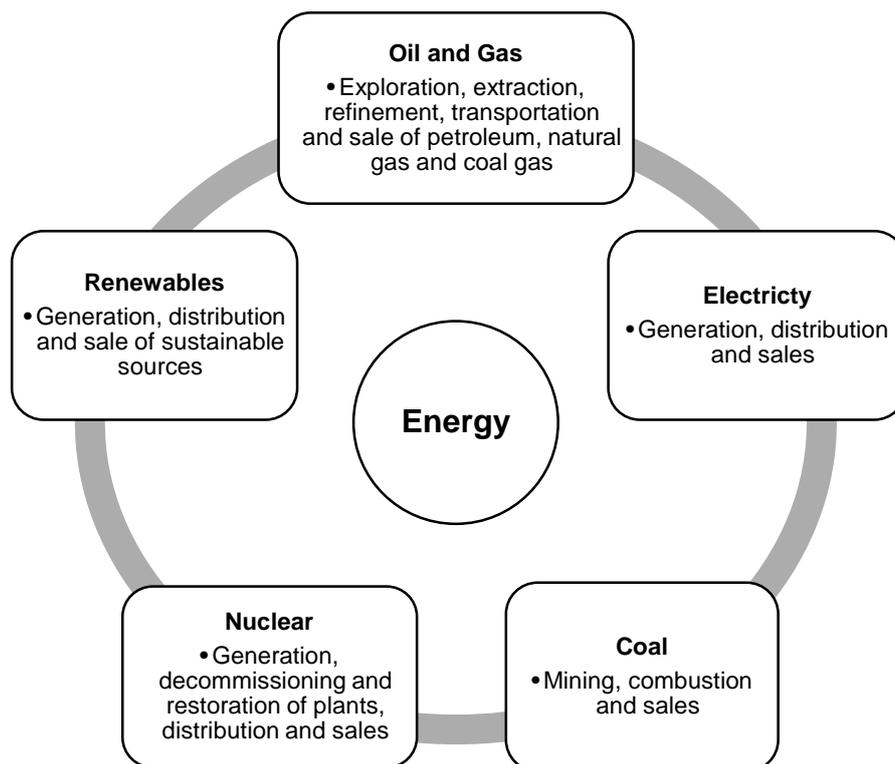
In 2013 the energy sector contributed 3.3 per cent of the UK's GDP, directly contributing £25 billion to the UK economy, with a further £71 billion in indirect contributions (Ward, Warburton and Terrens, 2014). Since 2005, the number of people employed in the sector has been increasing, predominantly driven by growth in the electricity sector (Department for Energy & Climate Change (DECC), 2014a). For example, employment rose by 3.7 per cent between 2012 and 2013. In 2013, 6.2 per cent of the industrial workforce was employed in the energy sector, equating to 169,000 people (DECC, 2014a).³ It is also one of the most productive sectors measured by GVA per direct employee (Ward, Warburton and Terrens, 2014). However, productivity has been declining since 2005, driven by a decline in oil and gas production (DECC, 2014b).

The energy sector include a range of sub-sectors which cover extraction, refining and manufacture of fuels, distribution, and sale (see Figure 2.1). The electricity and gas market is privatised, and regulation of the energy sector is undertaken by a range of different organisations (see Appendix B).

² In 2013 UK coal production fell to an all-time low of 13 million tonnes - Department of Energy & Climate Change (DECC) (2014), *UK Energy in Brief 2014*

³ Estimates and projections of employment growth may depend on the sector definition applied (for example mining and quarrying may behave in a different way to gas and electricity).

Figure 2.1 Sub-sectors in the energy sector



Workforce composition and changes

The sector workforce is predominantly male and is older than average. Office for National Statistics (ONS) data reports a total of 536,047 people employed in the mining, energy and water supply sectors (Oct-Dec 2014)⁴. The composition of the mining, energy and water workforce is predominantly male (79 per cent), compared with an average of 53 per cent across all industries (ONS, 2015).

Working Futures projections forecasts that 23,000 of the workforce in the coal, oil and gas, plus mining and related sectors, will retire by 2022. Just over a fifth (21 per cent) of those retiring will be science, research, engineering and technology professionals, and skilled metal, electrical and electronic tradespeople (Wilson et al., 2014).

Working Futures data also forecasts that 43,000 of the electricity and gas workforce will have retired by 2022. This equates to 37 per cent of the 2012 electricity and gas workforce compared to 39 per cent across all industries. A quarter of sector retirees are expected to be science, research, engineering and technology professionals, and skilled metal, electrical and electronic tradespeople (Wilson et al., 2014).

⁴ Labour Force Survey (2015), *Employment by industry* (Oct-Dec 2014 data)

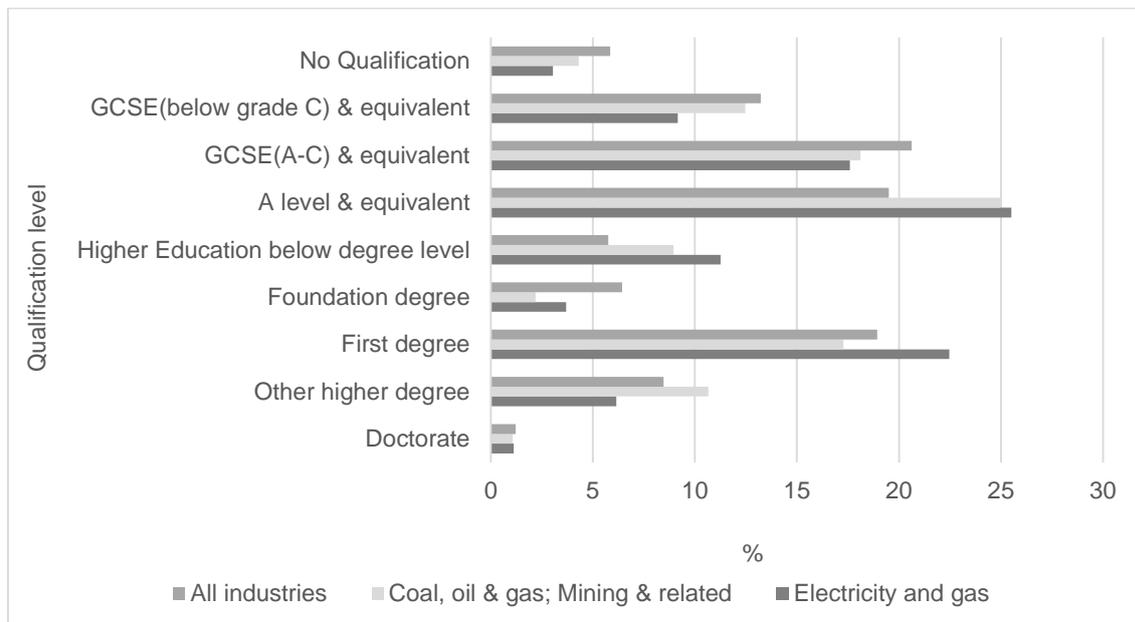
Training and qualifications

The UK Commission’s Employer Skills Survey (UKCESS) 2013 shows that there is strong commitment to provision of training in the electricity, gas and water sectors. For example, 75 per cent of sector employers reported that they offer on and/or off the job training, compared to 66 per cent across the economy as a whole (UK Commission, 2013). Similarly, 69 per cent of employers in the mining and quarrying sectors reported that they provide training (UK Commission, 2013).

UKCESS data also suggests there is strong commitment across the industry to on-going development, with 86 per cent of employers in the electricity, gas and water sectors, and 90 per cent of employers in the mining and quarrying sectors, offering a range of development opportunities to their employees (UK Commission, 2013). This compares to a whole economy average of 85 per cent.

Qualifications levels are generally higher than the average across all industries. The proportion of the electricity and gas workforce holding a first or higher degree (28.6 per cent) is slightly higher than the UK average of 27.4 per cent, as is the proportion of the workforce in the coal, oil and gas, mining and related sectors (28 per cent) (Figure 2.2).

Figure 2.2 Qualification levels in the energy workforce (2012)



Source: Wilson et al. 2014 Working Futures 2012-2022, electronic resource

2.3 Energy sub-sectors

This report focuses on a number of sub-sectors within the energy sector, as well as five key occupations (see Chapter Three). The purpose of this approach is to generate richer, detailed qualitative data, about sub-sectors and occupations which are of critical importance to the future growth of the energy sector as a whole. The sub-sectors covered are: electricity⁵; nuclear; oil and gas; and renewables. Standard Industry Classification (SIC) codes classify industrial activities into a common structure (Office for National Statistics, 2015). This report covers:

Table 2.1 Relevant energy sector SIC codes

SIC Code (2007)	Description
06.10	Extraction of crude petroleum
06.20	Extraction of natural gas
09.10	Support activities for petroleum and natural gas extraction
19.20	Manufacture of refined petroleum products
24.46	Processing of nuclear fuel
35.1	Electric power generation, transmission and distribution
35.11	Production of electricity
35.12	Transmission of electricity
35.13	Distribution of electricity
35.14	Trade of electricity
35.2	Manufacture of gas; distribution of gaseous fuels through mains
35.21	Manufacture of gas
35.22	Distribution of gaseous fuels through mains
35.23	Trade of gas through mains

Source Office for National Statistics, 2015

2.4 Recent developments and how these affect the outlook for jobs, skills and training

There are a number of drivers of change in the energy sector. These include policy and legislation, as well as economic, technological, social and environmental factors.

2.5 Policy and legislation

Electricity Market Reform

Electricity Market Reform (EMR) is an important policy driver of change. There are two core goals of EMR (DECC, 2014a):

⁵ Whilst coal has been a consistent source of energy for many years, its on-going future use is less certain, due to concerns about its impact upon the environment. This has prompted investigation into alternative sources of energy, given that the UK will have to become less reliant upon coal. Statistics produced by the Department for Energy and Climate Change (DECC) in 2014 indicate that coal production in the UK declined substantially by around 25 per cent between 2012 and 2013. Coal is not therefore directly in scope of this research, however it is indirectly included given that around a third of electricity is currently generated by coal-burning power stations. Data from Energy UK shows that a third of these face closure by 2016, in order to comply with EU air quality legislation

- to support low-carbon energy (which has motivated the creation of Feed-in-Tariffs and Contracts for Difference (CfD))
- to strengthen electricity supply (which has motivated the Capacity Market that provides retainer payments to reliable contributors to capacity).

EMR regulations came into force on 1st August 2014 (DECC, 2014a). The aim is to maintain sufficient generation in the UK to decarbonise the industry and achieve agreed targets, and to meet demand despite planned closures to power stations. These substantial changes to the electricity market seek to ensure security of the UK's electricity supply. The Department for Energy and Climate Change believes EMR will result in £110 billion being generated, which is likely to act as a strong catalyst for job creation and upskilling.

Changes to the policy and legislative landscape

“Policy is constantly made, and remade, depending on what the temperature is”

Feedback from key informant interviews

There was a consensus among key informants interviewed for this research that changes in the policy landscape can result in instability for the sector. Some respondents also perceived uncertainty linked to the 2015 General Election.

Uncertainty can act as a barrier for skills development, as it can be difficult for organisations to plan ahead, and commit to investment into training and development. This has been a particular issue in the renewables sector, and is compounded by economic factors – notably that new technologies for energy efficiency not yet ‘tried and tested’ are considered to pose a greater risk to investors.

Policy can also stimulate demand for jobs, skills and training, or in some cases can reduce focus on up-skilling and training. For example, feedback from key informants about the delayed introduction of CfD in Northern Ireland suggests that this has impacted on some projects' viability.

Energy Savings Opportunity Scheme (ESOS)

The Energy Savings Opportunity Scheme (ESOS) is a piece of EU legislation that requires member states to introduce a mandatory programme of energy audits for large organisations⁶. Initial audits will need to be completed by over 9,000 large companies by 5th December 2015. The outcomes of these will enable organisations to calculate the amount of energy used per employee as well as identify and understand the measures to reduce energy consumption and increase energy efficiency.

Energy efficiency targets

Another major driver of change is the energy efficiency targets in the UK, which were defined in accordance with the need to meet overarching EU targets for 2020.

The EU's commitment to the international climate change treaty ratified in Kyoto in 1997, resulted in an objective to achieve a 'smart, sustainable and inclusive economy'⁷. Targets were set for the UK within the Directive 2009/28/EC of the European Parliament including:

- 20 per cent reduction of greenhouse gas emissions in comparison with 1990 levels;
- 20 per cent of energy to be sourced from renewables;
- 20 per cent increase in energy efficiency.

The Energy Act 2011 in the UK set out ambitions to enhance energy security and enable investment in low carbon energy supplies in the UK, with devolved administrations setting their own targets⁸.

As part of its policy to reduce carbon emissions by 80 per cent (relative to 1990) by 2050, the Government has produced legally-binding carbon budgets which specify how much carbon the UK is allowed to produce in a 5-year period (DECC, 2014c).

Furthermore the EU recently announced new targets for 2030 (European Commission, 2014), to supplement the existing objectives, as follows:

- reduction of greenhouse gases of 40 per cent (compared to 1990);

⁶ Those with more than 250 employees or with a turnover in excess of 50 million Euro

⁷ http://ec.europa.eu/europe2020/index_en.htm

⁸ The Welsh Government outlined its commitment to a 'whole system transition to low carbon energy' in 2012, with rich natural coastline resources that can be converted into tide stream and wave energy. The Scottish Government has a target for renewable energy to generate 100 per cent of gross annual electricity consumption and 11 per cent of heat consumption by 2020, capitalising upon its substantial tidal, wind and wave power potential. Northern Ireland has targets to achieve 40 per cent of renewable electricity and 10 per cent renewable heat by 2020

- renewable energy providing at least 27 per cent of energy used in the EU overall;
- increasing energy efficiency by at least 27 per cent across the EU overall;
- electricity interconnection between member states of 15 per cent.

This may result in updated targets for the UK; key informants interviewed for this research suggest that this could act as a catalyst for further growth and thus employment opportunities for the renewables and nuclear sectors.

2.6 Economic drivers

Electricity

Around £200 billion of investment is planned for various projects in the electricity market from 2014 onwards (DECC, 2014d). There may be a positive ‘knock-on’ effect for investment as a result of Electricity Market Reform (EMR), due to DECC’s establishment of an organisation to manage Contracts for Difference (CfD) for renewable energy generators. This means that after signing up to a CfD, when a generator sells energy, any difference between the generator’s price and a so-called ‘strike price’⁹ is offset by a payment. For instance where the sale price is higher than the strike price, the generator pays into DECC’s organisation, but if lower than the strike price, the generator receives a payment (Ward, Warburton and Terrens, 2014).

The intention of this is to reduce instability and price volatility, and thus minimise risks from an investor perspective. A number of CfDs are already in place, with eight major renewable energy projects agreed prior to the first round of allocation expected to provide up to £12 billion of private sector investment and support 8,500 jobs (Ward, Warburton and Terrens, 2014).

Interconnection

The UK is moving towards a more ‘distributed’ energy system which is able to accommodate generated power from a greater number of smaller plants. The increase in number of generating plants, grid connections and generated output mean that the current transmission and distribution network infrastructure is in need of major expansion and upgrading over the coming years.

⁹ This is clearly defined at the outset based on expected market prices

Investment into electricity interconnection projects is becoming particularly important, especially because of the growth of the renewables sector. Whilst energy generators can rely on rain, sun and wind always being available, they cannot be sure when or how much supply they will produce in the UK, thus there is a strong need for better interconnectivity.

Ofgem is in the process of developing a long-term interconnection policy, whilst DECC will enable interconnectors to bid for capacity payments from 2015 (Ward, Warburton and Terrens, 2014). The intention is to offer stronger incentives to investors and thus help to safeguard energy security in the longer-term. Five electricity interconnection projects could be established by 2020.

Oil and gas

Similarly the oil and gas sector requires substantial investment, not least because many of its assets are ageing, prompting a need to invest into safety (HM Government, 2013a). Three-quarters of the UK's current primary energy demand is currently met by oil and gas, and the Department of Energy predicts that this figure will remain high by 2020, at around 70 per cent (Oil & Gas UK, 2014).

In 2013, capital of £14.4 billion was invested in the UK's oil and gas reserves (the highest level of investment in 30 years). Existing data shows this is expected to remain at a similar level of around £13 billion in 2014 (Oil & Gas UK, 2014). However the falling price of oil has directly influenced the amount of exploration activity taking place; there has been a substantial decline and reduced investment into new sales and exploration.

The energy sector, and oil and gas in particular, is a substantial generator of tax revenue to the UK economy, and the provision of tax relief for decommissioning projects may be an important factor in unlocking investment (HM Government, 2013a). An increase in decommissioning work may open up more commercial opportunities for businesses, thus prompting a need for more skilled workers.

Key informants note that the combination of economic and political factors is one of the most important drivers of change for the oil and gas sector, citing cost inflation as a major factor. Average wages are high, prompting an increase in revenues, but not in profits. Again, policy is likely to be a key catalyst for the sector outlook, with the Scottish Government urging action in the form of tax relief as well as incentives for exploration.

Some impacts for jobs and training has already been experienced. For example, BP recently announced plans to cut 200 jobs and 100 contractor roles in the North Sea, following an operational review (Fraser, 2015). This may result in a surplus of experienced and skilled workers. Key informants note that it will be vital to stem this flow as far as possible by aiming to retain these individuals in the energy sector as a whole, and transition the existing talent into a different sub-sector. Interview feedback emphasises how critical the risk of losing skilled and experienced workers is for the sector, particularly in light of a limited supply of key occupations (discussed in more detail in Chapter Four).

Nuclear

Evidence from the literature indicates that nuclear will also have a significant role in the UK energy mix in the future. New nuclear power is considered essential to meeting the Government's objective of delivering a secure, sustainable and low-carbon energy future. With the aim of encouraging a competitive environment for low carbon energy generation, it is anticipated that nuclear could contribute 40-50 per cent of the UK energy mix by 2050, compared with 20 per cent currently (HM Government, 2013b).

Whilst the UK currently has 16 nuclear reactors, all but one of these will be retired by 2023 (World Nuclear Association, 2014). However the UK Government is investing with a view to developing 16 GWe of new nuclear capacity operating by 2030, with an objective to develop between ten to thirteen new plants on five sites by this time (World Nuclear Association, 2014). EDF Energy is working on plans to build four new European Pressurized Reactors. Two will be built at Hinkley Point and two at Sizewell, supplying energy to around 10 million homes by 2025. The first is expected to be in operation by 2018.

Respondents interviewed for this research suggest that these developments will open up opportunities for up-skilling and training, as well as job creation. The latter may comprise a mix of new roles as well as a means of retaining the existing workforce from the current nuclear reactor sites, and transitioning them into the new plants.

Renewables

Investment in renewable energy generation spanned over half the total investment in the energy sector in 2013, amounting to £7.4 billion (Ward, Warburton and Terrens, 2014). Key informants anticipate that the level of investment will remain high over the coming decade, and particularly into the development of new technologies to increase renewables capacity. Higher levels of investment and research and development are anticipated for offshore wind in comparison with other renewables technologies.

In 2013, renewable energy provisionally accounted for 5.2 per cent of final energy consumption, an increase from the 2012 position of 4.2 per cent (DECC, 2014e). The potential for renewables in the UK is well documented, with growth experienced in both employment and GVA over the past five years, and further expansion forecast. Research carried out by RenewableUK in 2013 predicts that over 70,000 jobs could be created by 2023, nearly half of which would be in offshore wind.

In 2008, research forecast that the renewables industry could add up to £1 billion GVA and up to 33,000 jobs in Northern Ireland (Tym and partners, 2008). Similarly the Scottish Government has estimated the creation of around 40,000 jobs (Audit Scotland, 2013), whilst the Welsh Government predicted in 2012 further expansion of the renewables sector, up from 13,000 people directly employed in 2009-10. However, the exact scale of job creation is still unknown, and there are a wide range of factors which could influence it. Any delays to offshore wind developments will directly affect the scale of job creation and contribution to the UK economy.

2.7 Social and environmental drivers

Rising energy prices and fuel poverty

Fuel poverty is a growing issue for the UK, with an estimated 2.33 million households in fuel poverty by the end of 2014 (DECC, 2014d). Homes that are the most energy inefficient have a greater likelihood of being in fuel poverty, highlighting the need to improve efficiency within the existing housing stock.

Feedback from key informants states that rising energy prices are undermining householder capacity to move out of fuel poverty. Research published in 2014 showed an average price increase of 15 per cent in electricity bills, with an increase of 25 per cent in the average gas price, between 2010 and 2013 (Ward, Warburton and Terrens, 2014).

Increasing demand for energy yet constraints on fossil fuels

Growing global demand for energy will have a significant impact. Feedback from key informants suggests that demand for energy will be at least 30 per cent higher in 2040 compared with 2010, not least because of the expected increase in the global population from around 7 billion to nearly 9 billion during that time.

The demand for energy will continue to increase as technological developments are commercialised and become mainstream. Households are being encouraged to become more energy efficient, when paradoxically, they are concurrently increasing the number of technological devices such as smartphones and gaming equipment, acting as a catalyst for higher energy consumption.

Furthermore the closure of existing nuclear plants may result in a gap in generation capacity of around 20GW by 2020 (EU Skills, 2011a). There has also been a reduction in oil & gas production of around 50 per cent since 1999 with limited success in identifying and tapping into new fields (HM Government, 2013a).

