UK Government

Clean Power 2030 Action Plan: A new era of clean electricity

Assessment of the clean energy skills challenge - Evidence annex

Please note: This does not reflect final government policy.

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Contents

Introduction

The Department for Energy Security and Net Zero (DESNZ) has set up The Office for Clean Energy Jobs, which will focus on ensuring we have the skilled workforce in core energy and net zero sectors critical to meeting the government's Clean Energy Mission. It will focus on supporting regions transitioning from carbon-intensive industries to clean energy sectors, and ensuring clean energy jobs are high quality, with fair pay, favourable terms and good working conditions. It will emphasise the important role for trade unions at the heart of the clean energy sector, ensuring that unions have access to organise, and can use their expertise to help shape national industrial policy. Whilst collaborating broadly with a range of partners across the energy sector, industry, trade unions, skills providers, and local government to deliver on this.

The Office for Clean Energy Jobs will also work closely with the Department for Education, Skills England, and the devolved administrations to ensure the UK has the skills needed to deliver the Clean Energy Mission, forming a view across DESNZ sectors to feed into Skills England's wider assessment of the UK economy's structural skills needs, and supporting the targeted delivery of specific policy solutions in the energy sector. This document is an initial assessment of the skills challenges for the Clean Energy Mission conducted by the Office for Clean Energy Jobs.

The scale of the net zero workforce transition will require rapid reskilling and presents a significant opportunity for good job creation, with clean energy jobs tending to advertise salaries higher than the advertised UK average.[1] It is estimated that 1 in 5 jobs will experience a shift in demand for skills through the transition to net zero, with around 3 million workers needing some form of reskilling.[2]

Based on an assessment of external reviews, the Climate Change Committee have found that between 135,000-725,000 net new jobs could be created in low-carbon sectors by 2030. The energy efficiency & low carbon heating sector will likely see the largest increase in jobs by 2030, with further significant growth in low-carbon energy, CCUS & hydrogen, and surface transport sectors such as EV manufacturing.[3]

Evidence is critical in identifying future job opportunities, as well as the skills gaps associated with the UK's transition to clean energy. It can help inform how government and employers, alongside education and training providers, can work together to grow the clean energy jobs and skills pipeline. This Office for Clean Energy Jobs evidence annex supports the action identified in the Clean Power 2030 Action Plan to improve awareness of clean energy job opportunities. This evidence will be used as a basis for government to better understand the 2030 workforce requirements and support targeted skills planning.

[1] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Job adverts without advertised salary data have been excluded from this salary analysis. See Figure 5.
[2] LSE Grantham Institute / Place Based Climate Action Network (2021) Tracking Local Employment in The Green Economy: The PCAN Just Transition Jobs Tracker
[3] Climate Change Committee (2023) A Net Zero Workforce

Our data and evidence

The evidence presented in this report has been obtained through a range of sources including bespoke DESNZ analysis, official statistics from the Office for National Statistics (ONS), and workforce insights provided by employers. While some of the analysis presented here was produced based on assumptions regarding the previous government's targets, the jobs and skills in demand and their difficulty to recruit are anticipated to be largely similar to meet the Clean Energy Superpower mission. The Office for Clean Energy Jobs will continue to improve and keep this evidence under review to ensure the UK has the skills needed to deliver the Clean Energy Mission.

In Summer 2023, DESNZ, through the Green Jobs Delivery Group, commissioned employer-led Task and Finish groups to complete workforce assessments for selected key sectors. While this process involved key sectors to deliver net zero and wider environmental goals, this annex summarises the evidence returned for clean energy sectors, including those that will play a role in delivering the wider Clean Energy Mission. This evidence captures the scale of the workforce opportunity, including future labour demand, jobs and skills gaps, and barriers. For some sectors, heatmaps have been produced which identify in demand and difficult to recruit occupations.[4]

On top of these assessments, the Green Jobs Delivery Group also compiled evidence from 19 separate cross-cutting and sectoral roundtables involving over 300 attendees that examined the evidence and identified solutions.

The employer-led Task and Finish groups covered the following clean energy sectors[5]:

- Power and Networks
- Heat and Buildings
- Hydrogen and CCUS

There was further engagement to cover additional sectors, including Solar and Smart Systems & Flexibility. More information on the membership of the Task and Finish groups and the methods they employed can be found in the Sector Findings and Methodology sections. A number of these Task and Finish group assessments have been published separately, including Power & Networks, Hydrogen, and CCUS. This report brings these findings together to provide a holistic assessment of the skills challenge across clean energy sectors.

DESNZ also produces internal experimental analysis of clean energy jobs using Lightcast online job advertisement data. Since March 2023, this analysis has expanded to 8 clean energy sectors and covers new job advert characteristics. It now analyses key trends in share over time, skills, occupations, salary, and regional distribution. The experimental nature of the analysis means that not all job adverts are captured. The Clean Energy Job Adverts Analysis:

[4] The workforce assessment process utilised various methods, including employer surveys, data modelling, workshops, and research to uncover labour market challenges, projected demand and supply, workforce gaps, and employers' existing efforts.
[5] Additional Task and Finish Groups were established to cover Manufacturing, Nature, Resources and Waste, and Local Capacity and Capability for Net Zero, along with further engagement with the Water sector. While workforce assessments were carried out by these groups, they are outside of the scope of this evidence annex.

Charts and Methodology document provides more detail on the methodology and limitations of this analysis.