Fossil fuel reserves are finite, prompting a need to unlock the potential of sustainable energy sources, but key informants note that this must be underpinned by consumer behaviour change in the use of energy and energy management in the home. This highlights the need for skills and knowledge to help educate consumers about energy use and reduction (Ecuity Consulting LLP, 2014).

Natural resources can also be harnessed and exploited, especially in Wales (Centre for Regeneration Excellence Wales, 2011) and Scotland. For example wave and tidal energy has the potential to generate around 300MW by 2020 and up to 27GW by 2050 (DECC, 2013f).

2.8 Technological drivers

Smart energy technologies

Research undertaken by UKCES in 2010 suggested that the electricity, gas and water sectors may be substantially affected by environmental factors, with investment into new generating capacity based on renewable energy sources (Speckesser, Hillage and Hogarth, 2012). Feedback from the key informant interviews suggests that smart technologies, such as smart thermostats that help consumers to manage and reduce their energy consumption, are acting as 'bottom up' drivers of change. These technologies are expected to become more mainstream in the short-term, with research estimating that £320 million will be invested into smart energy technologies in 2015 (Ward, Warburton and Terrens, 2014).

This commitment to a shift to low carbon electricity in the longer-term is underpinning developments in electricity interconnection projects, and investment into smart grids. Smart grids are a new type of electricity network responsive to peaks and troughs in supply and demand. They offer an alternative to the existing system whereby electricity flows from suppliers to consumers, and instead will offer a two-way flow enabling customers to interact directly with the grid, helping to reduce waste and inefficiencies (Institute of Engineering and Technology, 2013).

In 2013, £21 million was invested in smart metering infrastructure, with this figure expected to rise dramatically to £111 million by 2014, and £320 million by 2015 (Ward, Warburton and Terrens, 2014). DECC estimates that smart grid technologies may be worth as much as £13 billion of GVA and have the potential to support 8,000 jobs by 2020, and 9,000 jobs by 2030 (DECC, 2013e). On-going investment into research and development is required to fully exploit the commercial opportunities.

Energy storage

Other important developments include the emergence of cheap, efficient energy storage systems that could fundamentally affect the energy sector. For example small, rapid charging lithium-ion batteries and sodium batteries are now being manufactured on a large scale. Readily accessible and cheap power storage solutions could, in the longer-term, result in consumers becoming wholly reliant upon local, modular energy storage and perhaps even abandoning the traditional electricity power grid.

Changes are also expected to influence the transport network, with around £11 million of funding committed from the UK Government to research carbon cutting technologies for new cars and vans (Office for Low Emission Vehicles, 2014).

Table 2.2 presents a summary of some of the most important emerging technologies.

Table 2.2 Energy storage technologies

Technology	Summary
Thermal energy storage	Collected by energy storage tanks during periods of off-peak electrical demand and re-distributed during peak demand time
REDT modular energy storage	Highly efficient and long-lasting storage batteries with a 25-year lifespan
Lithium air batteries	Lightweight batteries with potential to store large volumes of energy; scope for use in electric vehicles enabling 300+ mile range (Purchia, 2014)
Fuel cells	Able to power nearly any portable device, with the potential for hydrogen fuel cells to be used in cars, replacing petroleum. Offers opportunity to reduce energy bills by around a fifth for consumers, with lower carbon emissions
Carbon capture and storage (CCS)	These systems are able to capture up to 90 per cent of the carbon emissions produced in electricity generation processes

Fracking

Key informants offered mixed views as to whether fracking, used to extract gas from shale rock, offers a long-term opportunity for the UK in terms of job and energy creation, or whether the risks make it more of an uncertain prospect.

Potential benefits include an estimated 64,000 jobs to be created and greater energy security (DECC, 2014h). However critics argue that fracking will incur high drilling and specialist equipment costs, may have negative effects on the environment and could be strongly opposed in rural parts of the UK.

Change beyond 2025: uncertain factors

Table 2.3 provides a summary of some additional technologies which may have an impact on the skills and knowledge needs of the energy workforce.

Table 2.3 Examples of future technologies that may be more widely adopted within the energy sector

Technology	Summary
Mini nuclear reactors	Small-scale nuclear reactors that can be built on just a few acres and produce carbon-free power. Pre-fabrication and on-site assembly of mini nuclear reactors could substantially reduce upfront capital building costs. These could be used to power rural and remote areas and offer a safer option with no weapons-grade material, and an underground location
Hybrid turbines	Intergrates wind and solar power generation, specifically designed to be placed on buildings and in urban areas, with the advantage of being noise free and safer in bad weather
Flying wind farms	Buoyant air turbines (BATs) can be fitted with wi-fi to extend net capability and can detect and float to where the wind is strongest. If adopted more widely, BATs could diminish the substantial expense incurred to construct offshore wind farms
Geothermal boreholes	Extracts geothermal heat from underground lava, as highly pressurised steam is generated by pumping water to underground lava. Whilst there is arguably greater potential for energy supply in other countries due to geographical assets (e.g. Iceland), better interconnectivity could affect the UK's capacity to benefit from this
Carbon nanotubes	Sheets of carbon one-atom thick rolled into tubes, with a typical diameter 10,000 thinner than a human hair, which are highly efficient conductors of heat. These can act as a catalyst to speed up the reaction to produce energy for hydrogen fuel cells – which in turn can power electric vehicles. Whilst nanotubes have been expensive to produce to date, in recent years the price has been dropping, offering greater opportunity to exploit this technology

2.9 Chapter conclusion

The energy sector comprises a variety of sub-sectors, each of which have their own distinct characteristics. There is rapid change within the sector, predominantly as a result of technological developments. The range of drivers affecting the sector as a whole, notably political, economic and technological factors, influence each sub-sector slightly differently.

This contributes to peaks and troughs for supply and demand of the energy sector workforce, specifically in relation to jobs, skills and training. Growth in one sub-sector, for example fuelled by higher levels of investment, can act as a catalyst for job creation. However concurrently other sub-sectors may be experiencing decline.

Growth and job creation can be positively influenced through development of appropriate policies and/or investment. However there are other factors that may be more difficult to directly influence, which affect the outlook for skills, jobs and training, such as the oil price and EU carbon emissions targets. This indicates a need to closely monitor developments in the sector to ensure an adequate supply of trained and skilled workers.

3 Key occupations

Chapter summary

This chapter describes five¹⁰ key occupations that have been selected for detailed analysis, in order to provide rich and comprehensive data about workplace and skills challenges.

The five key occupations are in short supply within the energy workforce.

Progression to more senior roles can be achieved from the key occupations, as there are clear career pathways, underpinned by appropriate training, qualifications and experience. Progression is typically enabled by organisational infrastructure such as competency frameworks and regular development reviews.

Qualification levels within the energy workforce are above average, but qualifications are not necessarily the main enabler to progression. Some employers argue that existing training courses do not fully meet organisation or sub-sector specific needs, and so provide more in-house training.

3.1 Occupation selection criteria

This research focuses on five key occupations for more in-depth exploration: engineer; technician; project/change manager; sales and marketing manager; and overhead lines worker.

These were selected based on the following criteria:

- Volume - the number of people employed in a particular occupation
- Future importance – their importance to the sector and its supply chain, in order to support industry survival and growth; and
- Wider challenges – occupations known to experience skills shortages, training gaps or recruitment challenges.

The selection was based on evidence from the literature and data review as well as the key informant interviews. Further detail on the rationale for inclusion is provided in the following sections.

¹⁰ The research has further drilled down into two different types of two of the key occupations, engineer and technician

3.2 Engineer – rationale for inclusion and job description

The first key occupation is engineer. This report focuses on electrical or power systems engineers. Nearly all respondents referred to a skills shortage across a wide range of engineering disciplines. This is illustrated by a high level of demand for power engineering skills in the UK. In the oil and gas sector this issue is exacerbated by high levels of global competition for individuals with the necessary skills and experience (HM Government, 2013a). The picture is similarly competitive in other sub-sectors, due to a limited supply of engineers within the existing workforce. Furthermore, an ageing workforce within the nuclear, oil and gas and electricity sectors in particular¹¹ is resulting in an urgent need for skills in engineering to be replaced.

A shortage of high level skills (Speckesser, Hillage and Hogarth, 2012) is a cause for concern at a time when research forecasts a need for over 850,000 people in engineering disciplines with level 4+¹² qualifications over the next ten years (EngineeringUK, 2014). In 2012, UKCES predicted an increase in employment in energy of at least four per cent between 2010 and 2020, with the highest growth being for roles requiring high-level qualifications. Moreover, demand for new entrants is expected to rise in reaction to the ageing workforce profile, especially in technical and engineering roles within electricity, gas and water.

It can take several years for engineers to gain relevant qualifications and experience, and in the meantime employers are experiencing recruitment difficulties. Furthermore key informants note that it can be difficult to attract young people and females into engineering roles, particularly within oil and gas, which is not perceived to be an 'exciting' sector. This role also features in the Government Shortage Occupation List of April 2014 (Migration Advisory Committee (MAC), 2014).

¹¹ Strongly emphasised among interview respondents

¹² Equivalent to the next stage following A-levels and would include Certificates of Higher Education (Level 4); Higher National Diploma (Level 5); Bachelor's Degree (Level 6); Master's Degree (Level 7); and Doctorate (Level 8)

The job purpose, typical duties and skills and knowledge needs for the engineer roles in scope are presented below as job descriptions (Figures 3.1 and 3.2).

Figure 3.1 Job description: electrical engineer

Job purpose	Typical duties	Skills and knowledge needed
<ul style="list-style-type: none"> • Design, monitor, control and manage the electric system that supplies power to the hundreds of high voltage motors and thousands of low voltage motors in the field to required standards • Focus is on safety, reliability, quality and sustainability 	<ul style="list-style-type: none"> • Providing technical and engineering support and guidance to teams working on generators • Monitoring the performance of the electrical, instrument, automation and communication systems • Ensuring that electrical and electronic systems meet statutory and regulatory requirements • Undertaking in-depth analyses/studies of problems and identifying longer-term solutions and/or options • Producing budgets and plans for specific studies or modifications and managing the cost control process • Attending site meetings 	<ul style="list-style-type: none"> • Experience in the energy engineering sector useful but not essential (most entry level jobs give training) • Advanced roles may require masters or postgraduate degrees, and sub-sector experience • Ability to analyse complex problems and assess possible solutions; explain design ideas clearly; strong decision-making skills and excellent communication skills; prioritise and plan • Comprehensive understanding of electrical health and safety regulations relevant to the relevant energy sector plus technical expertise in the discipline

Figure 3.2 Job description: power systems engineer

Job purpose	Typical duties	Skills and knowledge needed
<ul style="list-style-type: none"> • Responsible for designing, developing and maintaining the power grids – the networks of components which convert different forms of energy into electricity, concerning the three main subsystems: generation, transmission and distribution 	<ul style="list-style-type: none"> • Work in a wide variety of industrial and commercial facilities, so duties vary widely • Examples of typical duties include: using mathematical and computer models to research and design new generating sites; • designing and selecting equipment needed at site; • analysing and improving site or equipment cost and efficiency; • assessing and reviewing new and current processes to find the most productive; and • working in collaboration with other design and maintenance disciplines to ensure the integrity of the overall design 	<ul style="list-style-type: none"> • A general understanding of power plants and the systems involved, particularly power system optimisation, planning and enhancement • Ability to work in a multi-tasking small team and participate in technical working groups • Ability to identify and resolve problems, including the ability to identify opportunities to improve systems and processes • Well-developed interpersonal and communication skills • Flexibility in times of change • Ability to meet deadlines consistently

3.3 Technician – rationale for inclusion and job description

Technicians fulfil a vital role, frequently supporting the work of engineers. The shortage of technicians has been well documented over a period of many years within the UK; recent developments in the energy sector points to a particular concern in relation to renewable energy technicians, and wind turbines specifically. This is partly due to a lack of graduates and school leavers with the appropriate skills. There is also a widespread shortage of nuclear technicians: the Nuclear Energy Skills Alliance (NESA) Delivery Plan 2014 identified priority skills needs amongst project managers, engineers and technicians.

Innovation and rapid change within the energy sector is a major driver prompting the need for more skilled technicians. Research points to a rising demand for technicians as a result of urban regeneration projects in the UK requiring an estimated 20 per cent of technicians and engineers (EU Skills, 2011b).

This report focuses on two types of technician roles:

- installation technician (sometimes called installation engineer); and
- renewable energies technician.

Evidence gathered from key informants emphasises difficulties in attracting and retaining technicians in the energy industry across all sub-sectors, and moreover shows that demand for technicians continues to rise in the UK. Furthermore the renewables industry is changing rapidly, in relation to commercialisation of and introduction of new technologies. For example the number of people employed in installing smart meters is estimated to increase from 1,400 in 2013 to 5,600 by 2016 (Ward, Warburton and Terrens, 2014). Research conducted in Scotland in 2013 found that 18 per cent of respondents within the Scottish renewables sector had skills gaps among technicians (O' Herily & Co, 2013; see also TBR, 2012).

Some parts of the sector have already started to try and redress gaps. For example the National Skills Academies for Nuclear and for Power, in conjunction with industry bodies, have begun developing new qualifications such as the Wind Turbine Service Technician Apprenticeship, to try and attract young people.

Job descriptions for these technician roles are shown in Figures 3.3 and 3.4.

Figure 3.3 Job description: installation technician

Job purpose	Typical duties	Skills and knowledge needed
<ul style="list-style-type: none"> Responsible for planning for, installing, testing and maintaining equipment needed for various jobsites in the energy sector – in workshops, offshore rigs, processing plants, renewable energy power stations, offshore wind farms, etc. 	<ul style="list-style-type: none"> Duties vary depending on the job site and energy subsector, but could typically include: <ul style="list-style-type: none"> carrying out maintenance, service, repair and modification of all company assets and equipment to ensure proper functioning, ensuring correct and safe use of tools; resolving technical issues and recommending alternative solutions to engineering problems related to installation activities; preparing detailed calculations and analysis on procedures and equipment; and ensuring procedures fit with safety standards 	<ul style="list-style-type: none"> Bachelor's degree in engineering, preferably mechanical or electromechanical, or an equivalent recognised and approved apprenticeship or qualification Must be very familiar with design tools and techniques, and keep informed on the latest developments in technology and science relevant to the and on safety guidelines, to ensure tools and procedures used are of the highest standard Good communication skills so they can explain complex designs and concepts to non-technical staff Good problem solving skills

Figure 3.4 Job description: renewable energies technician

Job purpose	Typical duties	Skills and knowledge needed
<ul style="list-style-type: none"> Ensuring the efficient functioning of equipment that collects, generates or distributes power from renewable energy sources e.g. hydroelectric generators, wind turbines, solar panels 	<ul style="list-style-type: none"> Depending on site, includes: <ul style="list-style-type: none"> assembly of heating and cooling mechanisms, system controls adjustments repairing and testing equipment identifying and reporting issues with particular systems and laying out and connecting electrical pathways e.g. for solar photovoltaic installers: calculating potential power output based on the orientation of a structure toward the sun, designing the layouts of photovoltaic panels to collect the most solar energy and attaching panels to photovoltaic supports 	<ul style="list-style-type: none"> Strength to lift heavy equipment Manual dexterity to manipulate tools Problem-solving and perception skills to identify and solve issues quickly Understanding of complex detailed information Ability to visualise outcomes occurring following modifications Detailed knowledge of tools, procedures and processes required, but covered through training

3.4 Project/change manager – rationale for inclusion and job description

Project/change managers will be a crucial part of the energy supply chain. The sector is changing at such a rapid pace (in particular when it comes to renewables) that change and project management skills are essential.

Research undertaken by Cogent in 2008 predicted that demand for project managers appeared likely to generate serious skill shortages. Interview respondents agreed that experienced project managers with the right mix of skills are in high demand across the whole of the energy sector.

The nuclear workforce assessment conducted by the Nuclear Energy Skills Alliance stated that the annual recruitment forecast is that up to 19 per cent of the current workforce will need to come from engineering disciplines and project management. This report indicated a need to plug this gap by going out to other industries or via overseas labour (Nuclear Energy Skills Alliance, 2014). Furthermore, project managers in the electricity transmission and distribution industry feature on the Government’s Shortage Occupation List (MAC, 2014).

Figure 3.5 shows the typical job purpose, duties, skills and knowledge needs for project/change managers in the energy sector.

Figure 3.5 Job description: project/change manager

Job purpose	Typical duties	Skills and knowledge needed
<ul style="list-style-type: none"> • Managing, overseeing and directing all of the elements necessary in making a project a success, from planning and execution to monitoring and closing, including delivering a structured approach to the transition of individuals 	<ul style="list-style-type: none"> • Analysing existing situation, desired ideal future state and capacity for change • Engaging senior managers as change leaders • Establishing education to confer skills needed for change • Assessing project brief, agreeing timescales, costs and resources • Select / lead project team • Negotiating with contractors and suppliers • Ensuring each stage is progressing according to time schedule, budget and to the appropriate quality standards • Reporting regularly on progress to senior management or the client 	<ul style="list-style-type: none"> • Experience of the full project lifecycle, including project scoping, resourcing, scheduling, budgeting, calculating risk and health and safety • Several years' experience applying project or change management principles, ideally in engineering or energy • Ability to establish relationships with and motivate teams • Superb facilitation and negotiation skills • Exceptional communication • Critical thinking and problem solving skills • A robust technical background and detailed knowledge of the energy industry as a whole

3.5 Sales and marketing manager – rationale for inclusion and job description

Procurement and sales will be increasingly important within the energy sector, particularly given that technological advances and behaviour changes are transforming not just the energy that is used, but the way in which we use it. This also points to a step-change in the way in which energy is bought and sold.

For example:

- there is greater complexity within what has historically been a highly regulated market, with a wide range of energy policies, schemes and regulations that are regularly updated or supplemented;
- the on-going effects of the recession have made customers more cost conscious and risk averse. This requires skills in effective negotiation and contract management in order to both attract and retain customers;
- price-fixing under such conditions necessitates dealing with multiple stakeholders during procurement discussions that are likely to be lengthier, as well as more complex, than previously.

The sector is likely to change significantly over the next five to ten years, as a result of technological advances and new materials/systems being used within the energy sector. These include: energy storage technologies such as thermal mass and phase change systems; fuel cells; lithium and sodium air batteries; and smart grids. These new developments are likely to alter the knowledge needs of sales and marketing managers.

The job description showing typical duties and skills and knowledge needs for sales and marketing managers in the energy sector is shown in Figure 3.6.

Figure 3.6 Job description: sales and marketing manager

Job purpose	Typical duties	Skills and knowledge needed
<ul style="list-style-type: none"> • Responsible for accomplishing business development by researching and developing marketing opportunities and plans, implementing sales plans and managing sales and marketing teams 	<ul style="list-style-type: none"> • Researching new products and markets; developing marketing strategies for energy products and services • Creating and maintaining relationships with clients • Negotiating contracts and finalising terms and conditions • Tracking and soliciting new business for various products and services • Developing and delivering proposals • Developing pricing strategies protecting margins and maintaining market position • Representing company to industry / trade groups nationally / internationally 	<ul style="list-style-type: none"> • Good standard of general education required; degree in energy or science field, or in business, sales and marketing very useful • Skills required include verbal and written communication, excellent organisational and planning skills, good business sense, ability to lead and motivate a team, strong sales and negotiation skills; drive and initiative • Detailed, specific knowledge needed of the energy market and the product and services technologies and application • 3-5 years of senior experience in strategy, sales and marketing in a relevant sector preferred

3.6 Overhead lines worker – rationale for inclusion and job description

There is a rising demand for repairs and innovation within the energy infrastructure, which has prompted an on-going need for overhead lines workers (EU Skills, 2010).

Moreover, although a highly skilled and well paid occupation, it can be very difficult to attract people to this role¹³, as it can involve long periods away from home, working at heights in potentially dangerous conditions, and work during unseasonal weather conditions.

Cogent’s study of skills needs in energy in 2008 included a dedicated exploration of overhead lines worker skills gaps. Predictions based on data from 2005 suggested that it would take four years to plug the gap between capacity and demand from increasing (due to a 4-year apprenticeship) even under ideal circumstances, and that it would take 12 years for capacity to meet 75 per cent of predicted demand. Research conducted by EU Skills in 2011 also identified shortages of overhead lines workers in the electricity transmission and distribution industry.

¹³ National Skills Academy for Power workforce data

Key informant interviews suggest that there may be substantial skills shortages at entry level which are having a longer-term impact to meet demand in the sector.

Finally, as with some of the other key occupations, this role features in the Government Shortage Occupation List (MAC, 2014). This list was recently reviewed with a recommendation that the entire job title of overhead lines workers be restored to the shortage occupation list (previously a number of sub-sets of the role had been excluded from the list) (MAC, 2015). The job description for overhead lines workers is shown in Figure 3.7.

Figure 3.7 Job description: overhead lines worker

Job purpose	Typical duties	Skills and knowledge needed
<ul style="list-style-type: none"> • Install, maintain and repair the overhead electricity lines network that supplies electricity from power stations to homes, businesses and industry 	<ul style="list-style-type: none"> • Carrying out preventative maintenance and switching operations • Installing and dismantling equipment, e.g. transmission cables • Assembling or removing components • Adjusting and configuring electrical systems • Inspecting, testing and diagnosing faults in cables and other equipment • Following strict health and safety procedures at all times 	<ul style="list-style-type: none"> • Competence working at height • Good degree of physical fitness • Very strong practical skills • Good attitude towards safety and customer service • Problem-solving ability • Ability to work independently and as part of a team

3.7 SOC codes

Standard Occupational Classification (SOC) codes are a means of classifying occupational information in the UK. The key occupations for this research have been mapped, as far as possible, to four-digit SOC codes (Appendix A). However it should be noted that due to the size and complexity of the energy sector, and the rapid pace of change prompting the creation of new job roles, there is not an exact match for the role of renewable energies technician.

3.8 Key occupation progression routes and career pathways

The evidence from interviews and the literature shows that with sufficient experience, and/or qualifications, that there are clear progression pathways between the key occupations, and that all are able to ultimately progress into management roles. This offers an opportunity to broaden this talent pool on the one hand, but on the other hand, risks losing valuable skills and experience from highly technical occupations that are essential to the energy supply chain. The following sections describe typical progression routes and exemplar career pathways for each of the key occupations.

3.9 Engineer – career pathway and progression routes

Feedback from nearly all of the employers and key informants suggests that engineers can enjoy a long and varied career moving into more senior roles (Figures 3.8 and 3.9).

“Progression is not a problem for engineers. If you leave university with a good engineering degree, everyone knows you have long-term career prospects”

Employer, oil and gas sector

Figure 3.8 Exemplar career pathway: electrical engineer

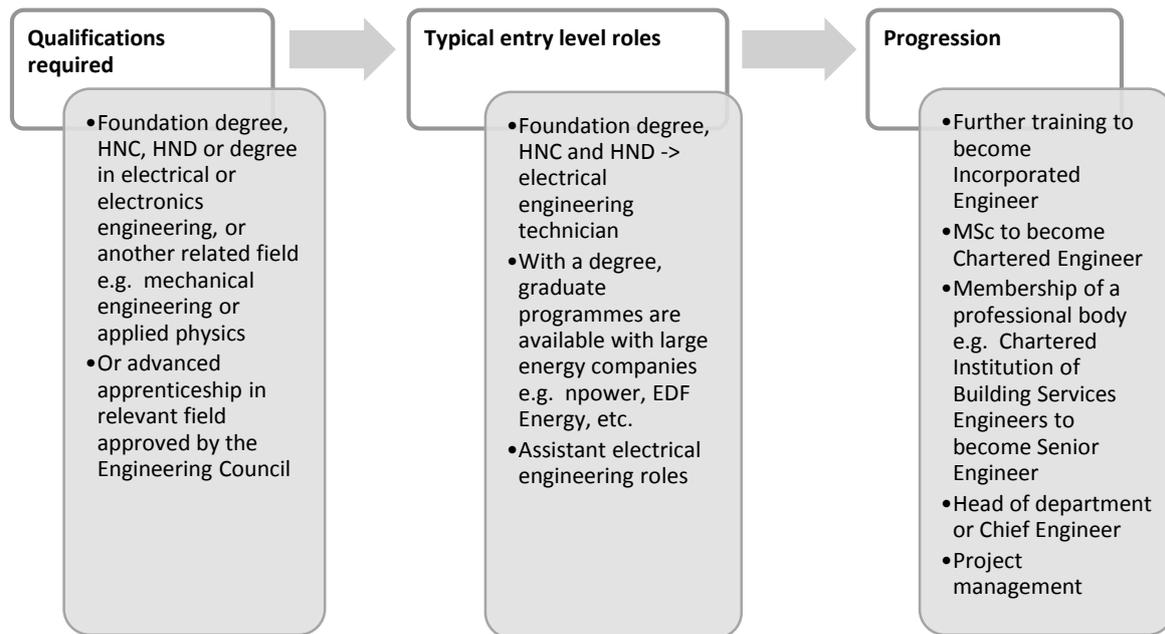
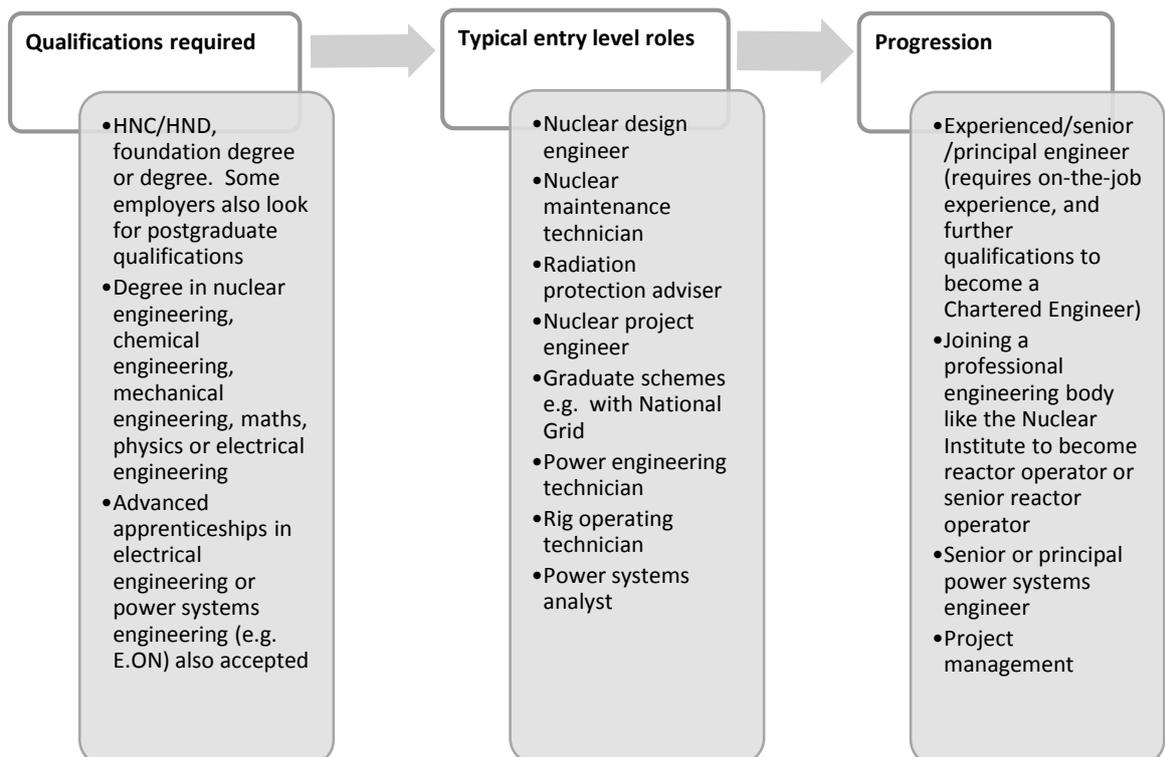


Figure 3.9 Exemplar career pathway: power systems engineer



3.10 Technician – career pathway and progression routes

Nearly 80 per cent of employers interviewed reported that technicians have multiple opportunities to progress into senior positions, which may include site supervision, asset management or project management (Figures 3.10 and 3.11). They can also progress to become engineers, but this takes time and additional training. A barrier to progression cited by just over 40 per cent of employers interviewed can be that employers are not always willing to invest in long-term development given the risk of losing valuable technical skills.

Figure 3.10 Exemplar career pathway: installation technician

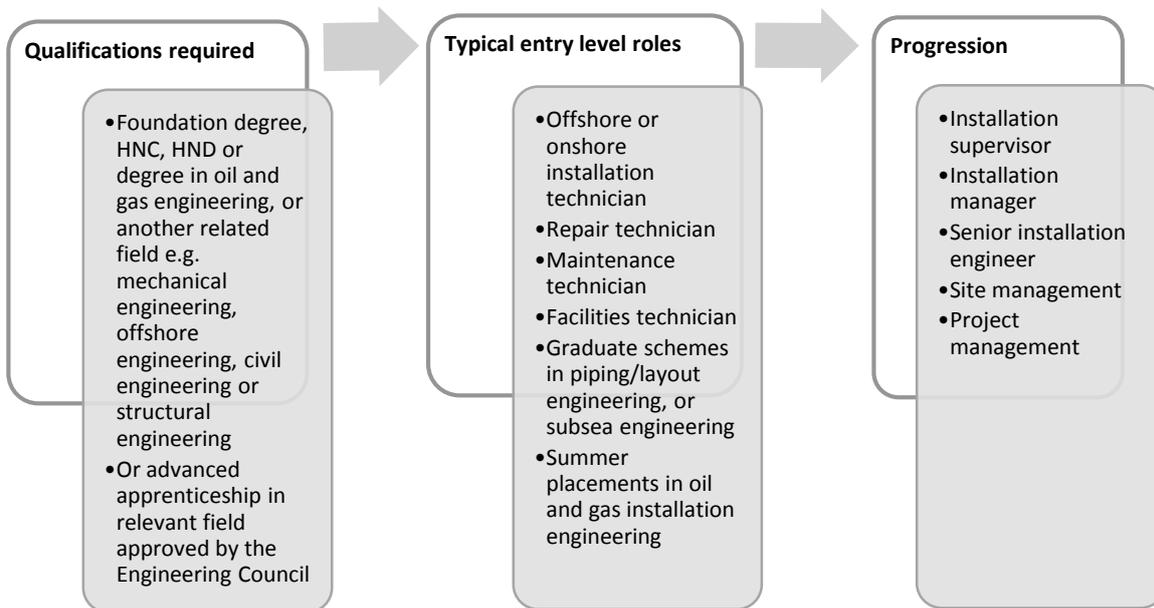
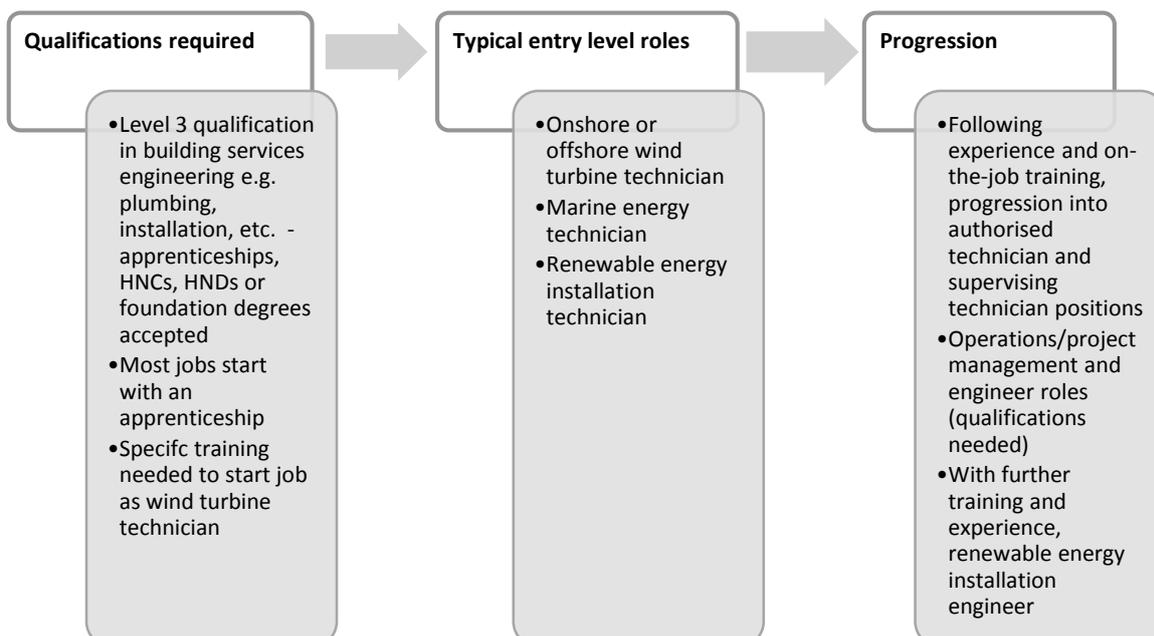


Figure 3.11 Exemplar career pathway: renewable energies technician



3.11 Project/change manager – career pathway and progression routes

There was a consensus among key informants that the role of project manager has only been recognised by the energy sector as a qualified profession in its own right relatively recently. Three-quarters of the employers interviewed stated that this has been a contributory factor to a limited pool of talent, which is exacerbated by a shortage of energy sector specific training in project management.

Just under a third of employers interviewed stated that there is a shortage of funding to support training. Just over two-thirds of employers also perceived there to be a lack of understanding of the career opportunities among careers advisors in schools and colleges, pointing out that consequently students do not recognise project management as being a long-term career option.

Nearly half the employers responding to the research find that once students enter the world of work they start to identify that the project management role can be accessed from a range of disciplines. A number of employers interviewed for this work are in the process of identifying what types of skills and experience are most useful in making this transition. This also includes seeking to understand which gaps need to be filled upon moving into project management from other sectors. This means there are more routes into this role than there are for the other key occupations discussed in this report. This variety of entry points is a critical enabler of progression.

“There are more routes into the profession from other backgrounds - there isn't the stigma around not being able to enter it unless you've been in it since you were 16”

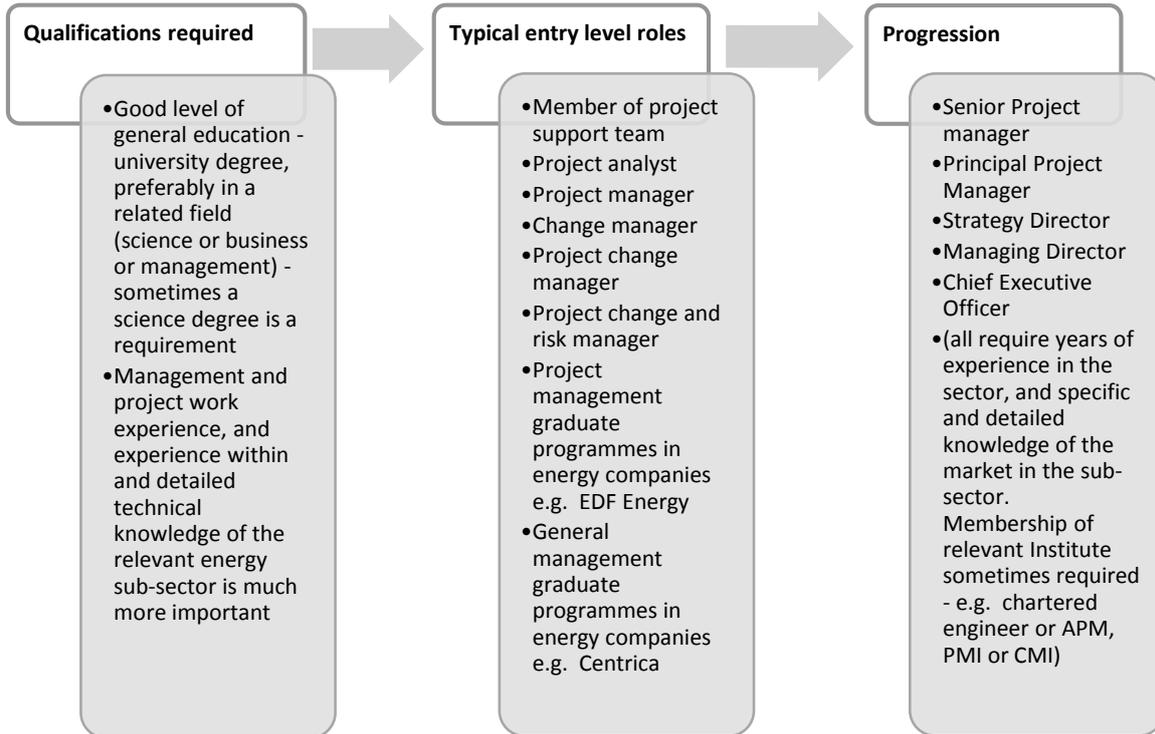
Employer, electricity and gas sector

There is a strong consensus among employers that highly skilled and experienced project managers can transfer into the role from existing technical positions such as engineers. The potential downside of this is that it removes them from the engineering profession. There are many opportunities for further progression into more senior roles ranging all the way up to Chief Executive (Figure 3.12).

“There is plenty of very interesting and challenging work. When people move into this line of work they're never short of opportunities”

Employer, renewables sector

Figure 3.12 Exemplar career pathway: project/change manager



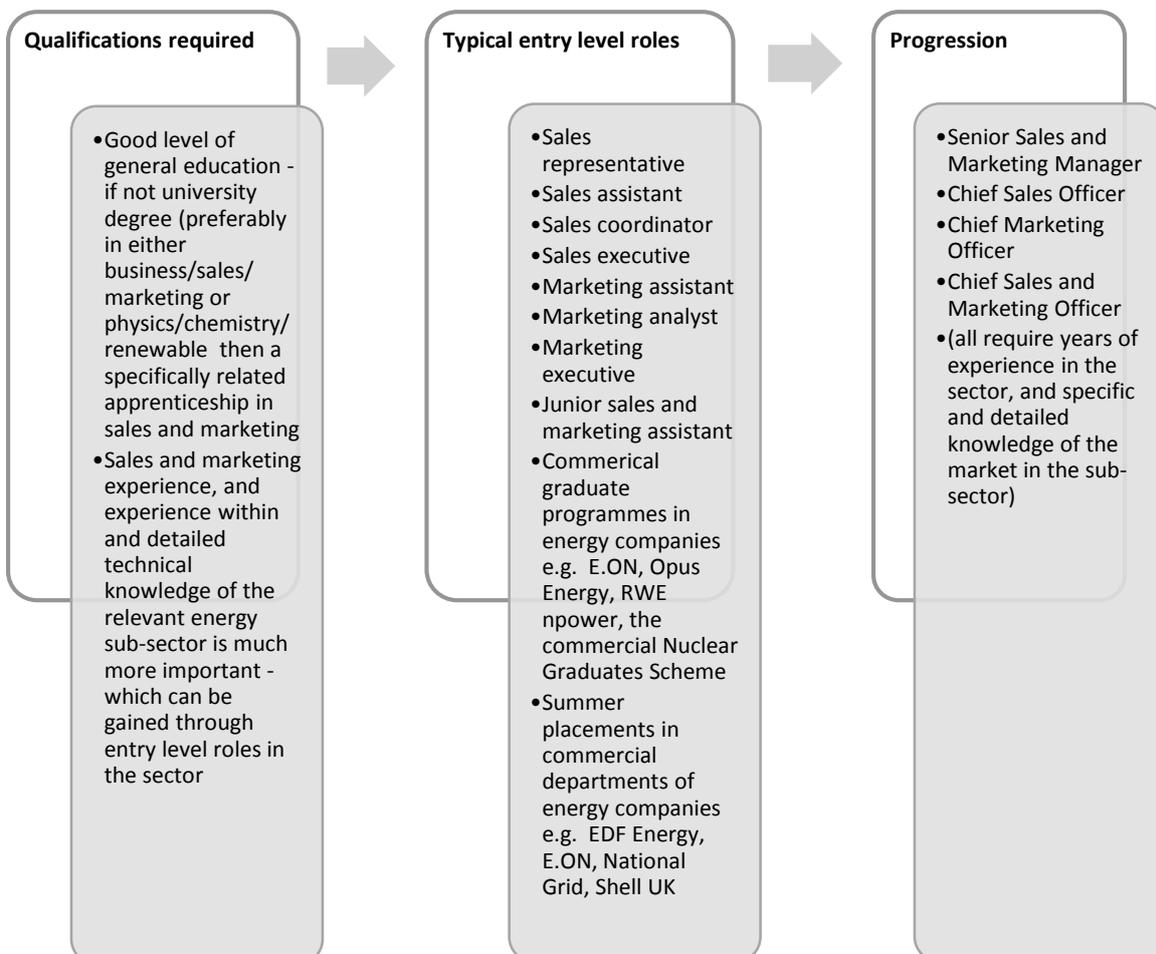
3.12 Sales and marketing manager – career pathway and progression routes

Interviewees argued that there are more barriers to progression for sales and marketing managers in comparison with the other key occupations. They reported that this is partly because there are fewer roles available, particularly in certain sub-sectors such as renewables.

The ageing workforce is also a reason for a more limited number of opportunities. A fifth of employers interviewed stated this can mean the loss of younger employees keen to progress more quickly, who are unwilling to wait for opportunities to become available.

However progression to senior sales and marketing roles is available for individuals with appropriate experience (Figure 3.13).