Clean energy workforce

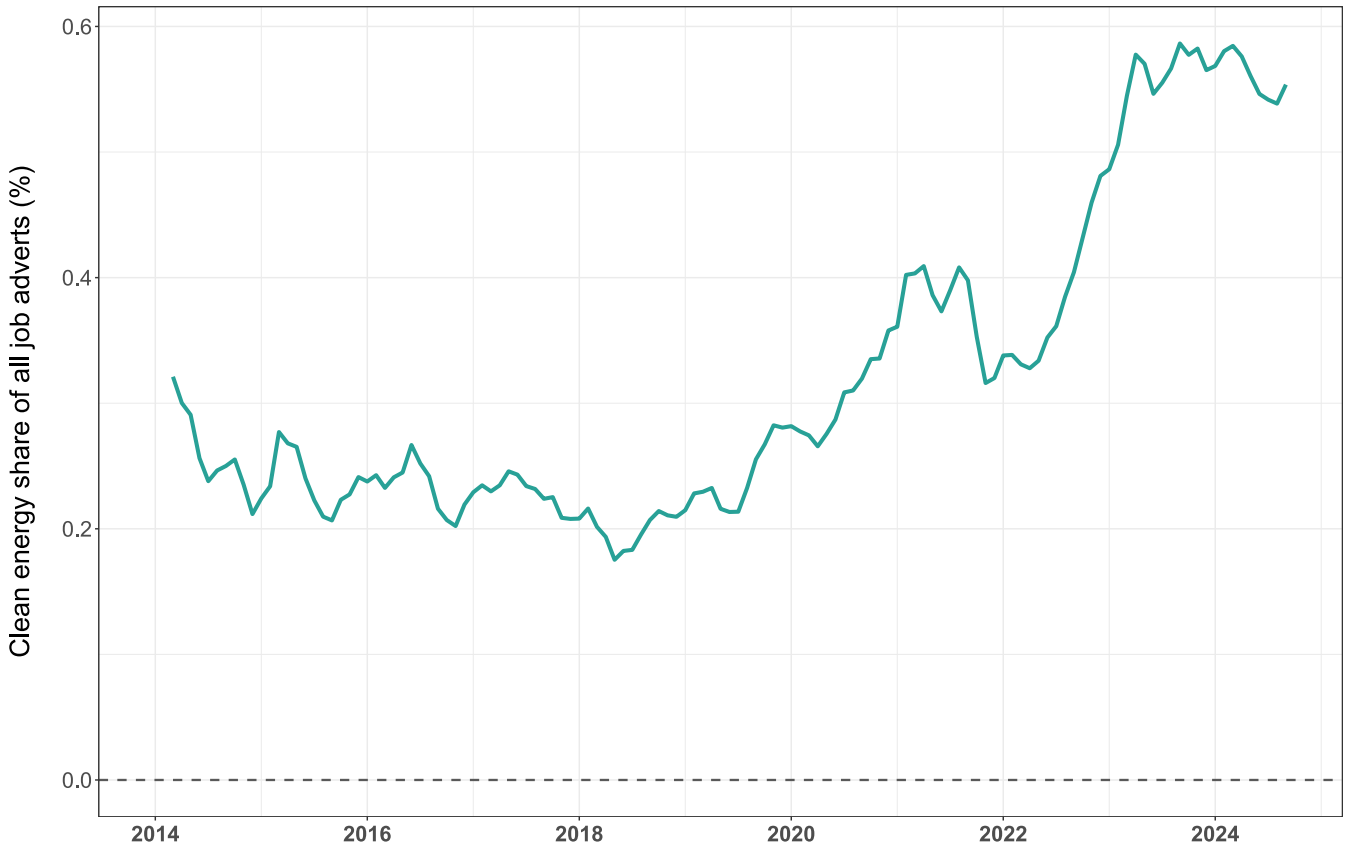
Clean energy jobs are a subset of the jobs which are required in the transition to net zero. These jobs are needed across a variety of sectors including renewables, nuclear, hydrogen & Carbon Capture, Usage & Storage (CCUS), heat & buildings, and industrial decarbonisation.

The clean energy workforce is rising strongly with the number of low carbon and renewable energy economy (LCREE) jobs growing more than 5 times faster than overall UK employment between 2020 and 2022.[6,7] The ONS estimates that by 2022 there were already around 272,400 full time equivalents (FTE) directly employed in LCREE jobs across the UK – a rise of 27% from 2020 to 2022.[8] 85% of these FTEs are estimated to be in England and 9% in Scotland. Wales and Northern Ireland are estimated to account for 4% and 2%, respectively. The ONS estimate that in 2022, up to a further 180,000 FTEs were indirectly supported across the wider supply chains for low carbon and renewable sectors.[9]

Clean energy job adverts have been growing quickly in recent years. As Figure 1 shows, the share of clean energy job adverts in the UK has increased sharply since the pandemic, with the share in 2024 roughly double the levels seen 5 years ago.[10]

[6] Growth comparison between low carbon and renewable energy employment figures from ONS LCREE (2022) & LCREE (2024) and total UK employment figures from the ONS business register and employment survey (2021 & 2023).
[7] More information on which businesses are considered part of the LCREE can be found here: ONS LCREE - glossary (2022)
[8] ONS (2024) Low carbon and renewable energy economy, UK: 2022
[9] The indirect estimates are Official Statistics in development. The ONS advise that totalling the direct and indirect estimates represents an overestimate due to difficulties isolating direct activity in the LCREE survey.
[10] DESNZ experimental analysis of Lightcast online job advertisement data (2024). The Clean Energy Job Adverts Analysis: Charts and Methodology document provides more detail on this analysis.

Figure 1: Proportion of clean energy job adverts as a share of all online UK job adverts since 2014