Figure 3.13 Exemplar career pathway: sales and marketing manager



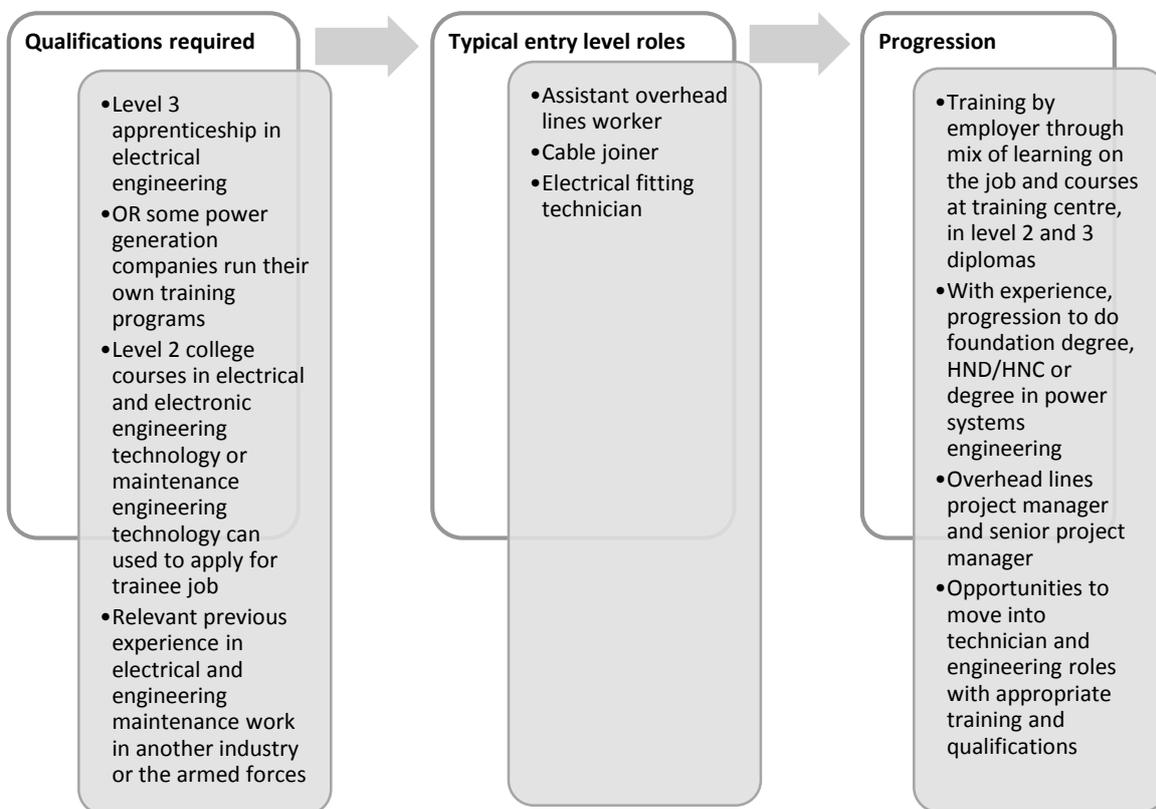
3.13 Overhead lines worker – career pathway and progression routes

Overhead lines workers are able to progress into more senior positions, including (with the relevant qualifications) into engineering roles or project management (Figure 3.14).

However a quarter of employers interviewed reported that once in the profession, individuals may be less interested in progression as they can command high rates of pay, and salary is more important than job title. This can act as a barrier to progression to senior roles.

This role offers fairly rapid progression from entry level if employees are able to attain a Level three qualification (entry level typically being at Level two).

Figure 3.14 Exemplar career pathway: overhead lines worker



3.14 Barriers to progression

The key occupations in scope of this report are in high demand, with some roles commanding very high salaries. Nearly two-thirds of employers interviewed stated that career pathways and opportunities for progression have become less relevant in light of the way in which roles have evolved. For example, project managers and to some extent, overhead lines workers, are increasingly being employed as short-term contractors, moving from one organisation to the next once the job is done. Many engineers are also becoming more mobile and opting to work as contractors for higher daily rates of pay. Just over half of employers interviewed stated that progression opportunities are not high on the agenda for the majority of these individuals, which can make it more challenging to recruit them, as it comes down to which organisation is able to pay the most.

Few barriers to progression have been identified by the majority of employers interviewed. Where issues do occur, these tend to be organisation-specific, rather than factors that affect the sector as a whole. For example two employers noted that promotion decisions can be driven by the length of time an individual has been with the company, rather than based solely on merit.

3.15 Enablers to progression

The ageing workforce, which is an issue across the whole of the energy industry, does offer one positive in the sense that it opens up progression opportunities for younger employees. However a challenge reported by a quarter of employers is that, as the Equality Act of 2010 removed the mandatory retirement age, this has made it difficult to be precise when forecasting employment profile changes and in succession planning.

Employers that have performance frameworks in place (85 per cent of those interviewed), find that these typically drive development discussions and structured plans for progression. These can act as critical enablers for progression across all key occupations where they are permanent employees.

Another enabler is access to Continuing Professional Development (CPD), which can include formal or informal training, as well as membership of a relevant professional body. For example, engineers are more likely to access progression opportunities if they have Chartered status.

Career progression pathways appear well documented within most organisations. For example in the oil and gas sector, engineers are typically able to progress either into managerial roles, or to a more senior status such as Chief Engineer, or 'Head of' a particular department or project.

Progression within the sector could also be promoted by facilitating the return of workers, particularly women, who have taken a career break (for example, to look after a young family. The majority (70 per cent) of women with STEM degrees do not work in the fields of engineering or physical sciences, and the absence of a mechanism to reintegrate workers after a career break contributes to a loss of skilled staff (Bosworth, Lyonette and Wilson, 2013). Encouraging employers within the energy sector to adopt strategies to retain and thus utilise the skills of their existing female staff could provide a route to achieving greater gender parity in the sector as well as reducing the numbers of experienced workers which leave the sector each year.

3.16 Effectiveness of qualifications as enablers to progression

There was a consensus among key informants and employers that there is a strong reliance on in-house training within the energy sector, which in some cases can be valued as highly as formal qualifications. In a highly regulated industry, nearly all employers interviewed commented that they prefer to supplement existing qualifications which may not precisely meet their organisation-specific, or sub-sector specific needs¹⁴.

This is supported by the secondary data. For example data collected by the UKCES Employer Skills Survey 2013 (UKCESS) shows that the type of training offered most frequently by employers in the electricity, gas and water sectors is job-specific training, reported by 87 per cent of employers that had engaged in workforce training (UK Commission, 2013). Similarly, 82 per cent of employers in the mining and quarrying sectors reported that they provide job-specific training, compared to a whole economy average of 85 per cent.

As well as gaps within the content of existing qualifications, a fifth of employers interviewed for this research stated that there are not enough courses available to train people in the technical skills that are necessary for the sector.

“We are working to develop a qualification encompassing the mechanical qualifications/knowledge required by installation technicians and the GasSafe modules. There is no such qualification in existence at the moment”

Employer, oil and gas sector

This is also an issue for project manager and sales and marketing manager roles, which require a blend of commercial ability and technical knowledge, combined with softer skills such as managing multiple tasks and lean project management.

¹⁴ Also see Chapter Six on National Occupational Standards (NOS) where employers cited a similar issue

“What is lacking is the skill of managing a portfolio of projects, understanding the independencies between projects and the complexities of this. There are less formal qualifications around this; we need more mentoring/theoretical training”

Employer, oil and gas sector

“Qualifications are having to catch up with the growing importance of the project management – education and qualifications have been slow to pick up this importance, for example it’s not covered in school and college career support. It’s still not seen as a career path”

Employer, nuclear sector

A smaller number of employers (just under 15 per cent of respondents) pointed to a shortage of appropriate electrical engineering courses providing the desired training for employees and aspiring engineers. There appears to be a greater focus on electronics rather than electrical engineering at the university level, and one employer expressed concern that a substantial number of university electrical engineering departments are being closed owing to a lack of interest.

“A lot of universities are closing down their electrical departments (because the courses are unpopular). We need more nuclear engineering courses at university and we need to look and see how we can get this specialised nuclear understanding”

Employer, nuclear sector

The following case study shows how universities have engaged with employers in the nuclear sector, to improve the relevance of undergraduate and postgraduate qualifications.

Case study: collaboration between academia and industry in the nuclear sector to improve relevance of qualifications

In 2005, the Nuclear Technology Education Consortium (NTEC) was established bringing together nine (now 10) UK universities, the Defence Academy and College of Management and Technology, to address issues identified within UK nuclear education (Roberts, 2013).

The NTEC offers Master’s level education in Nuclear Science and Technology, spanning 20 modules designed in collaboration with employers, to directly meet the needs of the UK nuclear energy sector, either in new build or decommissioning. This approach means that the course content and also the delivery method is tailored to industry requirements, enabling full-time students to complete a Master’s programme in one year, and part-time students in 3 years. Distance learning is available for half of the modules.

Furthermore all the modules are relevant for CPD, so businesses are able to send their employees on an intensive week-long course on a specific subject. The programme is accredited by the Engineering Council, so students can use their qualification to count towards Chartered Engineer status.

Having initially received funding from the Engineering and Physical Science Research Council (EPSRC), the consortium is now self-sustaining as a result of its fee income. This means that full fee waivers and a £7,500 stipend can be offered to full-time students meeting qualifying criteria.

Major UK nuclear companies sit on an External Advisory Board as a means of maintaining direct contact with industry, and ensure that courses continue to meet employer needs. Project placements in industry also help employers to secure graduates into permanent roles in their businesses after they complete the qualification.

3.17 Chapter conclusion

Shortages in the energy workforce have been identified for the five key occupations, with particular issues associated with the supply of engineers, technicians and overhead lines workers.

The changing nature of the energy sector, propelled by rapid technological change, indicates that the roles of project/change manager and sales and marketing managers may increase in importance. For example, a more complex regulatory landscape is likely to require more skills and knowledge in negotiating contracts, and potentially in embedding internal changes to deal with the introduction of new energy storage and management systems.

Respondents report that there are clear career pathways for the key occupations, with opportunities for progression to more senior positions once relevant qualifications and experience are attained. However there is also growing trend towards self-employment, with greater value attached to securing higher rates of pay, rather than to job title and status. This may suggest that clearly defined career pathways would not be sufficient to attract new people into these roles, and that salary may be the most important incentive.

4 The energy sector today

Chapter summary

This chapter discusses the skills and performance issues that are currently experienced within the energy sector, with a specific focus on the five key occupations

The energy sector is facing important skills challenges, with an ageing workforce, shortage of specific skills and loss of experienced workers and graduates to other countries.

Experienced workers moving out of the industry due to either retirement or to go into other sectors, are not being replaced in sufficient numbers or with sufficient speed. Concurrently, respondents perceive that there are not enough STEM graduates coming into the sector, resulting in skills shortages and gaps in the middle layer of the workforce.

Limited numbers of young people and women are entering the sector, due in part to a perception that the industry is not particularly appealing. Respondents feel there is an opportunity to improve careers information to make the sector more attractive to young people, and to ensure that they have a clearer understanding of the diversity of careers that are available in this industry.

These issues are contributing to a transition towards a more mobile workforce, able to command high daily rates of pay for temporary contract work rather than commit to permanent employment. In turn this can create instability for employers and may undermine their commitment to invest in training and up-skilling.

Whilst many employers are demonstrating innovative solutions to try and plug the skills gaps, some are still working in silos rather than collectively within the sector to address the issues.

4.1 Overview of the energy skills status quo

Figure 4.1 provides a summary of the strengths, weaknesses, opportunities and threats currently affecting key occupations' skills, training, recruitment and development, based on findings from key informant and employer interviews, synthesised with analysis of secondary data. A number of factors are generic across all occupations, and indeed the wider energy sector, whereas others are specific to one or more roles. These are discussed in more detail in the subsequent sections.

Figure 4.1 SWOT analysis of the skills status quo in the energy sector

Strengths	Weaknesses
<p>Employers widely recognise the urgent need to tackle skills shortages particularly for engineers and technicians (but not necessarily working collectively to tackle this)</p> <p>Sector offers a high degree of job stability and security</p> <p>Good supply of career development and progression opportunities (within and cross sectors)</p> <p>Cross-fertilisation opportunities widely available (e.g. Scotland's supply of renewable energy skills picking up surplus where there is a decline in oil and gas)</p> <p>Well-established and flexible training provision, predominantly in house, with a culture promoting internal training</p> <p>Skills and talent recruitment from outside of the sector is a viable option, although in some cases needs to be from a similarly regulated sector e.g. sales roles</p>	<p>Limited pool of experienced talent</p> <p>Competition for talent resulting in a certain amount of reliance upon workers from overseas</p> <p>Time and cost to gain vital qualifications within a heavily regulated sector</p> <p>Difficulties in securing the right mix of technical and commercial skills for sales roles</p> <p>Some sub-sectors, working environments and occupations not deemed attractive among young people or experienced workers in other sectors</p> <p>Succession planning has been ineffective or too late in some cases</p> <p>Training can be delayed by regulations preventing under-18 apprentices from working on site</p> <p>Energy specific knowledge and experience can take some years to accumulate, leaving a gap at middle management level in particular</p> <p>Challenging to attract skilled workers to remote locations</p>
Opportunities	Threats
<p>Employers are demonstrating innovation in recruiting and attracting talent</p> <p>More apprenticeships being used to overcome skills shortages</p> <p>In-house training opportunities and support towards chartered status are widely available</p> <p>Skills shortages offer opportunities to train young people to industry specific requirements for these job roles</p> <p>More CPD opportunities demonstrate available progression routes and assist talent retention</p> <p>Improving sector specific careers information</p> <p>Peaks and troughs in demand in one sub-sector could increase supply of skills into another</p>	<p>Ageing workforce exacerbating gap in the middle layer of the workforce</p> <p>Lack of and limited future take up of STEM skills</p> <p>Cost saving exercises within businesses pulling funds from investment into skills and training</p> <p>Career progression into managerial roles diminishes expertise among high-demand engineering/technician job roles</p> <p>Negative perception or lack of visibility of the sector among young people</p> <p>Global demand for skills and cheaper degree courses a catalyst for UK talent migration abroad</p> <p>Increasingly mobile workforce working as contractors: employers reluctant to invest in up-skilling expensive and potentially unstable resource</p>

4.2 Generic skills shortages affecting all key occupations

“We’ve recognised the skills gap too late – we’re now into crisis management”

Employer, nuclear sector

Nearly all employers interviewed for this research stated that the most important challenge facing the sector today is a substantial shortage of skills, which affects all the key occupations, but predominantly engineers and technicians who are in limited supply despite high levels of demand.

Findings from the UKCES Employer Skills Survey (UKCESS) indicate that of the employers with job vacancies in the electricity, gas and water sector, 36 per cent had at least one vacancy that was hard to fill. Furthermore, 31 per cent of employers with job vacancies stated that their business had at least one skills shortage vacancy (UK Commission, 2013).

These skills shortages appear to be most prevalent at skilled and professional levels, with 29 per cent of employers with vacancies in the electricity, gas and water sectors reporting vacancies due to skills shortages for professional occupations, compared with an average of 18 per cent across all industries (UK Commission, 2013).

Analysis of UKCESS data shows that of the employers with hard to fill vacancies in the electricity, gas and water sectors, 50 per cent reported that low numbers of applicants with the required skills was a factor. Of this group, 44 per cent reported a need to outsource work as a consequence of having hard to fill vacancies (UK Commission, 2013).

The consensus among key informants and employers specifically in relation to the key occupationsthe industry faces increasingly difficult skills challenges.which require action.

4.3 Ageing workforce

All sub-sectors of the energy industry face the issue of an ageing workforce. As an example, in 2011 research estimated that by 2025, 70 per cent of the existing nuclear workforce will have retired (Energy Institute Knowledge Service, 2011). Projections made in 2010 stated that the industry would require a thousand new recruits every year to ensure that power generation would be able to meet projected demand to 2025 and beyond (Cogent, 2010). Similarly, research undertaken in the electricity transmission and distribution industry in 2013, showed that the number of workers retiring was expected to increase year-on-year until the mid-2020s (National Skills Academy for Power, 2013). UKCES research in 2010 found that the energy sector had a significantly older workforce compared to the rest of the UK economy (Speckesser, Hillage and Hogarth, 2012).

Data from the Labour Force Survey in 2014 showing the age profile in the energy sector indicates that around two-thirds of the workforce is aged over 50, which is comparable to the average across industries. Furthermore only four per cent of workers in the energy sector are women working part-time compared to an all industry average of 20 per cent (Table 4.1).

Table 4.1 Age, sex and hours profile of the energy sector

Hours	Sex	Age groups	Energy and water		Average across all industries	
			%	n	%	n
Full Time	Male	16-24	5%	27,000	4%	1,272,000
		25-49	48%	244,000	29%	8,875,000
		50-64	24%	120,000	12%	3,646,000
		65+	1%	7,000	1%	284,000
	Female	16-24	2%	10,000	3%	958,000
		25-49	10%	51,000	16%	4,962,000
		50-64	3%	13,000	7%	2,036,000
		65+	0%	1,000	0%	74,000
Part Time	Male	16-24	1%	3,000	2%	563,000
		25-49	1%	5,000	2%	639,000
		50-64	1%	4,000	2%	542,000
		65+	1%	6,000	1%	353,000
	Female	16-24	0%	1,000	3%	827,000
		25-49	3%	15,000	10%	3,156,000
		50-64	1%	5,000	6%	1,677,000
		65+	0%	0	1%	378,000
Total			100%	512,000	100%	30,242,000

Source Labour Force Survey, 2014

4.4 Inconsistent succession planning

Feedback from employers suggests that, historically, employers in the energy sector have spent relatively little time on succession planning. In recent years this is largely attributed to the rapid pace of change in the energy sector as a whole, whereby projections for workforce requirements can alter quickly due to peaks and troughs in supply and demand.

There is inconsistency across the sector, with larger companies able not only to directly address the challenge and embed planning, but also to attract the majority of new entrants to the sector. However smaller, less visible employers are in a more vulnerable position and may struggle to recruit as well as to effectively plan ahead. A further issue conflicts somewhat with the problem of the ageing workforce, in that the removal of the mandatory retirement age has made succession planning difficult.

4.5 Limited numbers of young people entering the sector

Three-quarters of the employers interviewed for this research expressed concern about the impacts of the ageing workforce, not least because of the length of time it takes to train and develop within a highly regulated industry. Furthermore they question whether the energy sector is 'promoted' sufficiently to young people in school or Further Education, and whether career information is fit for purpose in helping to attract entrants to the industry.

"How do we educate young people earlier about the energy sector? Those in Further Education have no idea about the opportunities available. This is an essential industry that is badly underserved in education"

Employer, electricity and gas sector

The Energy and Efficiency Industrial Partnership (EEIP) is concerned that the sector is not sufficiently visible among young people, and support a case for improving the provision of detailed information about career prospects in this industry among young people at an earlier age.

Feedback from the majority of key informant interviews also indicates some issues with negative sector image among young people, particularly within oil and gas, which can be perceived to offer few progression opportunities with many jobs working unsociable hours and/or away from home. Research conducted by UKCES in 2010 suggested a need to make the energy sector more attractive to new recruits, including raising awareness of the benefits of working in this industry, as well as provision of better careers information, advice and guidance (Speckesser, Hillage and Hogarth, 2012). Employers in the nuclear sector have been working more closely with universities and bodies such as the National Skills Academy for Nuclear in recent years, to try and overcome issues such as sector image, and therefore help attract more young people. This is starting to take effect, but will still take time before there is a much larger pool of experienced talent from which to recruit.

"There is a gap in the middle – this is a weak area for the energy sector. There are lots of young people moving into the industry now, but you can't accelerate experience"

Nuclear professor, UK university

4.6 Limited STEM skills affecting key occupations in the sector

Nearly all the employers interviewed for this research have consistently cited a lack of STEM skills in the energy sector as an issue. Around 60 per cent of employers interviewed stated that not enough individuals are studying STEM subjects at undergraduate or postgraduate level, because of a range of perceptions among young people including:

- that costs incurred in studying for a degree and potentially a Masters are high;
- that cheaper degree options are available in other countries that are now being taught in English, meaning that students may tend to stay overseas once qualified;
- that entry criteria for acceptance on to STEM degree courses may be too obstructive;
- that STEM subjects are 'difficult'.

However, there is an overall balance between people holding STEM qualifications and the number of STEM occupations in the workforce. Research undertaken by UKCES in 2011 found that there was not an overall shortage of STEM graduates, but did indicate that more than 40 per cent of STEM graduates work in non-STEM occupations (Bosworth, Lyonette and Wilson, 2013). STEM graduates may be attracted into more lucrative sectors such as financial services, rather than studying for a higher level qualification directly related to careers in the energy sector.

EU Skills research found that where young people did have STEM qualifications, they were not necessarily attracted to careers in energy (Manson-Smith and Orji, 2012). Similarly research conducted by UKCES in 2010 found that many STEM graduates were finding jobs outside STEM sectors, and that in particular, the energy and utility sectors may not be viewed as particularly appealing (Speckesser, Hillage and Hogarth, 2012). This suggests that there may be an adequate supply of people with STEM qualifications in the workforce as a whole, but that limited numbers are moving into the energy sector.

A fifth of employers interviewed feel that not enough action is being taken at a 'top down' level, to bring about change that could enable higher numbers of students to study STEM subjects in the UK. Nearly 80 per cent of employers that raised this issue consider that tuition fees and restrictive entry requirements are the most difficult barriers to overcome. Two-thirds of employers suggested that incentives or some kind of training bursary is necessary to tackle this issue.

"The STEM issue is a huge challenge and has been for many years, but no concrete solutions are being offered. Good intentions are great, but they only get you so far – it is pounds and pence that seals the deal"

Employer, renewables sector

4.7 Competition for skills

Feedback from employers interviewed has highlighted competition for similar types of skills and experience in the energy sector, from:

- other sectors of the UK economy;
- sub-sectors within the energy industry;
- other nations, particularly where the lifestyle is more attractive.

Similar challenges affecting the UK in relation to energy security, consumption and efficiency, inevitably also affect other nations, and thus there is an increasing global demand for skilled workers in the energy industry. Individuals based in the UK can be tempted overseas by the prospect of lower living costs and a better quality of life in some countries (National Skills Academy for Power, 2013).