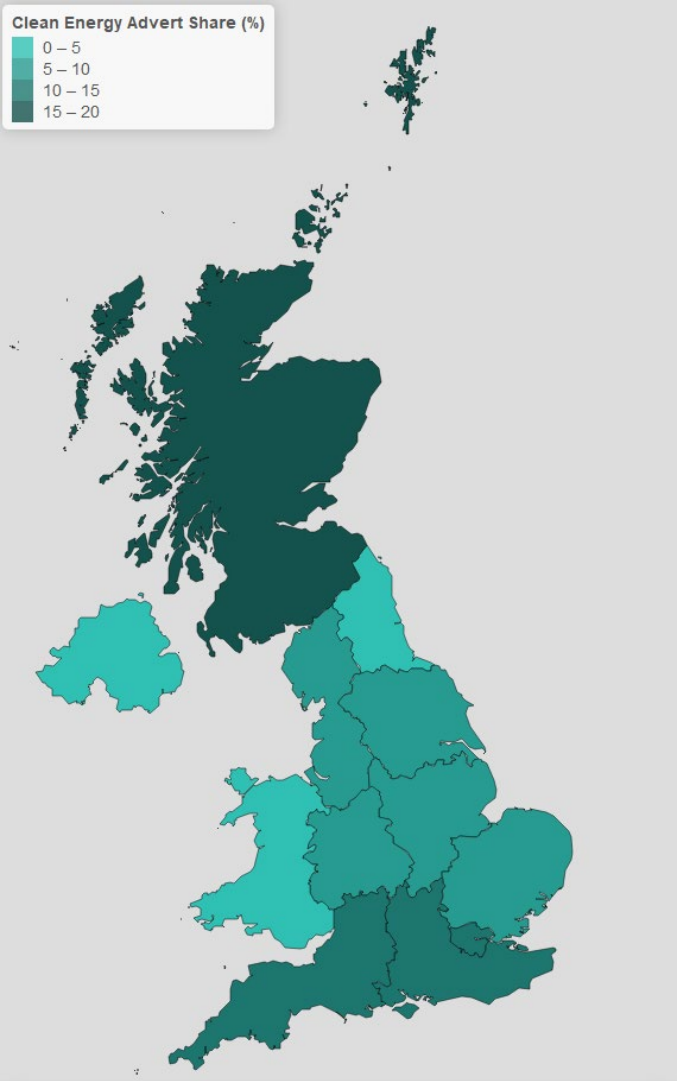
Note: Monthly share of clean energy online job adverts (3-month rolling average) 'Clean Energy Jobs' covers 8 keyphrase-defined clean energy sectors. See the job advert analysis document for more details.
DESNZ experimental analysis of Lightcast online job advertisement data, 2024

Clean energy job adverts are dispersed around the country with particularly high concentrations seen in Scotland and the South of England. Job advert analysis in Figure 2 indicates that clean energy job adverts are advertised in all parts of the UK. The analysis suggests that Scotland has the highest regional proportion at almost 16% of UK clean energy job adverts, closely followed by the South West advertising around 14%.[11]

There are some clear dominant clean energy sectors across regions of the UK. For instance, in Northern Ireland, the highest share of clean energy job adverts falls under Smart Systems and Storage Flexibility. Smart Systems and Storage Flexibility also has the second highest share of clean energy job adverts in Wales while Heat & Buildings has the highest.

Communities around the country can benefit from clean energy jobs, with investment into decarbonisation carrying opportunities to reduce regional inequalities. Germany has almost twice as many renewable jobs per capita as Britain. Sweden and Denmark almost 3 and 4 times as many, respectively.[12] As other countries race ahead to lead in the industries of the future, Britain must not be left behind.

Figure 2: Share of clean energy job adverts by region between 2021 and 2024.



Note: Percentage of total clean energy job adverts by region, between 2021 and 2024. 'Clean Energy Jobs' cover 8 keyphrase-defined clean energy sectors.

See the job advert analysis document for more details.

DESNZ experimental analysis of Lightcast online job advertisement data, 2024.

[11] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Regions with higher job advert counts will likely have a higher percentage share of UK clean energy job adverts.
[12] DESNZ analysis of IRENA (2023) Renewable energy and jobs: Annual review 2023

Cross-cutting findings

An assessment of the available evidence has highlighted the reliance on a highly skilled workforce to drive forward and enable the expansion of clean energy sectors across the UK. While this brings opportunities in some occupations, it also comes with a range of common challenges impacting labour supply across clean energy sectors, as well as the wider economy.[13] Qualification levels are based on standard classifications but in general, the higher the level, the more difficult the qualification is.[14]

Opportunities for clean energy jobs

There are a number of key occupations which are expected to be in demand across clean energy sectors. Some examples of these occupations include:

Engineering:

Engineers, particularly level 6 and above, will be in high demand, including civil, mechanical, and electrical engineers in sectors such as offshore wind, nuclear, and engineering construction. Other in demand engineering roles include design, chemical, and environmental engineers, demonstrating a key opportunity for STEM skills across clean energy sectors. Level 6 and above engineers typically require a university degree or a degree apprenticeship.

Welding and mechanical trades:

Welders will be required in a number of clean energy sectors, such as power and networks and CCUS. Occupations range from level 2 welding support operatives to level 4 high integrity welders to level 6 to 7 welding engineers. However, industry reporting suggests that welding and other mechanical trades are difficult to recruit for, so there may be labour supply challenges.

Electrical trades:

Electrical trades such as electricians and electrical fitters will be crucial for decarbonisation targets. Demand in clean energy sectors range from level 2 to 3 electrical fitters in electricity networks, senior electrical roles in offshore wind, and level 2 to 4 electrical trades in engineering construction.

[13] Unless stated otherwise, statements in this chapter are based on conclusions across the evidence provided through workforce assessments.
[14] References towards skill levels refer to The Regulated Qualifications Framework (RQF) used across England, Wales, and Northern Ireland. Further information on RQF qualification levels can be found here: RQF qualification levels, and information on the equivalent Scottish Credit and Qualifications Framework (SCQF) can be found here: SCQF Interactive Framework.

Planning:

Planning roles will be critical to delivering clean power projects. In 2023 to 2024, over 60% of delayed responses to planning applications from the Environment Agency were due to agency resourcing,[15] while Natural England have said the same for over 80% of the time they need to extend a deadline for a planning application.[16] Another statutory consultee, Historic England, have seen a 39% decrease in expenditure on heritage services in Local Planning Authorities in planning policy since 2009/10, impacting the delivery of developments.[17] Research by Skills Development Scotland projects an 11% growth in the planning sector in Scotland up to 2030, with additional recruitment required to meet this growth and to meet replacement demand due to retirements.[18]

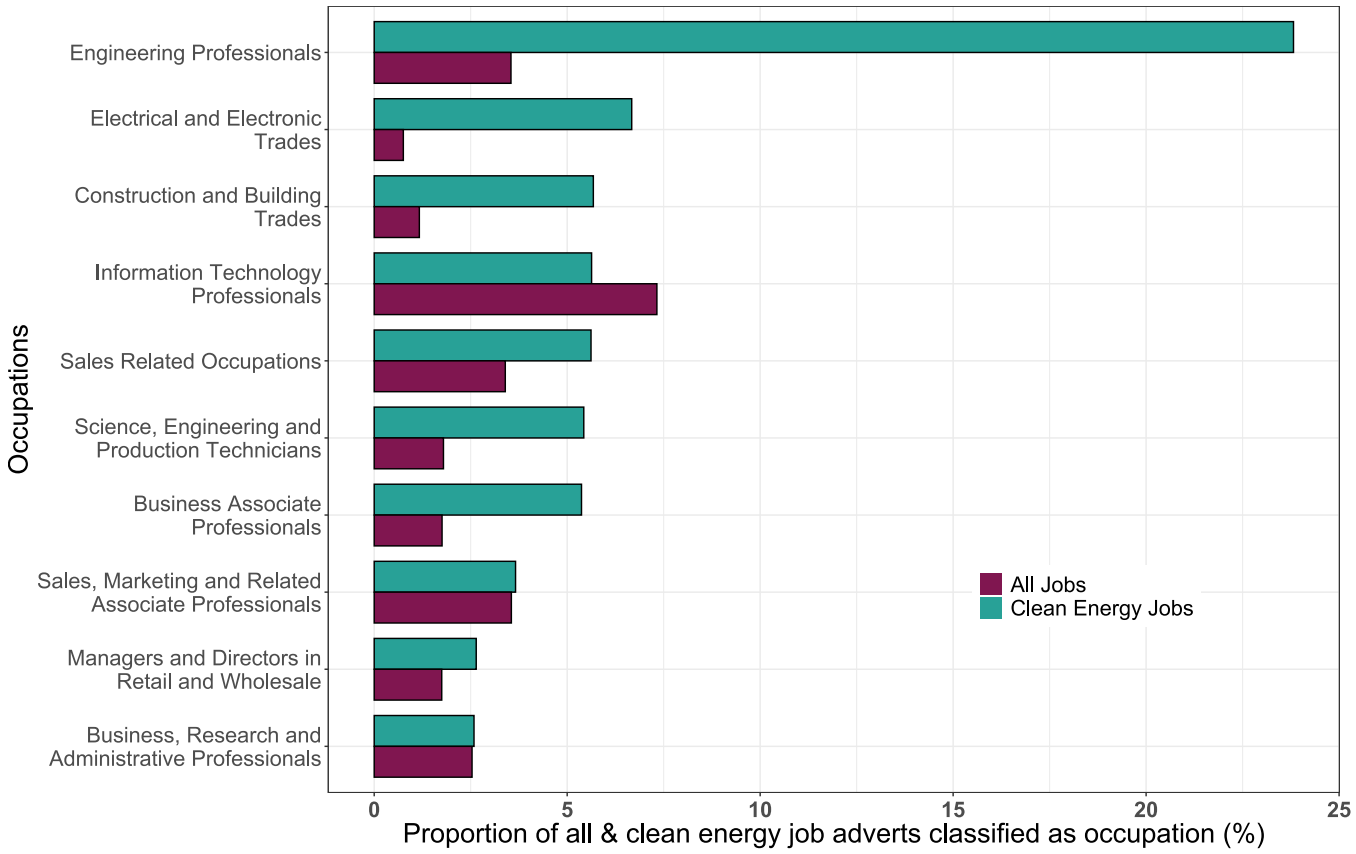
Managerial roles and other occupations:

There will be demand for managerial roles across all clean energy sectors: from project managers to corporate managers and directors. Demand for construction project managers will be particularly high, including new specialised roles, such as retrofit coordinator. While there are opportunities for existing clean energy workers to move into managerial roles, many will require upskilling where energy systems knowledge is required such as construction, heat networks, and retrofit. Most sectors reported high demand for managerial roles, ranging from levels 3-8, with high skills gaps expected due to challenges acquiring the required skills. A high transferability of skills means those already in managerial roles could take up similar positions in clean energy sectors. Opportunities will also exist in roles across the legal, finance, procurement, and corporate services sectors; some roles may require specialist sector knowledge.

The demand for some of these occupations is already reflected in the current workforce, with almost a quarter of adverts for clean energy jobs falling into the ‘engineering professionals’ occupation. Figure 3 highlights the top 10 occupations with the highest share of clean energy advertisements. This shows that engineering professions, electrical trades, and construction trades make up the top 3 largest proportions of clean energy job advertisements over the period of 2021 to 2024. For example, around 24% of all clean energy job adverts are engineering professionals, compared to less than 5% of all job adverts.[19]

[15] Environment Agency (2024) Environment Agency's planning consultation response timeliness: 2023 to 2024
[16] Natural England (2023) 2022-23 Annual report to the Department of Levelling Up, Housing and Communities
[17] Historic England (2024) Proposed reforms to the National Planning Policy Framework and other changes to the planning system: Historic England Response
[18] Skills Development Scotland (2021) Skills in Planning Research Paper
[19] DESNZ experimental analysis of Lightcast online job advertisement data (2024)

Figure 3: Top 10 occupations in clean energy job adverts compared against the occupation's prevalence in all job adverts



Note: Proportion of all and clean energy job adverts by occupation (2021-2024). Occupations ordered by top 10 clean energy share 'Clean Energy Jobs' cover 8 keyphrase-defined clean energy sectors. See the job advert analysis document for more details.