Paradoxically, just over a third of employers interviewed stated that some UK businesses have to rely upon overseas workers to plug the skills gap left from UK workers migrating abroad. This is backed up in the literature, with research conducted for UKCES in 2010 suggesting that the UK was already heavily reliant upon international migration in order to supply relevant skills to the energy sector (Speckesser, Hillage and Hogarth, 2012).

Feedback from employers has pointed out that it can be particularly difficult for SMEs to recruit the skills they need, as they simply cannot afford to pay the high salaries that occupations in shorter supply can demand. Analysis of UKCESS data shows that of the employers with hard to fill vacancies in the electricity, gas and water sectors, 40 per cent reported increasing their spend on advertising or recruitment costs in order to overcome difficulties in sourcing appropriately skilled candidates. Furthermore, 36 per cent of this group stated that they have used brand new recruitment methods or channels to try and plug the gaps (UK Commission, 2013).

4.8 An increasingly mobile workforce

The majority of employers interviewed for this research point to an increasingly mobile workforce, with a strong shift towards self-employment, prompting individuals to work as contractors for a daily rate of pay.

This appears to be more prevalent among project managers, overhead lines workers and to some extent, engineers. This can result in a workforce that is 'fleeting' rather than stable, and able to command very high rates of pay. For example some highly experienced individuals are able to charge a daily rate of £800-£900 or more. This can present a major barrier for SMEs and even some larger companies that are not in a position to be able to afford such high salaries, but cannot recruit permanent employees because of the limited supply of skilled and experienced individuals, as well as well as the more lucrative option of contract working. Research conducted to inform the UKCES Working Futures report found that in 2010, self-employment accounted for just under 10 per cent of total employment, and that this has risen from six per cent in 2000. Total numbers of self-employed people within this sector increased from 18,000 in 2000 to 30,000 in 2010 (Wilson and Homenidou, 2011). Employer and key informant feedback suggests that this trend is continuing, which may reflect the occupations explored during the interviews. When considering the electricity and gas sector as a whole, Working Futures suggests that the absolute number of self-employed workers will increase by 1,000 between 2012 and 2022.

4.9 Barriers to up-skilling and training

Feedback from employers interviewed points to a number of barriers resulting in reluctance within businesses to invest in up-skilling and training, including:

- the fast pace of change in the sector, which means some employers "sit on their hands" and wait to see where the opportunities arise – although they are willing to invest in skills once they are confident there would be a return on this investment;
- policy changes (a particular issue in the renewables sub-sector);
- an increasingly mobile workforce, which means responsibility for training and up-skilling is becoming more individual-led, rather than employer-led.

4.10 Issues specific to key occupations

The following section describes the findings in relation to the key occupations individually, describing issues that affect each one in particular.

4.11 Engineer

Limited supply of skilled engineers

Nearly all key informants and employers interviewed agree that the UK energy sector is suffering from a limited pool of experienced electrical engineers from which employers can recruit. This is partially a result of the sector's high demand for STEM skills and competition with other sectors for graduates with the right skills (Cogent et al., 2008). These shortages have led to a highly competitive and global recruitment market, with UK employers competing not only on a sub-sector and national level, but on an international scale.

Evidence from the literature suggests this skills shortage also extends to electrical engineering graduates; few UK STEM students enter the electrical engineering occupation (Cogent et al., 2008) which means that UK energy companies are in close competition to attract new entrants. The lack of 'home-grown' talent has meant that some energy employers have recruited skilled and experienced engineers from overseas in order to sustain their skills needs. Immigration legislation has made the recruitment of foreign engineers with the desired skills and knowledge easier (Cogent et al., 2008). However, there are concerns among employers that the UK energy sector is becoming heavily reliant upon skilled foreign engineers and in consequence is not concentrating on developing a pool of domestic talent (University of Birmingham, 2012).

"There is a massive shortage of electrical engineers with SAP (Senior Authorised Personnel) training. To overcome this shortage, we've had to recruit people from Europe because only they have received the training/have the skills. We should be doing this training in the UK as well"

Employer, electricity sector

Replacement demand

More than half of the employers interviewed stated that recruitment of electrical engineers is not keeping up with the current rate of attrition as a result of retirement or withdrawal from the energy sector. This has resulted in a limited supply of technical knowledge within the sector; a factor that has the potential to substantially limit the UK's ability to compete in the global energy market. Evidence from the literature indicates that electrical and power systems engineering skills and knowledge are recognised as being essential on new power-station build sites (EU Skills, 2010) and a shortage will affect the rate at which the UK can replace its out-of-date facilities and the quality of management at existing power stations.

Employers that raised this issue offered a number of possible explanations, most commonly:

- poor perceptions of the engineering role and mixed views of the energy sector act as deterrents to young people pursuing the occupation and qualified engineers entering the sector;
- engineers being lost to career opportunities abroad or outside of the energy sector

Training and qualifications

Around half the employers interviewed reported that they often recruit people with limited engineering or energy sector experience as they cannot source the experienced people they need, but this poses a challenge. The return on often costly investment in training electrical engineering apprentices and graduates can be slow. One employer commented that although engineering graduates possess academic ability and knowledge, they must learn how to apply this in a business context, which can take some time.

Graduates are therefore not always able to operate independently and require relatively high levels of support. Around a fifth of employers interviewed suggested that the solution to this issue is to encourage experienced electrical engineers to share their knowledge with apprentices and graduate engineers to prepare them for taking over their role in the future.

Some employers described how they have tried to address this issue by administering bespoke training in-house. A 2012 survey undertaken by the Energy Institute revealed that investment in internal training and development of current staff was the most popular method of skills development cited by employers (71 per cent of those surveyed).

4.12 Technician

Installation technician

Competition for limited supply of technical expertise

Feedback from nearly two-thirds of employers interviewed reveals that there is a shortage in the supply of installation technicians with the necessary skills and knowledge. The occupation is highly regulated owing to the complexity of the role and associated health and safety risks, and the number of individuals with the desired training is dwindling.

As with electrical engineers and other technicians, with such high demand for experienced workers, the recruitment market has become increasingly competitive. However, the nature of the job role means that installation technicians are expected to be mobile and flexible to travel to different sites for work. Feedback from employers reveals that contractor work is becoming increasingly popular among installation technicians, as this provides them with a more lucrative supply of work. Three employers reported that experienced technicians have turned down offers of permanent positions as a result.

One employer expressed a concern at the lack of domestic installation technicians with SAP (Senior Authorised Personnel) status and limited access to SAP training. The technical skills and safety knowledge associated with this is considered essential for the installation technician role. In order to source technicians with this training, this employer has become reliant upon recruiting installation technicians from abroad.

“The skills and knowledge acquired during SAP training are essential. This (training) is no longer happening so there is a shortage of those with these skills and some companies won’t pay for this training”

Employer, electricity sector

Attracting new talent

Recruiting graduate engineers into the installation technician role is proving a challenge for some UK energy businesses. Feedback from employers reveals that certain aspects of the occupation, such as the rural or remote working environments, are perceived as unappealing to young graduates and learners. For example, one employer reported that it had taken them five years to recruit an installation technician to work at one of their facilities. With a short supply of installation technicians from which employers can recruit, the sector’s ability to replace those technicians lost to retirement is limited. Similarly, this issue affects the level of technical expertise and experience within the sector and could potentially impact upon the UK energy sector’s ability to compete in the global market.

Renewable energies technician

Limited supply of knowledge and experience

Employers are competing within a challenging recruitment market for the limited supply of renewable energies technicians. Feedback from employers reveals there is a limited pool of people with the desired relevant renewables qualifications or sub-sector experience from which employers can recruit, and this has created a high demand and increased inter-sectorial competition for those with these skills.

“The pool of talent is not very deep – it is a very competitive environment”

Employer, renewables sector

Consequently a lack of sub-sector investment risks the loss of talented technicians that relocate elsewhere for a more competitive salary and job security.

Recruiting in an uncertain market

Just over three-quarters of renewable energy employers interviewed stated that the renewables energy market in the UK is turbulent and often unstable owing to a lack of consistent environmental policies. Therefore they are often reluctant to invest in renewables technician apprentices, as their work supply can be uncertain and sporadic.

The impact of this uncertainty upon recruitment is intensified by the high costs associated with renewables sector work. One key informant described how the challenge of securing project funding affects employers' skills needs and can have a detrimental impact upon the recruitment of renewables technicians.

“Renewables sector work is for those able to pay for it – we are still reliant upon grants”

Industry body, Northern Ireland

Access to training for the renewables sector

Just under a fifth of the renewable energy employers reported that one of the main staff development challenges is the lack of training courses teaching renewables sector specific skills and knowledge. The shortage of experienced and skilled renewables technicians is attributed to the lack of awareness of the opportunities in the sub-sector and the limited number of university and college courses which specialise in or incorporate renewables technical skills. This can impact upon current technicians, limiting their opportunity to upskill or refresh their knowledge. In turn this can limit the replacement supply of qualified renewables technicians.

With a perceived absence of suitable formal training courses, 40 per cent of employers reported that they provide in-house training to supply or supplement the necessary skills and knowledge. This process can be costly and time consuming for employers.

4.13 Project/change manager

Increasingly important yet ‘fleeting’ job role

The role of project or change manager¹⁵ is becoming increasingly important in the energy sector, with around two thirds of employers interviewed for this research stating that they are now seeking to employ more individuals in this role than before. This has been strongly driven by the rapid pace of change in the sector. Consequently, the majority of respondents interviewed are finding it more difficult to recruit skilled project managers as the demand for them has risen. This has brought about a transition in typical working practices with a shift towards self-employed contracting work, rather than direct employment of individuals.

Respondents state that experienced project managers in the energy sector are able to command very high daily rates. This has made the role somewhat ‘fleeting’ – those that are particularly valued can be tempted out to new contracts by higher rates of pay.

“These people are highly sought after. The problem for us is that they can be working on a project, get a phone call offering them more money elsewhere, and off they go at a week’s notice”

Employer, oil and gas sector

Employers reported that project managers are frequently in demand throughout the UK. They are often required to be mobile and follow the work, which can be a barrier for those unable to relocate owing to family or other commitments. Some respondents suggest that this might be a particular issue for older workers or female project managers. Moreover, whilst younger project managers may be more able or willing to travel, they may not necessarily possess the experience the role requires.

Priority skills needs

Feedback from nearly all the key informant and employer interviews indicates that project managers in highest demand possess interdisciplinary skills and experience, and are able to operate across multiple sectors in the energy industry.

The highest priority skills and attributes include:

- results focused;
- diligence;

¹⁵ For ease the term ‘project manager’ will be used in the remainder of this chapter

- time management;
- lean process improvement;
- skills in managing multiple projects simultaneously.

A quarter of employers that commented on this occupation stated that they are seeking project managers that can deliver the best possible results within an agreed timescale and budget.

“We want the ‘relentless deliverers’”

Employer, electricity sector

At present, it can be much harder for renewables organisations to find the project managers they need with relevant experience, given it is a ‘newer’ sub-sector of the industry.

Difficulties in sourcing the right mix of skills and knowledge

Feedback from nearly all the employer interviews indicates that whilst generic sales and marketing managers are generally reasonably easy to source, it can be much more difficult to find individuals that combine commercial ability with experience of the energy sector¹⁶. However on the whole, these roles are perceived to be easier to recruit to in comparison with the more technical roles, such as engineers and technicians.

The majority of employers interviewed cited the most important skills for sales and marketing managers to be the ability to:

- form strong relationships quickly;
- deal with top-end clients;
- translate technical jargon into simple to understand language.

Key informants stated that the mix of skills needed by sales and marketing managers has evolved rapidly, and may be subject to further change, because of the way in which the industry is changing.

Ageing workforce

The issue of the ageing workforce appears particularly pertinent to the sales and marketing role. Some employers are focusing on transferring existing knowledge to younger employees that will take over once existing workers retires.

¹⁶ There is also less information in the literature about this role specifically within the context of the energy sector, compared with other key occupations

However respondents reported two main issues with this approach:

- it can be difficult to predict precisely when workers will retire;
- it is not always possible to retain younger employees that are seeking development opportunities but perceive that limited progression is available.

In the meantime, some employers expressed concern that existing workers nearing retirement are not always keeping up to date with the pace of change in the sector.

“We have an ageing workforce – development has to be tailored in terms of things that will benefit the business in the long term. Active thinking and doing something different is sometimes challenging for this older workforce”

Employer, oil and gas sector

Recruitment and development

Although specific industry experience is highly desirable, just over a third of employers interviewed stated that it is possible to recruit from outside the industry if the individuals have transferrable skills and knowledge. People that come from a similarly regulated industry such as telecommunications or financial services are best equipped to adapt. Specific sub-sector knowledge can be provided through in-house training, although it takes time to firstly form this knowledge, and secondly to remain up-to-date with what is a rapidly changing industry.

“The main challenge is maintaining detailed knowledge of such a rapidly changing landscape, which is becoming a global one”

Employer, nuclear sector

However on the whole, nearly all employers interviewed consider it is relatively straightforward to develop the skillset through a mix of non-accredited internal training, job shadowing and mentoring.

Cross-fertilisation within organisations

Feedback from nearly all the key informant and employer interviews indicates that the sales and marketing manager role is frequently filled by internal applicants, who have moved over from another role in the business, typically a more technical remit.

This can be a dual-edged sword for employers, as although it means the commercial role is occupied by someone with strong technical skills and knowledge, it can also mean the loss of these in another part of the organisation. Moreover a third of respondents stated it is typically more difficult to replace someone in the engineering team than it would be in the sales team.

4.14 Overhead lines worker

Issues in attracting people to the role

Around two-thirds of employers interviewed reported a huge global demand for overhead lines workers. High wages are common, in acknowledgement of the disadvantages of the role, for example:

working at height;

concerns about personal safety;

working in unseasonable weather;

spending long periods of time away from home.

Just over half of the employers interviewed questioned whether people have a genuine understanding of the remuneration prospects, although some acknowledge that this might not be sufficient to compensate.

“The money on offer for overhead lines workers can be phenomenal, but this doesn’t always compensate for working away from home in potentially quite difficult conditions”

Employer, oil and gas sector

A negative perception of this role can be a substantial barrier to entry level applicants. Key informants pointed out that overhead lines workers can take advantage of the opportunity to travel the world – but recognise that this main ‘selling point’ of the role, is a major problem for UK businesses trying to retain, not lose skills.

“There is a real problem attracting young people into this role”

Employer, electricity sector

Peaks and troughs in the supply of the workforce

Feedback from employer interviews shows a trend towards losing skills in the form of people that migrate overseas to take advantage of more favourable working conditions and lifestyle (for example, in Australia). This is exacerbated by issues in attracting trainees into the role. The literature also points to an issue around peaks and troughs in the supply of the role. For example, high voltage overhead lines workers are required between the months of February and October for National Grid framework contracts, but outside of these times work is only available for low voltage distribution line. Furthermore there can be a loss of labour due to a 'substantial churn to more attractive locations', as well as the issue of the ageing workforce (MAC, 2015). The combination of these factors means that UK energy organisations are competing in a global market for experienced overhead lines workers, and there is a greater reliance on importing international skills to fill the gap in the UK marketplace.

Skills gaps

Analysis of secondary data suggests that 'substantial industry experience' is required to bolster qualifications in order for overhead lines workers to be considered fully skilled and competent. However, although skill levels have increased, respondents to the UK Government's partial review of its shortage occupation list, considered that overall, skill levels are not at the required standard (MAC, 2015).

Gender gap

The majority of employers reported that it can be very difficult to attract females to train as overhead lines workers. This was also indicated in the literature; for example in the recent review of the shortage occupation list one employer referred to recruitment programmes to boost the numbers of female employees (MAC, 2015). In light of the overall skills shortage in this role, a small number of respondents suggested that one potential option would be a dedicated recruitment campaign aimed at females.

Some recruitment of workers from overseas

Feedback from key informants and employers suggests that overhead lines workers are being recruited from overseas nations, in order to plug the skills gap in the UK.

For example, one project management and recruitment company in Wales is actively recruiting globally for qualified overhead lines workers, using a network of contacts based in countries such as Slovakia and Poland, to identify skilled and experienced individuals with proficiency in the English language. Existing legislation makes the process of recruiting and moving European workers to the UK relatively straightforward, and they can be accommodated close to the client, thus reducing the costs and time of travel. This saving can be passed to the clients. Therefore some employers question whether UK-based businesses may increasingly rely upon overseas workers who may offer a more cost-effective solution to the skills shortage.

However, the literature suggests that there are not large volumes of trained and competent workers available in other countries, due to a global demand for overhead lines workers, and that lack of proficiency in the English language could be a health and safety risk (MAC, 2015).

Potential solutions

One potential solution to plugging the skills gap has been developed through the Energy and Efficiency Industrial Partnership (EEIP). A bespoke programme has been designed which is aimed at retraining the long-term unemployed and ex-offenders to become overhead lines workers.

Due to procurement issues this project is on hold and has not yet commenced delivery, however is intended to offer opportunities to individuals combining theoretical skills with on the job training over a six-month period. Skills development will span softer skills with practical ability, including:

- literacy and numeracy assessment;
- working at height;
- use of hand tools.

Whilst training on the job, individuals will receive induction, mentoring and employability skills, whilst concurrently continuing to receive out of work benefits. Furthermore upon completion, a guaranteed six-month paid placement will be provided by an employer, in order to complete overhead lines worker full training.

4.15 Chapter conclusion

Evidence from primary and secondary data points to skills shortages that are prevalent across the key occupations considered. Peaks and troughs in demand can contribute to instability within the supply of the workforce, particularly where work is dictated by seasonal requirements, such as that of the overhead lines worker.

With competition for skilled and knowledgeable workers from other sectors and nations, as well as an ageing workforce, respondents consider it is important to promote career opportunities to young people and new entrants. They also note that this would need to involve strategies to overturn any negative perceptions of working in this sector, as well as educate people about the diversity of career opportunities, promotion and salary prospects.

As it will take some time to develop skills and experience to ensure the workforce is fully competent, respondents consider that the need to attract more people into this sector should be viewed as an urgent priority.

5 Future skills

Chapter summary

This chapter identifies likely changes for the energy sector, considering the key drivers, and how they are likely to impact skills and performance.

The energy sector is changing rapidly, underpinned by a vast range of new technologies and other drivers such as Government investment, energy efficiency targets and more sophisticated energy storage and management solutions.

The mix of skills required by the key occupations is also expected to evolve, with greater emphasis placed on both technical skills such as data analytics; ‘softer’ skills such as people management; and knowledge of the latest technologies as they become mainstream.

Respondents anticipate that the main risk for the future of the sector will continue to be skills shortages and overall impact for workforce supply. A number of employers are already starting to tackle this challenge through innovative approaches to recruitment.

5.1 Key drivers of change affecting the sector

“In the energy industry, the only certainty is change”

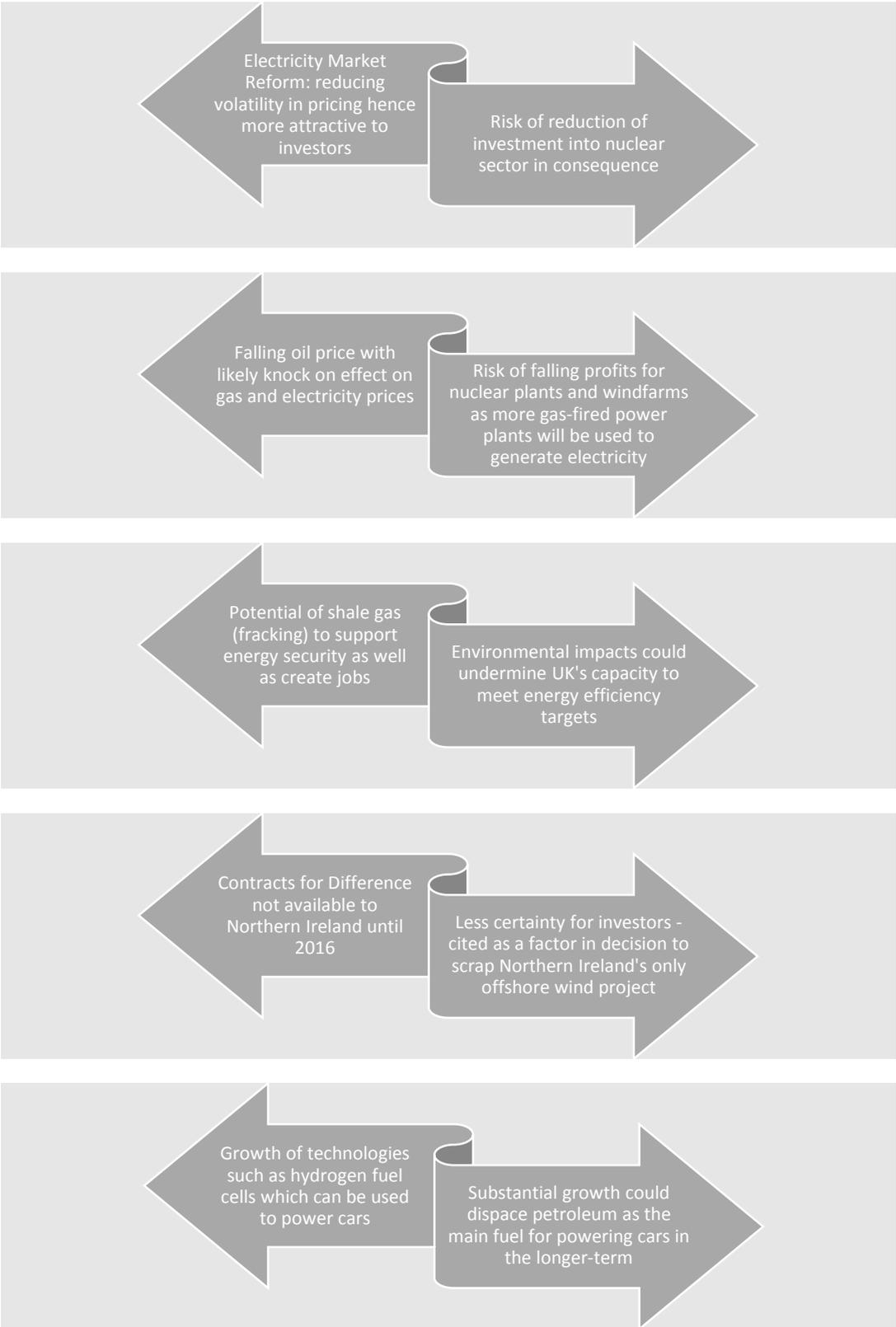
Employer, electricity and gas sector

A wide range of competing factors are expected to have an impact on the energy sector over the next ten years or so. Figure 5.1 illustrates the key drivers of change that are expected to drive developments in the energy sector up to 2025. Some drivers are conflicting, for example competition across different sub-sectors, whereas others are mutually reinforcing. In particular technology and economic factors are closely interlinked: technological development is driven by investment, but substantial investment will typically only be made where there is some assurance of a return i.e. into ‘proven’ technologies. The impact of these changes on skills and workforce challenges are discussed in section 5.2 below.