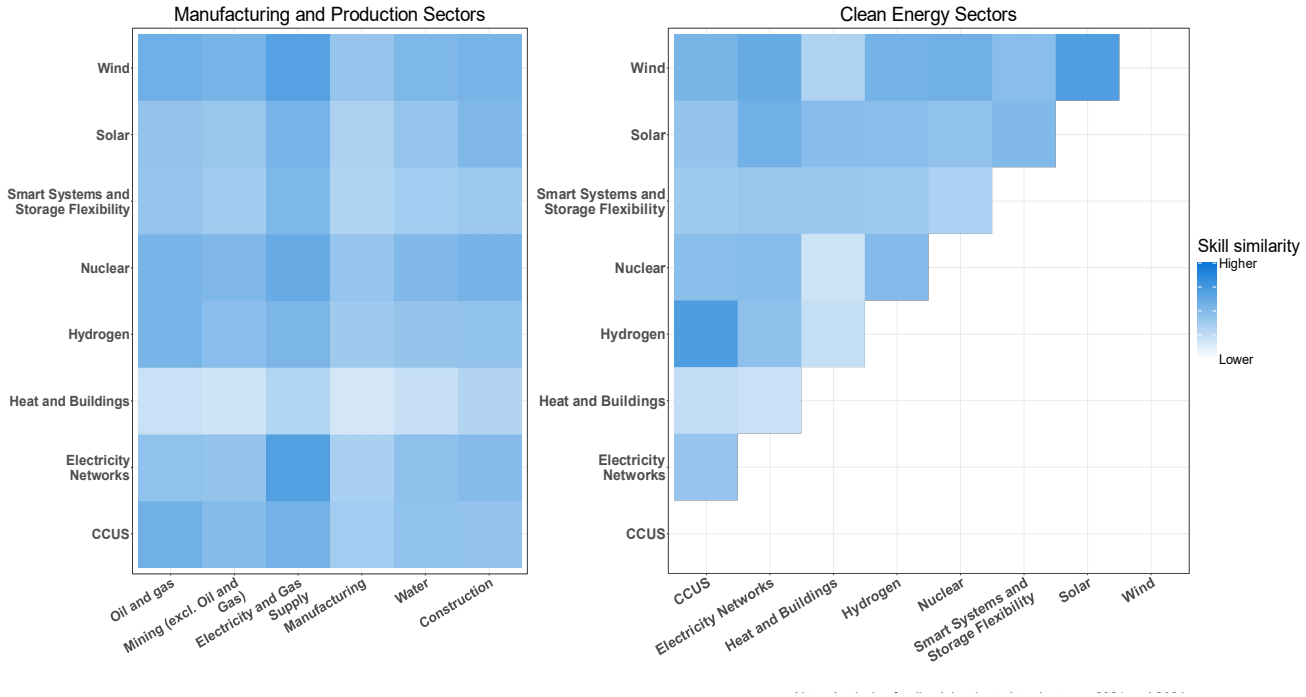
DESNZ experimental analysis of Lightcast online job advertisement data, 2024.

Most clean energy jobs will need to be filled by the existing workforce, with the skills and expertise of workers in carbon intensive sectors playing a crucial role in filling that demand. For instance, the clean energy mission provides a huge opportunity for reskilling and transferring skills with over 90% of the UK's oil and gas workforce possessing skills that have medium to high transferability to the offshore renewables sector.[20]

As also shown in separate analysis by DESNZ in the lefthand chart of figure 4, there is relatively high skills similarity between many carbon-intensive and clean energy sectors. This is particularly the case for wind, solar, nuclear, hydrogen, and CCUS. This suggests that workers in carbon-intensive sectors are likely to have many of the necessary skills to work in these clean energy sectors, such as project management, engineering, and construction skills. In terms of skills similarity across clean energy sectors, this appears to be high between CCUS, hydrogen, wind, and solar. This means that some workers will continue to be able to move easily between these sectors from a skills perspective.[21]

[20] Robert Gordon University (2023) Powering up the workforce
[21] DESNZ experimental analysis of Lightcast online job advertisement data (2024)

Figure 4: Similarity of skills demanded by online job adverts across several carbon-intensive and clean energy sectors



Note: Analysis of online job advert data, between 2021 and 2024.

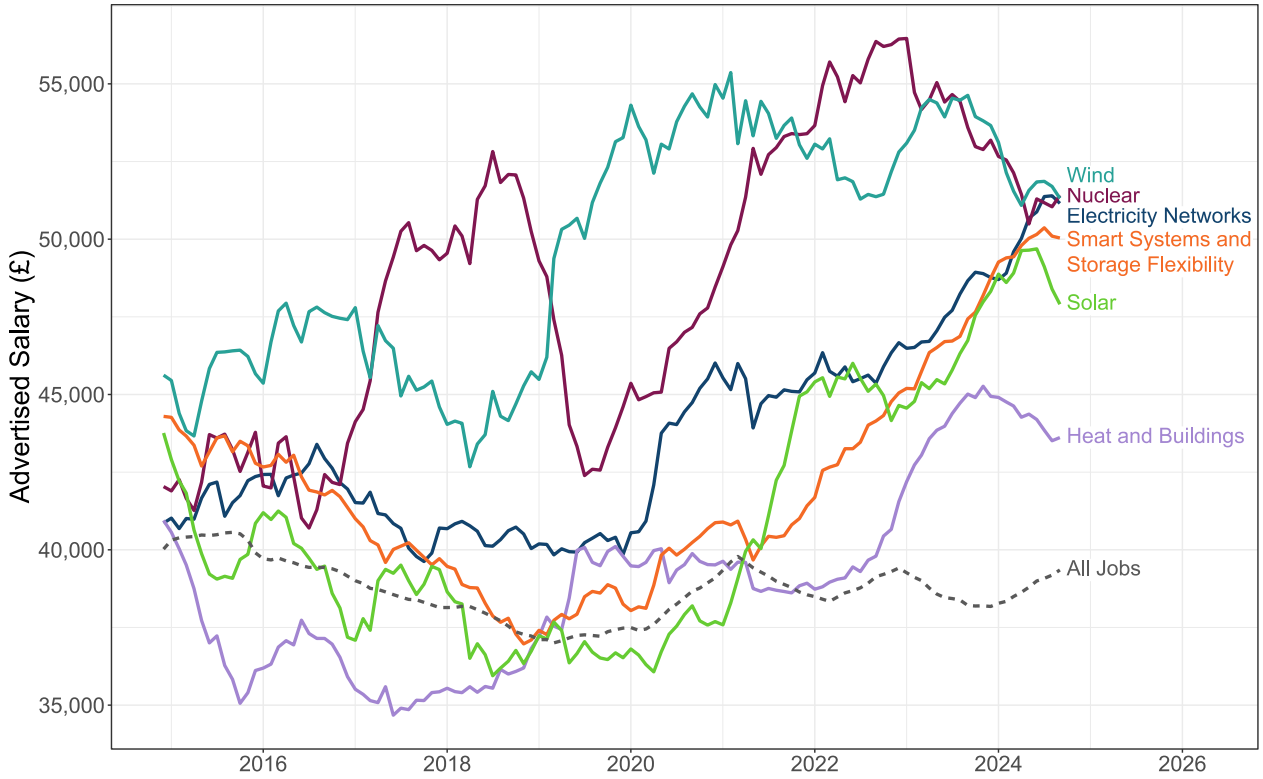
'Similarity' refers to cosine similarity, calculated using skills and their prominence across SIC groupings and clean energy sectors. The following traditional sectors are considered: Construction (Section F), Water (Section E), Electricity and Gas Supply (Section D), Manufacturing (Section C), Mining excl. Oil and Gas (SIC 05,07,08,099), Oil and Gas (SIC 06,091).