Figure 5.1 Key drivers of change affecting the energy sector

Policy & Legislation	Economy
<p>Electricity Market Reform (EMR)</p> <p>Transition to Contracts for Difference (CfD)</p> <p>Energy Savings Opportunity Scheme (ESOS)</p> <p>Uncertainties due to changes in policy over the years</p> <p>General Election: uncertain political position beyond 2015</p> <p>Impacts for Scotland following the referendum not yet fully known</p> <p>EU energy efficiency targets (2020 and 2030)</p> <p>UK and devolved nation energy efficiency targets</p> <p>Potential of nuclear power to significantly contribute to reduction in carbon emissions and thus meet policy targets</p> <p>The need for energy security</p>	<p>Investment:</p> <ul style="list-style-type: none"> - £110 billion investment necessary to upgrade the grid by 2020 - Interconnection project investment - Ageing assets in oil & gas prompting greater investment into safety - New build nuclear sites investment - CfD intended to reduce volatility in electricity prices and thus reduce risk for investors into renewable technologies <p>Energy sector a high generator of tax revenue</p> <p>Decommissioning work to increase, offering commercial opportunities for businesses</p> <p>Fiscal regime e.g. tax relief offered for decommissioning projects</p> <p>Oil price reduction and inflation of wages; reduced investment into new sales and exploration due to the low price of oil</p> <p>Concerns of risks of investment into unproven technologies affecting renewables in particular</p> <p>Potential for job creation, but scale unknown</p>
Society & Environment	Technology
<p>Rising energy prices coupled with the issue of fuel poverty and a need to improve energy efficiency of the existing housing stock</p> <p>Increasing demand for energy yet constraints on fossil fuels</p> <p>More competitive market: new entrants in both energy supply and generation</p> <p>Closure of existing nuclear plants may result in a gap in generation capacity</p> <p>Reduction in oil & gas production of around 50 per cent since 1999: a need to improve recovery techniques but production efficiency falling</p> <p>Natural resources to be harnessed, especially in Wales and Scotland</p> <p>Concern about environmental impacts resulting in behavioural change e.g. switch to electric vehicles (although not expected to be mainstream for many years)</p> <p>Risk of natural disaster e.g. Fukushima nuclear collapse of 2011</p>	<p>On-going growth in renewables capacity with high levels of activity planned for offshore wind</p> <p>Expansion of smart grid and smart metering</p> <p>Rapid technological developments e.g. fuel cells, cheap and accessible energy storage solutions, lithium-ion batteries and sodium batteries etc.</p> <p>Technology such as smartphones a potential catalyst for increasing energy consumption</p> <p>Growing interest in potential of other key areas such as shale gas and carbon capture and storage</p> <p>Focus on developing technology to enhance recovery techniques in oil and gas</p>

Figure 5.2 'Push and pull' factors: competing interests and drivers across the energy sub-sectors



5.2 Impact of drivers of change upon future workforce and skills challenges

5.3 Sector-wide changes and impacts

Sector job roles and the skills, qualifications and training required to fulfil them will change over the next decade. By 2025, it is likely that the skills mix required in the key occupations will have changed, in response to issues such as the need to understand and adopt 'green' energy, implement effective energy storage solutions, and buy and sell different types of energy in new ways.

Just over two-thirds of employers interviewed reported an increasing need across all occupations for stronger people management and communication skills. There is also an emerging trend for a greater need for specific technical skills, as technology becomes more specialised. For example in the oil and gas sub-sector, the drilling function is now split into 10 to 15 different components.

“In the future we will need highly technical skills – it will be all about specialisations within specialisations”

Employer, oil and gas sector

Policy developments will be a key catalyst of change, and could affect the appetite for up-skilling and training in either a positive or negative way, depending on the nature of the strategy. For example about two thirds of employers interviewed in the renewables sector are somewhat cautious when it comes to investment into skills, training and development of existing employees, as well as recruitment of trainees and apprentices, as their pipeline of work is reliant on a stable policy landscape.

As another example, the impact of the introduction of the Energy Savings Opportunity Scheme (ESOS) is as yet unknown, but key informants suggest that it could result in a need for more widespread knowledge and understanding of energy efficiency, which could in turn prompt investment into energy management skills and training across the sector.

New build nuclear power plants that will operate from 2018 are likely to be more sophisticated, and could make greater use of carbon capture and storage technologies. This will change the skillset required to operate and maintain power stations – and could present a further risk to the sector in the form of skills shortages (University of Birmingham, 2012).

5.4 How skills needs are expected to evolve - key occupations

It should be noted that the majority of respondents found it difficult to identify skills needs for the future in this sector, as the rapid pace of change makes it challenging to accurately predict the requirements.

Engineer

Feedback from the majority employers interviewed reveals that the mix of skills required of engineers is diversifying, with an increase in demand expected in the future for commercial skills (also noted by UKCES research in 2010) such as:

- project-schedule and cost management;
- systems and risk analysis skills;
- data analytics;
- communication and negotiation skills;
- knowledge of new technologies as they become mainstream, notably smart metering and smart grids.

The majority of key informants and employers acknowledged there is growing expectation that electrical engineers will have a wider understanding of engineering beyond their specialism in order to successfully work on collaborative projects.

One key informant suggested that this issue should be tackled at the student/graduate level to equip future electrical engineers with the range of skills required to manage large scale projects within a tight budget, as these are currently only gained through lengthy experience in the sector.

“All engineers need to understand how to reduce costs and make a project viable. New graduates need to be trained in cost effectiveness because they do not have the experience of working on sites so do not know how to cut costs as effectively”

Professor, oil and gas, Scottish University

Technician

The mix of skills needs is likely to evolve in response to the rapid pace of change in technology and innovation relevant to the sector. Just over half of employers interviewed noted that technician roles are likely to require skills in data analytics and IT, which historically would not have been particularly relevant.

Technicians will also be expected to maintain a detailed knowledge of relevant technologies as they emerge. Technical skills in smart grids and smart metering will be crucial as these are rolled out more widely across the UK.

Project/change manager

Looking ahead to the future, the majority of employers interviewed anticipate a greater focus on an interdisciplinary approach, as well as a more commercial perspective applied to project management. Historically, there has not been as much need to understand how to deliver within budget and the impact of slippage on the overall economic and logistics of a project, but this is increasing in significance.

Sales and marketing manager

The wider landscape is far more complex than in previous years, meaning that skills in understanding and negotiating more multi-faceted contracts for sales managers are becoming increasingly vital. Furthermore the majority of respondents expect purchasing to evolve due to greater use of digital interfaces, which means IT skills are becoming more important for this role.

A third of respondents also noted that new entrants in both energy supply and generation will result in a more competitive energy market, giving consumers a wider choice of providers and potentially lower prices. For example, new entrants are expected to take advantage of smart energy technologies. This also highlights the on-going need for more technical ability within the sales and marketing skillset.

Overhead lines worker

It was more difficult to obtain detailed perspectives from respondents about likely changes to the overhead lines worker role. Around a fifth of respondents expect overhead lines workers will need to have a broader understanding of new technologies, notably smart grids and smart metering.

The evidence from the literature suggests that overhead lines workers will need to have a detailed knowledge of electrical engineering as well as some management skills, in light of a remit that includes supervision of junior and trainee lines workers (MAC, 2015).

5.5 Risks and opportunities

5.6 Workplace challenges and risks

Feedback from the literature and from the majority of interviews identifies a range of future risks.

“There’s a demographic time-bomb in the energy sector – this is a big, big challenge”

Employer, renewables sector

The most critical challenge identified for the future energy workforce is the shortage of skills. The majority of employers interviewed perceive that unless urgent action is taken, an already limited pool of talent will continue to diminish. This appears to be a two-fold problem, with senior people leaving the workforce at the top due to retirement, and not enough entrants coming in at the bottom

The ageing workforce poses a challenge to the workforce supply in the coming years. Key informants suggest that heavy reliance on overseas workers and competition for skills could result in ‘wage wars’. A substantial shortage of project managers, engineers, technicians and overhead lines workers could present an issue for the UK’s ability to manage new build power stations as well as the effective maintenance of existing facilities. Furthermore an increasingly mobile workforce employed on short-term contracts may be more expensive for employers, and may also undermine the take up of training and up-skilling in the sector, as employers are more reluctant to invest in people that will not stay with their business over the longer-term.

Whilst it is positive that the sector has recognised the shortage of experienced and skilled individuals, and is considering how to resolve this issue, a further risk is that organisations and sub-sectors are working on this in silos and potentially duplicating effort.

5.7 Opportunities and potential solutions – tackling recruitment issues

“It is a finite market place so we face competition for the best people. Skills shortages and gaps are a constant reality”

Employer, nuclear sector

Employers report that it is difficult to attract new entrants to the sector. However, work is being undertaken to reverse this, with some highly innovative examples of approaches taken to engage students. Furthermore there is an opportunity linked to the cyclical nature of demand in different parts of the sector. Peaks and troughs in demand in one sub-sector could increase the supply of skills from one sub-sector into another.

Engineer

Feedback from employers interviewed reveals that the sector has responded to recruitment challenges by turning its focus on young and aspiring engineers. Rather than compete for the constricted supply of experienced workers, many employers are instead taking on apprentices and providing comprehensive in-house training.

This approach enables them to mould and develop their own electrical engineers with a skillset that will meet their specific company needs, whilst concurrently developing experience in the energy sector. However, health and safety regulations limit under-18s access to power facilities can often delay apprentices' training, thereby increasing the overall investment cost to the employer.

One respondent from a large nuclear energy organisation described how they encourage their electrical engineering apprentices to pursue further training and chartered status:

“Apprentices can go for EngTech status – this is a status that the institutes have brought into to recognise competence at this level - they can then move up to the Incorporated Engineer status (BEng level), and then Chartered Status (MEng level)”

Employer, nuclear sector

Around three-quarters of employers stated that they simply have to offer higher salaries in order to get the people they need. However not all employers are in a position to offer higher wages to attract the right people, and so try to be more innovative when it comes to the benefits package. For example this might include one or more of a ‘golden hello’, generous relocation package and an offer to pay for chartered professional membership and qualifications.

“We have to offer over the odds to reward experienced engineers”

Employer, nuclear sector

Around 10 per cent of employers also report that they are working with dedicated recruiters that become preferred suppliers – so they get a comprehensive understanding of their needs. In some cases (examples were cited particularly in nuclear which has issues in attracting people to more rural locations), recruiters are specifically targeting areas with high unemployment and offering packages for people who will then live away from home during the week.

One way the oil and gas sub-sector has sought to resolve its recruitment problem is by recruiting from outside the sector. Engineers from the military (HM Government, 2013a) are a well-documented source of skills, knowledge and experience of working in challenging, fast-paced environments. However, these recruits do not possess the desired sectorial knowledge and experience, and consequently employers must provide the necessary training to equip them with the skills needed to operate in the energy sector.

Another employer in the electricity sector is in the process of developing a coaching/mentoring scheme within the business to transfer skills from older employees to younger, entry-level employees. This is being done on an informal level through shadowing and short meetings.

Installation technician

Respondents report that employers are attempting to resolve future workplace challenges in a number of different ways. One employer reported that they specifically look to recruit graduates with lower level engineering degrees and train them in-house as technicians. In addition, a number of training courses and apprenticeships have also been launched to attract students to the installation technician occupation.

Northern Ireland Electricity has expanded its portfolio of apprenticeships and graduate schemes and included added benefits such as scholarships of up to £14,000 per student (Department for Employment and Learning, 2011). Specialist 'Wind Turbine Operation and Maintenance' apprenticeships targeting aspiring renewable technology installation technicians, and 'Upstream Oil and Gas Technician' training programmes have also recently been set up by the Scottish Government in collaboration with employers (Scottish Government, 2013b).

Another employer interviewed described how they have tried to resolve this issue by contributing to the development of training courses providing students with the technical skills and safety knowledge required in the installation technician role.

Renewable energies technician

One possible solution is to increase the quantity of renewables focused training available, which would have a knock-on effect of raising awareness of the opportunities in the renewables sub-sector, and in turn generating a higher number of qualified renewables technicians.

New apprenticeship schemes have already been established for on and off-shore wind turbine technician roles with the intention of plugging the gaps in current training provision.

Similarly, in the wake of the growing 'electrification' of heating and subsequent decline in the demand for gas, respondents suggested that retraining the current gas installer and technician workforce to broaden their knowledge and understanding to include renewables technology could bolster the skills supply of the renewables sub-sector.

One employer explained how they were trying to resolve this issue by relocating their regional and satellite offices to locations where there is a pre-existing supply of the required skills. Several employers and key informants referred to Scotland's natural supply of technician and engineering skills accrued through work in the oil and gas sector which can be used on renewables sector project such as off-shore wind farms.

Another large renewables business is targeting students in their second year by offering up some of their own employees to go and teach seminars in universities. An electricity and gas employer has set up a leadership competition to attract students with a lucrative prize – with an underlying objective of identifying the best potential graduates to recruit.

The Scottish Government in particular has committed to investing in renewables specific skills development. In addition respondents state that a greater number of renewables apprenticeships are being established to strengthen the UK's future supply of renewable technicians.

Project/change manager

Coming up with viable strategies to recruit talented project managers is high on the agenda for many energy employers, from SMEs to large corporate organisations. Several respondents commented that they simply have to find more money to retain the right people, or try to tie them into longer contracts (which can be an expensive option). This has partly come about as employers acknowledge they have been slow in recognising the project manager role as one that is required for the energy sector¹⁷.

“We’ve been slow in identifying the need for this level of skilled Project Manager – we’re catching up, and now we are competing against non-energy businesses too”

Employer, nuclear sector

“We’re catching up with the increased importance but we’re not there yet”

Employer, electricity sector

Where possible employers interviewed are trying to find ways to enable mobility without permanent relocation – for example allowing project managers to work from home and live away perhaps only for two rather than four or five days per week.

One example of a longer-term approach to recruit and sustain a pipeline of skilled project managers is in the nuclear sector. One large employer is working with a dedicated Project Academy, which is recruiting apprentices, and has a long-term goal to develop project management capability and a related apprenticeship framework.

Overhead lines worker

There has already been progress in Scotland to address future skills shortages for overhead lines workers, as a result of funding made available through the Energy Skills Challenge Fund, as the following case study illustrates:

¹⁷ There is less evidence in the secondary data about this role specifically in the context of the energy sector, compared with other key occupations

Case study: use of dedicated Government funding to support training and job creation opportunities for overhead lines workers in Scotland

The Scottish Government, through its Energy Skills Challenge Fund, is providing dedicated investment to bridge skills gaps in the energy sector. Two colleges, Forth Valley and Dumfries and Galloway, are working with employers such as Scottish Power, to offer a training course for unemployed people to become overhead lines workers. To be eligible, individuals must be unemployed and have some trade skills.

Employers manage the recruitment process in conjunction with Job Centres, whereupon individuals are selected to complete a training course comprising 10 weeks of theoretical skills and knowledge taught in a classroom, combined with seven weeks of practical on-site training. Students are subject to regular reviews, and those that pass the course are guaranteed a permanent job with the employer.

To date Dumfries and Galloway College has run four courses, which have equipped all participants with a Level two City & Guilds qualification, which is based on National Occupational Standards (NOS), which employers need from their overhead lines workers. The model has been very successful, with all participants securing the job upon completion of the training. Each course can take between 12 and 16 students.

Funding is managed through Skills Development Scotland, and employers make in-kind contributions, such as the provision of equipment for training purposes.

5.8 Chapter conclusion

Respondents perceive that the energy sector will continue to experience rapid change, predominantly in response to technological advances. These are expected to impact on skills and training needs, for example resulting in a growing requirement for more technical skills to install new energy management systems. However respondents also acknowledged that it can be more difficult to look ahead and plan for the future, in light of current skills shortages and a need to focus on strategies to recruit the hard to fill vacancies across the key occupations.

A number of employers have developed and implemented innovative solutions to try and plug skills shortages. However on the whole it appears that such activity is taking place in silos, rather than the sector working together to try and tackle the issues. The Energy and Efficiency Industrial Partnership can play an important role here in developing collaborative initiatives across the sector.

6 Current and future interest in occupational standards

Chapter summary

This chapter covers National Occupational Standards (NOS); the extent to which they are used and valued; and the level of interest in developing new, high quality standards among respondents to this research.

The majority of employers in the energy sector have some familiarity with NOS, but typically only larger employers with HR teams have a comprehensive knowledge of their purpose and how to use them.

However employers are typically making indirect use of NOS, without necessarily being aware that they are doing so – for example through competency frameworks developed by Sector Skills Councils based on NOS.

NOS developed for the energy sector can be considered too generic, and the majority of employers appear more inclined to support development of new standards if these closely reflect sub-sector specific contexts and keep up with rapid change.

6.1 Overview of existing National Occupational Standards

National Occupational Standards describe the knowledge, skills and understanding an individual needs to be competent at a job. They are UK-wide, demand-led, evidence-based benchmarks of competent performance which underpin vocational learning and development, apprenticeships and qualifications across all sectors, occupations and parts of the UK.

NOS can be used in many different ways. For example:

- awarding bodies can use NOS to create qualifications (including those used in Apprenticeships) to train individuals for a job;
- employers can use them create a job description to recruit new staff or a training plan to develop their skills;
- individuals can research and identify different types of jobs which match their skills and experience.

The vision for NOS is to ensure they are employer demand driven and based on informed analysis of current and future labour market need. UKCES is working with networks of employers (including through professional bodies, sector skills organisations and industrial partnerships) to ensure that NOS articulate the ambition and aspiration of their workforces clearly and effectively.

6.2 NOS across the energy sector

Desk-based research identified 27 NOS suites of direct relevance to the sector (Table 6.1)¹⁸. A more comprehensive summary of the NOS coverage is in Appendix C.

Table 6.1 NOS coverage within the energy sector

Developing body	NOS suites	Number of NOS	Sub-sector or key occupation
Cogent	Safety services oil and gas extraction	10	Oil and gas
Cogent	Offshore elected safety reps	7	Oil and gas
Cogent	Nuclear decommissioning	23	Nuclear
Cogent	Safety case preparation	22	Nuclear
Cogent	Nuclear material accountancy & safeguards	14	Nuclear
Cogent	Nuclear operations	12	Nuclear
Cogent	Nuclear reactors	3	Nuclear
Cogent	Process engineering maintenance	6	Engineers & technicians
ECITB	Maintaining plant & systems; electrical	15	Engineers & technicians
ECITB	Maintaining plant & systems; mechanical	12	Engineers & technicians
ECITB	Maintaining plant & systems; instrument and controls	13	Nuclear
Energy & Utility Skills	Electricity power utilities	33	Electricity
Energy & Utility Skills	Electricity network control engineer	16	Electricity
Energy & Utility Skills	Downstream gas	44	Electricity and gas
Energy & Utility Skills	Multi-utility network construction	31	Electricity and gas
Energy & Utility Skills	Network construction operations	30	Electricity and gas
Energy & Utility Skills	Gas network operations	28	Engineers, project managers & technicians
Energy & Utility Skills	Gas networks engineering	28	Engineers, project managers & technicians
Energy & Utility Skills	LPG installation and maintenance; industrial and commercial installation and maintenance	22	Engineers, project managers & technicians

¹⁸ Based on a NOS Directory search (<http://nos.ukces.org.uk>) using the following key search terms: 'oil and gas', 'nuclear', 'renewables', 'energy efficiency', 'electricity' and 'energy'. Suites which were not sector-specific have not been included in the overall total

Energy & Utility Skills	Gas network construction	18	Engineers, project managers & technicians
Energy & Utility Skills	Wind turbines	8	Renewable energies technician and engineers
Energy & Utility Skills	Building services engineering technology and project management	6	Engineers, project managers & technicians
Semta	Installation and commissioning suite 3	21	Oil and gas
Semta	Engineering maintenance & installation suite 2	16	Engineers & technicians
Semta	Engineering maintenance suite 3	11	Engineers & technicians
Summit Skills	Electrotechnical	4	Technicians
Semta	Engineering & manufacturing suite 4	22	Engineers, project managers & technicians

This mapping exercise has identified potential gaps in NOS coverage for sales and marketing managers, and project/change managers. These key occupations are covered by NOS in relation to the specific typical functions that are undertaken. However, what is missing is the energy-specific context, and in particular, drilling down to sub-sector level.