There may be a small proportion of job adverts which fall into both groups being compared.

Source: DESNZ experimental analysis of Lightcast online job advertisement data, 2024.

Clean energy jobs can offer well-paid, high-quality careers. As seen in figure 5, these jobs tend to advertise salaries higher than the advertised UK average.[22] For example, as of September 2024, the wind sector had an average advertised annual salary just over £51,000, and heat and buildings had an advertised average of approximately £44,000.[23]

Figure 5: Average advertised salaries for online job adverts in clean energy sectors since 2014



Note: Monthly average advertised salary for online job adverts (12-month rolling average).
The dotted line represents the average advertised salary across all online job adverts.
The dotted line will also include clean energy job adverts
Advertised salaries are nominal (not inflation adjusted)
Source: DESNZ experimental analysis of Lightcast online job advertisement data, 2024.

[22] 'All Jobs' is the 12-monthly nominal mean salary advertised in online job adverts. It is therefore not directly comparable with estimates of gross annual earnings
[23] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Job adverts without advertised salary data have been excluded from this salary analysis.

Common challenges

Whilst all sectors are unique in the barriers facing their jobs and skills needs, there are common challenges that cut across clean energy sectors, as well as shared challenges across the wider economy. Some of the common challenges impacting clean energy sectors are:

Competition for Skills:

All sectors face challenges in finding employees with the right skills to take on roles, but the challenge can be particularly acute for some skills in clean energy sectors. As highlighted above, there will be increasing demand in the clean energy jobs market across a range of roles, but qualified workers in these roles will also be in demand from other competing sectors. Acute skills challenges anticipated across clean energy sectors include STEM, non-technical skills such as leadership and management, digitisation, and specialist and niche sector-specific skills such as skills for electrification and heat pump installation. These challenges will be exacerbated by existing shortages across the wider economy.

Awareness of opportunities:

Research has highlighted poor public understanding of key opportunities and career pathways for jobs in clean energy. For instance, WorldSkills UK found that 63% of those aged 16 to 24 had never heard of green skills and didn't know what they are,[24] while Public First found that only 27% of all young people having heard the term 'green jobs' are able to explain what it means.[25] WorldSkills UK also found that around two-thirds of young people wanted more resources to increase their awareness of green career pathways. Beyond awareness of opportunities within the clean energy economy, it's crucial that these jobs are seen as attractive, with many sectors reporting that limited knowledge of and assumptions about the work environment can mean sectors are perceived as less desirable to work in. Poor awareness and perceptions of green jobs can be expected to translate into a lower take up of skills and training provision to get those jobs.

Equality and diversity:

Many sectors report a lack of diversity in clean energy jobs. For instance, women currently account for only a fifth of the nuclear workforce,[26] and 21% of offshore wind.[27] Looking at example occupations critical to clean energy sectors, it is estimated that only 26% of the total STEM workforce is female;[28] for engineering roles, this falls to just 15.7%.[29] Women are also significantly underrepresented in the training courses that lead to clean energy jobs, such as STEM based apprenticeships and university degrees, which means the immediate pipeline of workers will not resolve this issue. Those from ethnic minority backgrounds are also under-represented in clean energy sectors compared to national demographics (19.3%)[30], including

[24] World Skills UK (2022) Skills for a net-zero economy: Insights from employers and young people
[25] Public First (2023) Generation Green Jobs?
[26] Nuclear Skills Delivery Group (2023) Nuclear Workforce Assessment
[27] OWIC (2023) Offshore Wind Skills Intelligence Report 2023
[28] STEM Women (2023) Women in STEM Statistics: Progress and Challenges
[29] EngineeringUK (2024) Women in engineering and technology
[30] ONS (2023) Working Age Population

accounting for just 7% of the offshore wind[31] and 5% of the heat pump workforces.[32] While evidence around the proportion of workers with disabilities within clean energy sectors is limited, available reports suggest low representation including 5.6% of workers in nuclear[33] and 7% in heat pumps.[34] Evidence on social mobility in clean energy sectors is also limited, though socio-economic representation may be impacted by issues in the wider economy, for instance 41% of engineers come from higher socio-economic backgrounds, compared to 33% of the total workforce.[35] Improving the diversity of the clean energy workforce is intrinsically valuable to ensure that those from underrepresented backgrounds are able to access highly skilled, rewarding, future-proof jobs. These challenges mean that we are not fully utilising the talent and ambitions of the whole UK workforce.

Ageing and retiring workforce:

The UK has an ageing workforce, with 1 in 3 workers aged over 50.[36] This is also true across many clean energy sectors such as engineering construction where 38% of the workforce is aged over 50,[37] and heat pumps with two-thirds of the installer base aged over 45.[38] Many individuals with the required clean energy skills have either left the workforce or will retire soon, requiring rapid upskilling to limit shortages from the attrition of a retiring workforce.

Barriers to training:

Some skills supply is impacted by a constraint on training capacity. Employers have identified several barriers within training and upskilling provisions, including a shortage of teachers and staff needed to adequately facilitate training programmes. Employers also report limited human resources capacity amongst micro-sized firms and SMEs to organise training and engage with workforce offers. Employers may also be disincentivised by the cost and admin of upskilling staff or may struggle to dedicate the time to do training. Uptake of training is heavily reliant on there being clear ongoing demand for the skills employees would be gaining, a challenge which is more acute for sectors with a large SME presence. These challenges, along with a number of other drivers, have contributed to a steady decline in employer investment in training over the last decade, with real terms investment per employee down 19% since 2011.[39] Provision of training is contingent on clear demand and ongoing uptake from employers.

[31] OWIC (2023) Offshore Wind Skills Intelligence Report 2023
[32] DESNZ (2023) Heating and cooling installer study
[33] Nuclear Skills Delivery Group (2023) Nuclear Workforce Assessment
[34] DESNZ (2023) Heating and cooling installer study
[35] The Sutton Trust (2022) Bridging the Gap
[36] ONS (2024) Labour Force Survey
[37] ECITB (2021) ECITB Workforce Census 2021
[38] DESNZ (2023) Heating and cooling installer study
[39] DfE (2023) Employer Skills Survey: 2022

Sector characteristics

Table A: A summary of some of the key characteristics found across clean energy sectors and some of the more acute and pressing workforce challenges

Workforce estimates are summarised from a range of sources, including employers through workforce assessments, the ONS, and government analysis.

Sector	Workforce Characteristics	Sector Trends	Key Workforce Challenges
Offshore Wind[40]	• Average workforce age of 40 (2023) • 20.6% of workforce are female (2023) • 7% of workforce are from ethnic minority backgrounds (2023)	• Almost 30% of the workforce is in Scotland; followed by Humber (16%) and London (15%) (2023) • 2.6% of the workforce are apprentices (surpassing sector target of 2.5% by 2030) (2023)	• Competitive labour market with skilled workers being attracted to other sectors and competing internationally for a skilled workforce. • Pressing need to train the younger generation to ensure long-term talent supply – particularly in STEM with over 60% of roles in the sector requiring STEM skills.
Onshore Wind[41]	Limited evidence on workforce characteristics.	• Many of the wind farms in the planning process are in remote areas.	• Competition with other large infrastructure projects, particularly for construction and engineering skills. • Sector is also heavily influenced by offshore wind, which uses many of the same skillsets.
Solar[42]	Limited evidence on workforce characteristics.	• Project sizes extend from large-scale solar panel sites to domestic rooftop systems.	• Shortages in the number of electricians coming through electrotechnical training can impact recruitment in the solar sector.

[40] Offshore Wind Industry Council (2023) Skills Intelligence Report
[41] Climate X Change (2024) Mapping the current and future workforce and skills requirements in Scotland's onshore wind industry
[42] The Electrotechnical Skills Partnership (2023) The Solar Power Challenge 2035

Sector	Workforce Characteristics	Sector Trends	Key Workforce Challenges
Nuclear[43]	• 10% of the civil and defence workforce are aged 60 or over (2023) • 26.4% of the civil nuclear workforce are female. This falls to 20% in STEM areas but rises to 45.3% in non-STEM areas (2023) • 87.6% of the civil and defence workforce are white (2023) • 5.6% of civil and defence workforce are disabled (2023)	• Jobs centred around nuclear power stations and Nuclear Decommissioning Authority sites.	• Pressing need to train coupled with long lead times required to train for specialist roles and gain sufficient experience to work at high skill levels. • Potential difficulties recruiting subject matter experts from the wider employment market, who typically require 10 or more years' experience.[44]
Electricity networks[45]	• Ageing workforce in craft and engineering roles • 22% of energy and utilities workforce are female (2022) • 10% of energy and utilities workforce are from ethnic minority backgrounds (2022)[46]	• Significant investment coming in grid expansion and upgrades and in handling new connections of renewable energy.	• Lack of industry visibility to potential new entrants, exacerbated by a limited pipeline of young people choosing STEM qualifications. • Competition for qualified workers, particularly for STEM roles, with other industries such as finance and technology.
Smart Systems & Flexibility[47]	Limited evidence on workforce characteristics.	• Connected at a local level, with some integrated systems spanning multiple local authorities.	• Skills gaps are particularly acute in some local authorities with challenges often compounded by the diverse nature of integrated local energy systems.

[43] Nuclear Skills Delivery Group (2023) Nuclear Workforce Assessment 2023
[44] Nuclear Skills Delivery Group (2021) Nuclear Workforce Assessment 2021
[45] National Grid (2020) Building the Net Zero Energy Workforce
[46] Energy & Utility Skills (2024) Energy & Utilities Sector Profile – These estimates cover the wider energy and utilities sector (including waste and water).
[47] UKRI (2022) Smart local energy systems: Skills and capabilities

Sector	Workforce Characteristics	Sector Trends	Key Workforce Challenges
Energy Efficiency & Retrofit[48]	• Low female representation in practical trades, but recent improved uptake of training programmes leading to an increase of women progressing into professional occupations.	• Fragmented with many SMEs operating in small regional supply chains. • Reliance on self-employed sub-contractors for some trades.	• Poor retention and career uptake due to a lack of embedded and clearly defined pathways. • Poor promotion of careers amongst new entrants and the existing workforce.
Heat pumps[49]	• 2/3rds of the installer workforce aged 45 or over (2023) • 95% are male and white (2023) • 7% are disabled (2023)	• Nearly 95% of heating and cooling businesses are sole traders or microbusinesses (2023)	• Uncertainty around what replaces gas heating deters smaller businesses from investing in skills and training required, with only 40% of installers expecting demand for gas boilers to decrease within the next 10 years.[50]
Biomethane	Limited evidence on workforce characteristics.	• Supports jobs in rural areas. • 80% of all GB plants located in areas with a lower-than-average GVA.[51]	• Limited access to skilled labour for highly specialised roles. • Issues attracting the skills needed, driven by poor awareness of opportunities in the sector.[52]
Heat networks	• 25% of workforce aged over 50 (2023) (mean age is 37.1 for females and 42.5 for males) • 19% of workforce are female (2023) • Relatively limited representation from ethnic minorities.[53]	• Relatively immature but growing heat network market across the UK.	• Limited provision of heat network modules in higher education, limiting opportunities to gain whole systems understanding. • Poor awareness of the industry amongst students. [54]

[48] Heat and Buildings Task and Finish Group analysis (2023)
[49] DESNZ (2023) Heating and cooling installer study
[50] NESTA (2022) How to Scale a Highly Skilled Heat Pump Industry
[51] BEIS (2021) Final Stage IA: Green Gas Support Scheme/Green Gas Levy
[52] Heat and Buildings Task and Finish Group analysis (2023)
[53] Heat NIC (2023) Gathering workforce diversity data
[54] Heat Network Skills Review (2020)