Around a third of employers interviewed also suggested that there may be some gaps for the engineering and technician roles in the energy sector, as a result of the changing natures of the industry and specifically the emergence of new technologies. Key informants questioned whether NOS are developed from scratch or updated quickly enough to keep up with this pace of change.

6.3 Employer familiarity with National Occupational Standards (NOS)

The majority of employers interviewed have heard of NOS, however smaller employers tend to have limited actual knowledge and understanding of what they are.

“(It is) a term we come across a lot but do not necessarily understand”

Employer (SME), nuclear sector

Larger employers typically with bigger HR departments, are far more familiar with NOS and in many cases have been approached to, or have actually, contributed to their development.

6.4 Current use of and value attached to National Occupational Standards (NOS)

Competency frameworks based on NOS

The majority of employers interviewed typically assess their staff against a competency framework. This might be a bespoke structure developed to meet specific organisation needs, or a more sector-specific overarching standard.

For example, 30 per cent of employers interviewed in the nuclear sector stated that they use competency standard frameworks developed by Cogent and the Engineering Construction Industry Training Board (ECITB), and use these as a basis for undertaking training gap analyses.

“If there are any gaps then we make arrangements to resolve these gaps to get people to the required levels in these areas”

Employer, electricity and gas sector

One employer stated that they were in the process of developing their own competency framework, in addition to using a range of competency framework from organisations such as the National Skills Academy and Civil service frameworks.

“We go to the key players first and if necessary tailor their frameworks so they suit our needs”

Employer, nuclear sector

Around 10 per cent of the organisations that report using sector skills council competency frameworks, stated that they had never heard of NOS. This indicates where NOS may be ‘hidden’ to employers, given that such frameworks and industry standards are typically structured using NOS as the nucleus.

Feedback from just over a quarter of employers interviewed suggests a reliance on professional bodies that have these frameworks based on NOS already in place, rather than extensive direct interface between employers and the actual NOS. Even larger employers that had supported NOS development were not always aware that NOS had been used to frame sector-wide competency frameworks.

Employers using competency frameworks based on NOS consider these to be very useful, and are “*relied upon*”.

Feedback from the key informant interviews indicates that a lot of time is being spent on competency standard development. However around half of employers indicate that this is often undertaken in silos rather than collectively, in order to address company-specific, rather than sector-specific needs. The sector skills council, EU Skills, is seeking to set up a competency accord to provide greater commonality.

Qualifications based on NOS

Given the sector is so highly regulated, making health and safety a primary concern, it can often be the case that training provided in one organisation, is not accepted as fit for purpose by another. This means that qualifications based on NOS are not always as highly valued as in-house training. A lot of in-house 'top up' training is offered which is non-accredited, but specific to individual employer needs. NOS are used in the development of technical and vocational qualifications such as those used in apprenticeships, but employers who are not involved in the development of these qualifications may be unaware of this.

NOS considered too generic to meet specific needs

"NOS are not useful to our specific organisation. We have our own specific internal way of achieving what we need from our employees"

Employer, electricity sector

Approximately two-thirds of the employers interviewed stated that NOS are not widely used, as they are too generic and do not meet business-specific needs.

"The vast majority of roles we recruit are so specialised that NOS is pointless"

Employer, oil and gas sector

Key informants stated that as occupations in the energy sector become more specialist and technical, with the need to maintain strong knowledge and understanding of emerging technologies, the likelihood is that NOS in their existing structure will not meet business needs.

"They (NOS) are hard to use as they are 'one size fits all' and do not meet the needs of our business"

Employer, nuclear sector

Nation differences

Feedback from the majority of employers and key informants indicates that there is far greater awareness, understanding of and value attached to NOS in the devolved nations than there is in England. Respondents based in Scotland attached discernibly more value to NOS than employers in other UK nations. For example a quarter of the Scotland based employers interviewed had taken part in activities to develop NOS, and were using them for multiple purposes including for training needs analyses and development planning.

Other uses of NOS in the energy sector

Around 10 per cent of respondents that had not previously heard of NOS considered that they would “*probably find them beneficial*”. Other common areas where the majority of employers considered that NOS are useful include:

Assessing qualification needs;

Defining core skills needs; and

Being able to recognise individual competency.

One organisation has used NOS for supplementing training modules but felt overall “*their usefulness depends upon the job role*”, with more practical, hands on roles being more readily aligned with NOS.

Case study: use of NOS in the renewables sector to define core skills and training needs

One employer in the renewables sector has used NOS to define the base skills needs of all of the business’ occupations, from trainee to more senior roles.

The NOS have been very useful as the main starting point from which to define competence, skills and knowledge needs, and they have also helped the employer to identify gaps in existing skillsets, and appropriate training and qualifications to fill these gaps.

“If NOS didn’t exist, we would have had to have invented them”

To supplement the existing information within the NOS, this employer has developed contextual sector skills and knowledge requirements, which are used alongside the functional standards. If it was possible to add a sector-specific context to the NOS, this employer would find them even more helpful.

This employer is currently working with the Sector Skills Council to support future standards development, and considers that a strategy to create higher-level standards would be a highly constructive way forward for the energy sector.

Data from other sources

The 2014 UKCES Employer Perspectives Survey (EPS) included questions about awareness and usage of NOS. The results indicate that employer engagement with NOS is limited, with 60 per cent of respondents stating that they have no awareness of them at all, and the second most common response (21 per cent) being awareness of NOS but with no understanding of what they are.

EPS data found that employers who provide training are more likely to have knowledge of NOS than their counterparts (21 per cent versus 12 per cent), although only 12 per cent of all employers who provide training actually use NOS.

The survey results suggest that usage of NOS is relatively limited, even in scenarios where they might be expected to be helpful. Of the respondents who recruited to a vacancy in the past 12 months, only eight per cent use NOS to develop job descriptions or recruitment criteria. Amongst those employers who provide training, nine per cent use NOS to develop training plans.

Ten per cent of sector employers stated that they use NOS in any way. Amongst those who stated that they use NOS, the most common usages are to develop training plans (70 per cent), undertake staff appraisals or performance management (64 per cent), and to develop job descriptions or recruitment criteria (62 per cent). However, employers may be using NOS or products based on NOS without being aware that they are linked to NOS. For example, the UK Commission's Employer Perspectives Survey shows that 82 per cent of UK employers offering formal Apprenticeships in 2014 stated that they did not use NOS, when elements of all of these Apprenticeships were based on NOS.

6.5 Future interest in National Occupational Standards (NOS) and potential improvements

The majority of organisations emphasised the need to promote NOS and to improve their accessibility.

“Make them (NOS) more accessible or easier to understand so more small organisations can use them”

Employer, nuclear sector

Two-thirds of employers interviewed appear open-minded to the prospect of developing new high quality occupational standards. However they would need to be strongly convinced that there was a benefit to them as a business of doing so.

One organisation felt that large companies typically have more time and resource available to input into NOS development, whereas smaller companies are somewhat unrepresented.

The main improvements to NOS that employers suggest are to:

- make them more sector-specific, including by sub-sector, not just the energy sector as a whole;
- make them more accessible: improve the search facility of a more user-friendly NOS directory; promote them so that employers are aware of them; and make the standards themselves easy to read and digest;
- develop and circulate them more quickly, especially when new technologies or new occupations emerge as a result of rapid changes in the sector.

6.6 Chapter conclusion

Although awareness levels of NOS appear to be somewhat low among employers in the energy sector, there may be greater indirect use of NOS through for example competency frameworks developed for the sector which are based on these standards.

Large employers appear more likely to know about and understand NOS, prompting greater use of them, and this suggests there may be an opportunity to educate smaller employers about how to access and make use of them.

Employers in the sector can perceive that NOS are too generic to meet specific sub-sector needs, and this is partially attributed to the rapid change in the sector, making it difficult to NOS to keep up. However if new higher-level NOS were more readily accessible and developed more quickly in response to sector change, employers consider that they may be more interested in making use of them, as well as supporting their development.

7 Conclusions

Sector outlook

The differences between sub-sectors in the energy industry as a whole means that the sector outlook for jobs, skills and training is mixed. For example substantial job creation is forecast in the electricity sector as a result of Electricity Market Reform (EMR) bolstered by major investment into smart metering infrastructure. However the falling oil price is undermining job stability in the oil and gas sector.

Employers and key informants report that multiple drivers of change can quickly affect prospects in the sector, contributing to a sense of instability. This has been a key factor for limited succession planning within many UK energy businesses, and was viewed by some employers as a barrier for longer-term workforce planning and up-skilling.

Current workforce and skills challenges

Although the energy sector offers a range of well-paid occupations with good progression prospects, it is clear that employers perceive substantial skills shortages for all of the key occupations, largely as a result of:

- competition for skills between sub-sector as well as from other sectors, which can be more visible and appealing to graduates;
- skilled and experienced workers migrating overseas, where working conditions and the lifestyle may be more attractive;
- limited numbers of STEM graduates entering the sector;
- a negative perception of some of the energy sub-sectors among young people;
- poor visibility and consequently interest in the energy sector as a career prospect among young people and potential new entrants from other industries;
- an ageing workforce.

Future workforce and skills challenges

The main challenge facing the energy workforce in the future is on-going skills shortages. This is likely to be exacerbated by a growing shift towards contract work rather than direct employment.

A number of innovative solutions have been developed by individual employers to try and tackle recruitment problems. However there is a need for the sector to work collectively to address the problems rather than in silos.

The required skills mix is expected to evolve in the future, requiring more technical skills such as data analytics, as well as knowledge of new technologies as they emerge. There is a vital need for occupational standards and qualifications to keep up with such rapid sector developments to ensure the workforce has the necessary skills.

Many employers, although requiring a core set of qualifications depending on the occupation, also rely on in-house training to add contextual detail appropriate to the needs of their business.

Current and future interest in occupational standards

Many employers make indirect use of National Occupational Standards without necessarily being aware of the standards themselves – for example via competency frameworks developed by Sector Skills Councils. Employers are more likely to be interested in higher-level standards if these are more sub-sector specific, address gaps in coverage, are quickly updated and made readily accessible.

Research recommendations

Given the urgency of the skills shortage, a collective and collaborative sector-wide approach that brings key employers together to tackle the issues, is strongly recommended. This would work effectively within the remit of the existing employer-led Energy and Efficiency Industrial Partnership (EEIP).

This collective would subsequently be in a position to support and input into the development of relevant higher-level occupational standards, to more closely reflect specific sector needs and address existing gaps in coverage.

In addition, collaboration between highly experienced workers and new entrants to the sector could be facilitated by internal mentoring, which may be a useful means of cascading skills and knowledge from the ageing workforce on the verge of retirement.

A further objective which already closely aligns with the strategy of the EEIP, would be to encourage stronger links and collaboration between industry and academia, enabling the latter to design qualifications and training that better meets the needs of employers. A useful model to adopt could be that of the Nuclear Technology Education Consortium (NTEC) described in Chapter Three. This type of collaboration could also be a means of helping to promote careers in the energy sector to young people whilst still in education.

Funding to support training schemes to increase the supply of these ‘endangered’ yet critical key occupations is also recommended, adopting a similar model used in Scotland for their overhead lines worker training initiative.

In view of the peaks and troughs of supply and demand within the energy sector workforce, enabling mechanisms to facilitate cross-fertilisation and channel the flow of skills between sub-sectors, would help ensure that experienced workers are not lost from the sector for good. This would need to be underpinned by greater collaboration and knowledge sharing between the sub-sectors, for example in the form of a “clearing house” for those that lose their job in one sub-sector, to place them into another.

In addition support could be offered with career transitions to recruit those with readily transferrable skills into the energy sector – such as ex-military personnel. This may also necessitate development of new occupational standards to support with conversion of skills and knowledge.

Finally it will be important to improve careers information to enhance visibility of energy sector occupations and prospects among young people and women, and those that could transfer from other industries. At sector level, this may be assisted through the provision of funding for work placements and traineeships, which could be facilitated by the EEIP. At a more strategic national level, it will be important for the sector to collaborate with the National Careers Service, as well as ensure that sufficient data are available for consultation on the online portal for informing career decisions, (Labour Market Information) LMI for all¹⁹.

¹⁹ <http://www.lmiforall.org.uk/>

Appendix A – Key occupations mapped to SOC codes

The key occupations listed above have been mapped to SOC codes as follows:

Table 8.1 Key occupations mapped to SOC code

4-digit SOC code	Key occupation (overarching)	Key occupation (specifics)
2123 – electrical engineers	Engineer	Electrical engineer Power system engineer
3113 – engineering technicians	Technician	Installation engineer
3112 – electrical and electronics technicians	Technician	
2142 – environment professionals	Technician	Renewable energies technician*
1123 – production managers and directors in mining and energy	Project or change manager	N/A
3545 – sales accounts and business development managers	Sales and marketing manager	N/A
5249 – electrical and electronic trades n.e.c.	Overhead lines worker	N/A

*Not an exact match – closest available and suggests there is a gap within the SOC coding system for renewable energies.

Appendix B – Regulation of the UK energy sector

Table 8.2 Regulation of the energy sector in the UK²⁰

Regulatory authority	Role
Department for Energy and Climate Change (DECC)	Policy-making Licencing oil and gas exploration and extraction Management of environmental impacts of offshore oil and gas, including decommissioning Awarding final consent for major energy specific infrastructure projects (following Planning Inspectorate consent)
Coal Authority	Licencing oil and gas coal exploration Management of environmental impacts of offshore oil and gas
Office for Nuclear Regulation	Regulation of civil nuclear sites
Environment Agency	Management of environmental impacts of the nuclear sector, including decommissioning Management of environmental impacts of onshore oil and gas
Gas and Electricity Markets Authority	Governing body of Ofgem
Office for Gas and Electricity Markets (Ofgem)	Regulator of gas and electricity markets
Planning Inspectorate	Reviews applications for major infrastructure projects and advises DECC on giving consent

²⁰ HM Government (2014), *Policy: Providing regulation and licensing of energy industries and infrastructure*

Appendix C – National Occupational Standards (NOS) coverage in the UK energy sector

These suites were identified through the online NOS Directory (<http://nos.ukces.org.uk>) using key search terms: ‘oil and gas’, ‘nuclear’, ‘renewables’, ‘energy efficiency’, ‘electricity’ and ‘energy’. Not all the suites were directly relevant and so have not been included below.

Title of NOS suite	Installation and commissioning suite 3
Number of NOS	21
Developing body	Semta
Relevant sub-sector(s) or key occupation(s)	Oil and gas
Titles of NOS within this suite	
Installing instrumentation and control equipment Installing workplace environmental control equipment Installing fluid power equipment Commissioning engineered systems Installing environmental pollution control equipment Installing heating and ventilation equipment Installing emergency electrical power generation equipment Installing equipment to produce an engineered system Using engineering drawings and documents in installation and commissioning activities Commissioning environmental pollution control equipment and systems Installing hydraulic lift equipment Commissioning mechanical equipment and systems Commissioning fluid power equipment and systems Commissioning emergency electrical power generation equipment and systems	
Title of NOS suite	Engineering maintenance and installation suite 2
Number of NOS	16
Developing body	Semta
Relevant sub-sector(s) or key occupation(s)	Engineers and technicians
Titles of NOS within this suite	
Assisting in the installation of heating and ventilation equipment Assisting in the installation of instrumentation and control equipment Assisting in the installation of compressed air equipment Carrying out maintenance on emergency power generation equipment Carrying out fault location on mechanical equipment Carrying out fault location activities on assistive technology systems and equipment Assisting in the installation of environmental pollution control equipment Carrying out fault location on service systems and equipment Carrying out maintenance on environmental control equipment Carrying out scheduled maintenance tasks on service systems and equipment Carrying out scheduled maintenance activities on mechanical equipment Assisting in the installation of equipment to produce an engineered system Carrying out maintenance on air conditioning and ventilation equipment	

Title of NOS suite	Engineering maintenance suite 3
Number of NOS	11
Developing body	Semta
Relevant sub-sector(s) or key occupation(s)	Engineers and technicians
Titles of NOS within this suite	
<p>Assisting in the installation of instrumentation and control equipment</p> <p>Assisting in the installation of mechanical equipment</p> <p>Maintaining emergency power generation equipment</p> <p>Assisting in the installation of fluid power equipment</p> <p>Maintaining mechanical equipment within an engineered system</p> <p>Maintaining environmental control equipment</p> <p>Carrying out preventative planned maintenance on mechanical equipment</p> <p>Reading and extracting information from service drawings and specifications</p> <p>Assisting in the installation of engineering services equipment</p> <p>Maintaining fluid power equipment within an engineered system</p> <p>Assisting in the installation of equipment to produce an engineered system</p> <p>Maintaining workplace environmental control systems</p> <p>Carrying out fault diagnosis on fluid power equipment and circuits</p> <p>Carrying out preventative planned maintenance on fluid power equipment</p> <p>Carrying out preventative planned maintenance on engineered systems</p> <p>Maintaining gas distribution systems and equipment</p> <p>Maintaining compressed air systems and equipment</p> <p>Maintaining process control systems</p> <p>Carrying out preventative planned maintenance on services systems and equipment</p> <p>Carrying out preventative planned maintenance on electrical equipment</p> <p>Carrying out fault diagnosis on electronic equipment and circuits</p> <p>Maintaining instrumentation and control systems</p> <p>Maintaining electrical equipment within an engineered system</p> <p>Maintaining process controller equipment within an engineered system</p> <p>Maintaining emergency power generation equipment</p> <p>Carrying out fault diagnosis on communication-electronic systems</p> <p>Carrying out fault diagnosis on instrumentation and control equipment</p> <p>Maintaining instrumentation and control equipment and circuits</p> <p>Carrying out preventative planned maintenance on instrumentation and control</p> <p>Repairing/overhauling instrumentation and control equipment</p> <p>Assisting in the installation of electrical/electronic equipment</p> <p>Assisting in the installation of fluid power equipment</p> <p>Assisting in the installation of instrumentation and control equipment</p> <p>Maintaining fluid power equipment within an engineered system</p>	
Title of NOS suite	Process engineering maintenance
Number of NOS	6
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Engineers and technicians
Titles of NOS within this suite	
<p>Interpret detailed electrical information from technical sources</p> <p>Read and extract information from instrument and control engineering drawings and specifications</p> <p>Identify and suggest improvements to working practices and procedures whilst maintaining mechanical plant and equipment</p> <p>Identify and suggest improvements to working practices and procedures on electrical plant and equipment</p> <p>Reinstate the work area after completing the maintenance of process plant and equipment</p> <p>Reinstate the work area after completing the maintenance of process engineering plant and equipment</p>	

Title of NOS suite	Safety services oil and gas extraction
Number of NOS	10
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Oil and gas
Titles of NOS within this suite	
<p>Contribute to the health and safety of the working environment within safety services</p> <p>Contribute to maintaining the implementation of safety management systems within safety services</p> <p>Contribute to the reporting, investigation and follow-up of accidents and incidents with safety services</p> <p>Contribute to the planning and implementation of preventive and protective measures within safety services</p> <p>Establish and maintain effective working relationships within safety services</p> <p>Prepare and present demonstrations and information and provide advice to support learning within safety services</p> <p>Contribute to the effectiveness of work activities within safety services</p> <p>Provide information and advice to support a health and safety culture in the workplace within safety services</p> <p>Contribute to the maintenance of working environment to conform with statutory and organisational requirements within safety services</p> <p>Maintain the condition of engineering assets within safety services</p>	
Title of NOS suite	Offshore elected safety representatives
Number of NOS	7
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Oil and gas
Titles of NOS within this suite	
<p>Contribute to safety meetings and communicate outcomes in the offshore oil and gas industry</p> <p>Provide safety information to constituents in the offshore oil and gas industry</p> <p>Investigate incidents and distribute lessons learned in the offshore oil and gas industry</p> <p>Represent constituents in discussion with employers in the offshore oil and gas industry</p> <p>Conduct inspections and audits in the offshore oil and gas industry</p> <p>Accept the role and develop yourself as a safety representative in the offshore oil and gas industry</p> <p>Carry out risk assessments and understand control measures in the offshore oil and gas industry</p>	
Title of NOS suite	Electrotechnical
Number of NOS	4
Developing body	Summit Skills
Relevant sub-sector(s) or key occupation(s)	Technicians
Titles of NOS within this suite	
<p>Install enclosures for electrical cables, conductors and wiring systems</p> <p>Inspect and test electrical systems and equipment</p> <p>Install and connect electrical cables, conductors, wiring systems and equipment</p> <p>Maintain electrical systems and equipment</p>	
Title of NOS suite	Nuclear decommissioning
Number of NOS	23
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Nuclear
Titles of NOS within this suite	
<p>Carry out planned preventative maintenance procedures on equipment used in nuclear decommissioning</p> <p>Assemble equipment to aid nuclear decommissioning</p> <p>Dismantle equipment used in nuclear decommissioning</p> <p>Adjust equipment used in nuclear decommissioning to meet operational requirements</p> <p>Contribute to technical leadership on nuclear decommissioning activities</p> <p>Operate remote controlled equipment for use in nuclear decommissioning</p> <p>Dismantle contaminated plant, structures and equipment used with nuclear facilities</p> <p>Supervise radiation-related work activities</p> <p>Prepare Alpha radiation/contamination controlled work areas</p> <p>Minimise and package radioactive waste</p> <p>Provide operational monitoring assistance</p>	

<p>Implement safe access systems in a radiation/contamination controlled environment Prepare engineering equipment for use in a radiation/contamination controlled environment Monitor operational radiological conditions Check radiological monitoring instruments and equipment are in good order Undertake decontamination operations Enable learning through demonstrations and instruction Enable individual learning through coaching Deal with variations and defects in electrical plant and equipment Identify and minimise hazards and risks Ensure health and safety requirements are met in your area of responsibility Allocate and check work in your team Assess candidates using a range of methods</p>	
Title of NOS suite	Safety case preparation
Number of NOS	22
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Nuclear
Titles of NOS within this suite	
<p>Monitor compliance with nuclear safety cases Verify evidence for nuclear safety cases Review nuclear safety cases during operation Obtain contextual information for nuclear safety cases Identify methods to control identified nuclear safety risks Provide risk assessments for nuclear safety cases Provide frequency assessments for nuclear safety cases Provide information and advice on nuclear safety cases Provide training for the implementation of nuclear safety cases Establish the scope of nuclear safety cases Provide deterministic assessments for nuclear safety cases Present nuclear safety cases for review and approval Design training programmes for the implementation of nuclear safety cases Provide consequence assessments for nuclear safety cases Identify residual safety risks in nuclear safety cases Manage review and approval procedures for nuclear safety cases Write technical content for inclusion in nuclear safety cases Develop safety claims for use in nuclear safety cases Assign the production of evidence for nuclear safety cases Peer review nuclear safety cases during review and approval procedures Plan and coordinate the preparation of nuclear safety cases Liaise with stakeholders directly involved with the safety</p>	
Title of NOS suite	Maintaining plant and systems; electrical
Number of NOS	15
Developing body	ECITB
Relevant sub-sector(s) or key occupation(s)	Engineers and technicians
Titles of NOS within this suite	
<p>Hand over plant and equipment Repair components of electrical plant and equipment to operational condition Remove components from electrical plant and equipment Dismantle electrical plant and equipment Adjust electrical plant and equipment to meet operating requirements Monitor the performance and condition of electrical plant and equipment Establish that an engineering maintenance process has been completed to specification Position and install electrical plant and equipment Carry out planned maintenance procedures on electrical plant and equipment Replace components in electrical plant and equipment Assemble components of electrical plant and equipment Determine the feasibility of repair of components from electrical plant and equipment Test the performance and condition of electrical plant and equipment Analyse the test results relating to the tested electrical plant and equipment Diagnose and determine the cause of faults in electrical plant and equipment</p>	

Title of NOS suite	Maintaining plant and systems; mechanical
Number of NOS	12
Developing body	ECITB
Relevant sub-sector(s) or key occupation(s)	Engineers and technicians
Titles of NOS within this suite	
<p>Replace components in mechanical plant and equipment, Carry out planned maintenance procedures on mechanical plant and equipment, Dismantle mechanical plant and equipment, Monitor the performance and condition of mechanical plant and equipment, Assess the performance and condition of mechanical plant and equipment, Diagnose and determine the causes of faults in mechanical plant and equipment, Analyse the test results relating to the tested mechanical plant and equipment, Adjust mechanical plant and equipment to meet operating requirements, Remove components from mechanical plant and equipment, Test the performance and condition of mechanical plant and equipment, Assemble bolted joints to a specification in engineering construction, Hand over or take control of mechanical plant and equipment</p>	
Title of NOS suite	Maintaining plant and systems; instrument and controls
Number of NOS	13
Developing body	ECITB
Relevant sub-sector(s) or key occupation(s)	Nuclear
Titles of NOS within this suite	
<p>Monitor the performance and condition of instrument and control systems Adjust instrument and control systems to meet operating requirements Remove components from instrument and control systems Dismantle instrument and control systems Assemble components of instrument and control systems Replace components from instrument and control systems Determine the feasibility of repair of components from instrument and control systems Test the performance condition of instrument and control systems Position and install instrument and control systems Carry out planned maintenance procedures on instrument and control systems Repair components of instrument and control systems to operational condition Assess the performance and condition of instrument and control systems Diagnose and determine the causes of faults in instrument and control systems</p>	
Title of NOS suite	Nuclear material accountancy and safeguards
Number of NOS	14
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Nuclear
Titles of NOS within this suite	
<p>Perform stocktaking and material verification Liaise with safeguard inspectorates and other stakeholders Control internal nuclear material movements on-site Control external nuclear material movements onto and off a site Maintain and review nuclear material measurement quality Enter data onto the nuclear material accountancy and safeguards system and verify data Define and deploy approved nuclear material measurement capability Carry out nuclear material measurement system analysis Configure and manage a nuclear material accountancy and safeguards system Confirm the commissioning proves achieves nuclear material accountancy and safeguards requirements Identify, incorporate and implement nuclear material accountancy and safeguards requirements in decommissioning plans Investigate and resolve nuclear material accountancy and safeguards anomalies and discrepancies Identify and incorporate nuclear material accountancy and safeguards requirements in designs Compilation of accounts and nuclear material accountancy and safeguards reporting</p>	

Title of NOS suite	Nuclear operations
Number of NOS	12
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Nuclear
Titles of NOS within this suite	
<p>Support the reactor start up process in a nuclear power station Maintain services and operations to comply with requirements in a nuclear power station Monitor plant information in a nuclear power station Test plant to confirm availability in a nuclear power station Carry out plant manoeuvres of a nuclear power station Respond to plant and equipment alarms in a nuclear power station Carry out actions in the event of a contingency in a nuclear power station Control personal radiation dose uptake in a nuclear power station Handover and accept control of plant operation in a nuclear power station Carry out reactor fuel cycle operations in a gas-cooled nuclear power station Store and despatch irradiated fuel and associated components in a gas-cooled nuclear power station Process and dispose of radioactive waste fluids in a gas-cooled nuclear power station</p>	
Title of NOS suite	Nuclear regulators
Number of NOS	3
Developing body	Cogent
Relevant sub-sector(s) or key occupation(s)	Nuclear
Titles of NOS within this suite	
<p>Develop and review regulator's policy for nuclear regulation Carry out nuclear inspections Deal with nuclear non-compliance</p>	
Title of NOS suite	Electricity power utilities
Number of NOS	33
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Electricity
Titles of NOS within this suite	
<p>Prepare a generation system for service in the electricity power utilities environment Live line operations in the electricity power utilities environment Test plant and apparatus in the electricity power utilities environment Phasing out of cables in the electricity power utilities environment Install underground cables in the electricity power utilities environment Restore and reinstate the work area in the electricity power utilities environment Maintain plant and apparatus in the electricity power utilities environment Dismantle plant and apparatus in the electricity power utilities environment Cable jointing operations in the electricity power utilities environment Movement of loads in the electricity power utilities environment Authorise work on plant and apparatus in the electricity power utilities environment Location and identification of underground utility services in the electricity power utilities environment Construct, and comply with, safe access systems in the electricity power utilities environment Operate a local generation system in the electricity power utilities environment Emergency response to plant failure in the electricity power utilities environment Access, movement and egress in the electricity power utilities environment Fibre optic fusion splicing and termination in the electricity power utilities environment Carry out excavation work on underground cables in in the electricity power utilities environment Start up and shut down a generation unit in in the electricity power utilities environment Coordinating work activities on plant and apparatus in the electricity power utilities environment Fault location and diagnosis on plant and apparatus in the electricity power utilities environment Isolate and de-isolate a generation system in the electricity power utilities environment Coordinate a response to a contingency in the electricity power utilities environment Deal with variations and defects on plant and apparatus in the electricity power utilities environment Routine testing of a generation system in the electricity power utilities environment Working safely in an engineering environment Deliver customer service on your customer's premises Working efficiently and effectively in engineering</p>	

Hand over and accept responsibility for operation of a generation unit or system in electricity Control of working parties Producing technical information for engineering activities Using and communicating technical information Obtaining resources for engineering activities	
Title of NOS suite	Engineering and manufacturing suite 4
Number of NOS	22
Developing body	Semta
Relevant sub-sector(s) or key occupation(s)	Engineers, project managers and technicians
Titles of NOS within this suite	
Carrying out maintenance activities on mechanical equipment Carrying out maintenance activities on mechanical equipment within an engineered system Carrying out maintenance activities on instrumentation and control equipment Carrying out maintenance activities on fluid power equipment Carrying out maintenance activities on fluid power equipment with an engineered system Leading maintenance activities Leading installation or commissioning activities Obtaining resources for the implementation of engineering activities Schedule engineering activities Implement engineering processes Evaluate engineering risk assessments Carrying out maintenance activities on instrumentation and control equipment Specify risk reduction methods and procedures Plan and decommission engineering equipment, processes or facilities Specify methods and procedures to achieve engineering requirements Monitor and evaluate engineering processes Undertaking project management activities Solve engineering or manufacturing problems Carrying out the testing and calibration of instrumentation control equipment and circuits Carrying out maintenance activities on electrical equipment Carrying out maintenance activities on electrical equipment within an engineered system Carrying out maintenance activities on process controller equipment within an engineered system	
Title of NOS suite	Electricity network control engineer
Number of NOS	16
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Electricity
Titles of NOS within this suite	
Evaluate operational processes used on electricity network assets Commission assets on the electricity network Implement work on electricity network assets Configure electricity networks to asset owner's requirements Solve electricity network engineering problems with engineering solutions Investigate incidents relating to electricity network assets Schedule operations and maintenance activities on electricity network assets Specify methods and procedures to operate and maintain electricity network assets Obtain the resources to carry out work on electricity network assets Maintain and develop own technical and operational engineering expertise related to electricity network assets Determine the requirements for operations and maintenance of electricity network assets Specify methods and procedures to reduce risk on electricity network assets Monitor and solve customer service problems Build and manage teams Lead meetings Manage finance for your area of responsibility	

Title of NOS suite	Downstream gas
Number of NOS	44
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Electricity and gas
Titles of NOS within this suite	
<p>Connect pipework Install domestic gas space heating appliances Install gas meters and regulators (2.5 to 1076 cubed/hr) Apply environmental legislation, working practices and principles (mechanical services) Identify systems, equipment and components Rectify and modify mechanical systems, equipment and components Service and maintain mechanical systems, equipment and components Rectify faults in plumbing systems, equipment and components Service and maintain ductwork systems, equipment and components Inspect and test mechanical systems, equipment and components Commission mechanical systems Install weathering systems Identify faults in plumbing systems, equipment and components Identify and rectify faults in cooling systems, equipment and components Decommission heating & ventilation systems, equipment and components Prepare resources for pipe jointing activities Install plumbing systems, equipment and components Decommission cooling systems, equipment and components Commission cooling systems, equipment and components Install domestic heating systems, equipment and components Service industrial and commercial heating & ventilation systems, equipment and components Apply health & safety legislation and working practices Decommission plumbing systems, equipment and components Maintain industrial and commercial heating & ventilation systems, equipment and components Identify faults in mechanical systems, equipment and components Oversee the work environment Fit and fix cooling systems, equipment and components Organise the working environment Service and maintain cooling systems, equipment and components Prepare to carry out work Maintain effective working relationships Provide relevant people with technical and functional information Carry out safe electrical working practices on electrical control (and supply) for mechanical building services systems Maintain domestic gas space heating appliances Electrical fault finding on domestic gas appliances Maintain gas warm air central heating systems and appliances Maintain gas water heating and wet central heating appliances Establish electrical control (and supply) of mechanical building services and systems Install gas water heating and wet central heating appliances Install gas pipework up to 35mm BS6891 Strength testing, gas tightness testing and direct purging – ICE/UP/1A Install gas meters and regulators (2.5 to 16.0m cubed/hour) Dealing with reported gas upstream emergencies Dealing with reported gas downstream emergencies</p>	
Title of NOS suite	Multi-utility network construction
Number of NOS	31
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Electricity and gas
Titles of NOS within this suite	
<p>Manage and oversee the joining of material in a utility environment Install engineering products or assets for Utility Network Construction Install gas engineering products or assets above 180mm up to and including 355mm Inform customers about gas network construction related issues Agree a course of action to deal with gas network construction related issues Advise and inform others about network construction operations Control gas network activities against quality standards and systems</p>	

<p>Commission gas networks Establish and maintain effective working relationships in Utilities Network Construction Carry out operational planning for gas network construction operations Carry out risk assessments for gas network construction operations Joint materials by electrofusion processes on Utilities Network Construction Conduct specified testing of gas network engineering products or assets Restore gas network components to operational condition by repair Analyse and interpret the results of Gas Leakage Surveys to determine the location of gas escapes Joint materials by fusion processes on Utility Network Construction Ensure your own actions aim to protect the environment during network construction operations Joint materials by butt fusion processes on Utilities Construction Install equipment for safe working sites on Utilities Network Construction Jointing operations in an electricity power utilities environment Conduct specified testing of gas networks associated with leakage location Minimise risks to life, property and the environment during gas emergencies Conduct specified connections to gas network mains and commissioning Decommissioning and abandonment of mains and services 63mm and above Install equipment for safe working on the highway for Utilities Network Construction Operate powered tools and equipment for routine and predictable requirements on the Utilities Construction Network Create an efficient and effective work environment in Utilities Network Construction Locate and avoid supply apparatus for Utilities Network Construction Maintain a safe and secure working environment in Utilities Network Construction Reinstate excavation and pavement surfaces after network construction operations Excavate and maintain holes and trenches for Utilities Network Construction</p>	
Title of NOS suite	Network construction operations
Number of NOS	30
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Electricity and gas
Titles of NOS within this suite	
<p>Contribute to controlling costs against agreed budgets Coach individual learners Transfer control of networks Analyse information to support decision making Establish and maintain professional relationships Working under supervision, assemble components to meet specifications Record and store information Control network activities against quality standards and systems Obtain information for decision making Working under supervision, join materials by manually controlled thermal processes Commission networks Advise and inform others Working under supervision, join materials by machine controlled thermal processes Implement installation and construction methods and procedures for Network Construction Operations Monitor the installation process for Network Construction Operations Assist in preparing resources and segregating the area for site works Carry out operational planning for Network Construction Operations Carry out risk assessments for Network Construction Operations Safe control of mains connections – senior competent person Assist in preparing for re-instatement of excavation and pavement surfaces Safe control of mains connections – competent person Ensure your own actions aim to protect the environment Assist in locating and avoiding supply apparatus and sub-structures Working under supervision, excavate holes and trenches in ground and pavement structures Assist in preparing resources and segregating the area for highways works Monitoring excavation in the highway Locate and avoid supply apparatus and sub-structures Working under supervision, operate powered tools and equipment for routine and predictable requirements Monitoring, signing, lighting & guarding</p>	

Working under supervision, contribute to health, safety and environment in the workplace including hygiene	
Title of NOS suite	Gas network operations
Number of NOS	28
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Engineers, project managers and technicians
Titles of NOS within this suite	
<p>Control allocated resource to achieve requirements in diverse situations Determine resource requirements to achieve objectives in diverse situations Replace assembly or sub-assembly components (main laying) Join materials by manually controlled thermal processes in diverse situations Join material by machine-controlled thermal processes in diverse situations Restore components to operational condition by repairs in diverse situations Analyse and interpret the results of engineering activities in diverse situations Determine technical requirements to achieve objectives in diverse situations Install engineering products or assets in diverse situations Replace assembly or sub assembly components in diverse situations Conduct specified testing of engineering products or assets in diverse situations Prepare work areas and materials for engineering activities in diverse situations Contribute to the organisation of work activities in diverse situations Plan for engineering activities in diverse situations Prepare resources and segregate the area for site works in diverse situations Assist in preparing for reinstatement of excavation and pavement surface Assist in locating and avoiding supply apparatus and sub-structures Working under supervision, contribute to an efficient and effective work environment Contribute to health, safety and environment in the workplace in diverse situations Prepare resources and segregate the area for highways works in diverse situations Working under supervision, contribute to health, safety and environment in the workplace Locate and avoid supply apparatus and sub-structures in diverse situations Working under supervision, operate powered tools and equipment for routine and predictable requirements during gas network operations Excavate holes and trenches in ground and pavement structures in diverse situations Reinstate excavation and pavement surface in diverse situations Operate powered tools and equipment for routine and predictable requirements in diverse situations Contribute to an efficient and effective work environment in diverse situations</p>	
Title of NOS suite	Gas networks engineering
Number of NOS	28
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Engineers, project managers and technicians
Titles of NOS within this suite	
<p>Configure utility networks to asset owner's requirements Evaluate operational processes used on utility network assets Schedule installation and construction activities on utility network assets Establish a design brief for utility network assets Provide technical information for the design of utility networks Create design for utility network assets Maintain and develop own technical and operational engineering expertise related to utility network assets Apply professional ethics and values in the utility engineering work role Commission assets on the utility network Transfer control of gas networks Implement work on utility network assets Determine the requirements for installation and construction of utility network assets Schedule operations and maintenance activities on utility network assets Evaluate designs for utility network assets Obtain the resources to carry out work on the utility network assets Specify methods and procedures to reduce risk on utility network assets Develop a strategy for the design process of utility network assets Establish the client's utility design requirements Solve utility network engineering problems with engineering solutions</p>	

<p>Determine the requirements for operations and maintenance of utility network assets Produce specifications for utility network assets De-commission assets on the utility network Specify methods and procedures to install and construct utility network assets Specify methods and procedures to operate and maintain utility network assets Complete designs for utility network assets Implement improvements to the quality of work carried out on utility network assets Carry out maintenance of utility network assets Investigate incidents relating to utility network assets</p>	
Title of NOS suite	LPG installation and maintenance; industrial and commercial installation and maintenance
Number of NOS	22
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Engineers, project managers and technicians
Titles of NOS within this suite	
<p>Decommission systems and components Decommission gas storage and supply systems Establish, maintain and develop effective working relationships with others Contribute to the organisation of work activities Unit for boats yachts and other vessels Carry out periodic examinations of gas storage and supply systems Plan work activities for gas systems and components Contribute to the improvement of business products and services Service and maintain complex systems and components Design natural gas systems Specify programmes for working on gas systems and components Purge and commission gas storage and supply systems Commission systems and components Liquefied petroleum gas changeover unit Diagnose and rectify faults in gas storage and supply systems Maintain a safe working environment for gas related work Service and maintain gas systems and components Install complex systems and components Unit for commercial gas systems and appliances Install gas storage and supply systems Install gas systems and components Apply core gas safety measures to work activities</p>	
Title of NOS suite	Gas network construction
Number of NOS	18
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Engineers, project managers and technicians
Titles of NOS within this suite	
<p>Joint materials by butt fusion processes in complex situations for gas network construction, Maintain site biosecurity and personal hygiene on anaerobic digestion plants, Establish and maintain effective working relationships in complex situations for gas network construction, Joint materials by electrofusion processes for complex operations in gas network construction, Conduct specified testing of gas network engineering products or assets in complex situations, Determine resource requirements needed to achieve objectives in complex gas network situations, Plan engineering activities for complex gas network situations, Determine technical requirements needed to achieve objectives in complex gas network construction, Install equipment for safe working in complex situations on sites during gas network construction, Install equipment for safe working in complex situations on the highway during gas network construction, Operate powered tools and equipment for routine and complex applications on gas network construction, Install engineering products or assets for complex operations in gas network construction, Locate and avoid supply apparatus in complex situations for gas network construction, Create and efficient and effective work environment for complex operations on gas network construction,</p>	

<p>Maintain a safe and secure working environment during complex operations on gas network construction, Reinststate excavations and pavement surfaces in complex situations for gas network construction, Excavate and maintain holes and trenches for complex operations in gas network construction, Conduct and commission specified connections to gas network mains in complex situations</p>	
Title of NOS suite	Wind Turbines
Number of NOS	8
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Renewable energies technician and engineers
Titles of NOS within this suite	
<p>Minimise risks to life, property and the environment in electricity power utilities Remove plant and apparatus in the electricity power utilities environment Maintain plant and apparatus in the electricity power utility environment Inspect plant and apparatus in the electricity power utilities environment Complying with statutory regulations and organisational safety requirements Configure equipment in the electricity power utilities environment Work with other people Fault location & diagnosis on plant apparatus in the electricity power utilities environment</p>	
Title of NOS suite	Building Services Engineering Technology and Project Management
Number of NOS	6
Developing body	Energy & Utility Skills
Relevant sub-sector(s) or key occupation(s)	Engineers, project managers and technicians
Titles of NOS within this suite	
<p>Determine requirements for environmental technologies in building services engineering Manage work activities and resources to meet building services engineering project requirements Manage building services engineering projects on site Contribute to planning of building services engineering project work methods, resources and systems Develop, test and agree building services engineering project designs Commission building services engineering installations</p>	

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Evidence Reports present detailed findings of the research produced by the UK Commission for Employment and Skills. The reports contribute to the accumulation of knowledge and intelligence on skills and employment issues through the review of existing evidence or through primary research.

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