Sector	Workforce Characteristics	Sector Trends	Key Workforce Challenges
CCUS[55]	• Requires both onshore construction and offshore workforce – high overlap of skills with other sectors including oil & gas. • Limited evidence on workforce characteristics.	• Many jobs will cluster in regions, typically in industrial heartlands.	• Skills competition with other sectors and regional competition for critical advanced skillsets. • Poor awareness of opportunities in the sector, including how existing training pathways could lead to CCUS jobs.
Hydrogen[56]	• Many of the roles needed in the hydrogen economy are STEM roles which will be impacted by STEM skills shortages across the wider economy. • Without a different approach, the gender and EDI disparity within construction, manufacturing, and production will continue to repeat.	• Many jobs will cluster in regions, typically in industrial heartlands. • As an emerging sector, the rate of innovation is significant.	• Risk the sector may lose staff resources to the immediate build out of other power infrastructure projects. • The job roles impacted by hydrogen are not yet widely understood; early articulation of the competencies needed will be crucial for the timely adoption of new technology. • Limited clarity between training and jobs, and poor awareness of opportunities in the sector.
Construction[57]	• 25% manual construction workers aged over 55 (2023) • 13% women, but only 2% in trades (2023) • 91.2% white (2024) [58]	• High proportion of SMEs and self-employed, mobile workforce. • Sector operates in a cross-cutting capacity, with many of the skillsets required across clean energy sectors and the wider economy.	• Lack of diversity and false perceptions of construction as low-paid and low-skilled dissuade young entrants. • Only 27% of construction employers employed apprentices in 2021, while the proportion of employers training any staff fell from 67% in 2018 to 42% in 2021.[59] • Construction employers, more than many others, find many young recruits are poorly prepared for work.

[55] ECITB (2024) Green Jobs Delivery Group – CCS Task and Finish Group: Findings and recommendations of the group
[56] Hydrogen Skills Alliance (2024) Green Jobs Delivery Group – Hydrogen Task and Finish Group: Findings and Recommendations Executive Summary
[57] Heat and Buildings Task and Finish Group analysis (2023)
[58] ONS Labour Force Survey
[59] CITB (2022) Skills and Training in the Construction Industry 2021

Sector	Workforce Characteristics	Sector Trends	Key Workforce Challenges
Engineering Construction	• 38% aged 50 and over; 14% aged under 29 (2021) • 86% male (2021) • 96% white (2021)[60]	• Sector operates in a cross-cutting capacity, with many of the skillsets required across clean energy sectors and the wider economy.	• Poor diversity across the wider engineering workforce, for instance only 15.7% of the engineering workforce was female in 2023.[61]

[60] ECITB (2021) ECITB Workforce Census 2021
[61] EngineeringUK (2024) Women in engineering and technology

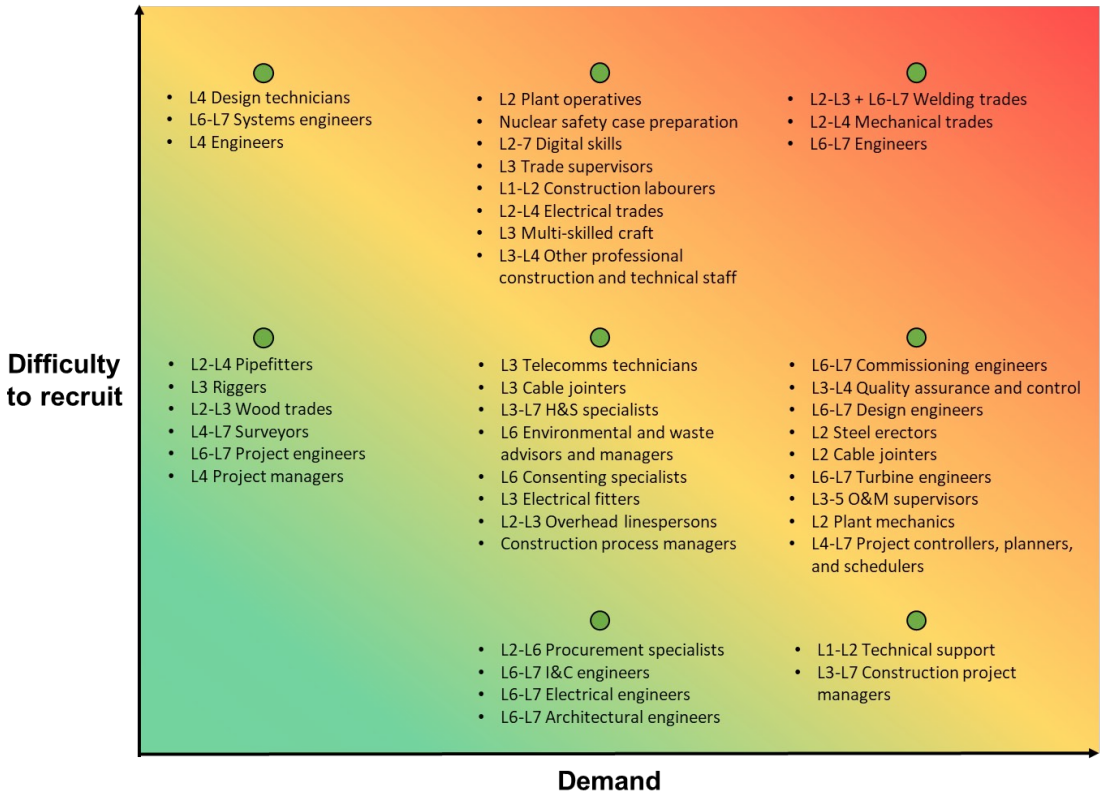
Sector findings

Workforce assessments completed by employer-led Task and Finish groups in Summer 2023 identified opportunities and challenges across sectors. Some of these groups also produced heatmaps using varied approaches. More details can be found in the methodology section. Workforce estimates have been produced using a range of methods and are underpinned by varying assumptions, which in some cases may lead to double counting across sectors. Care should be taken not to use these estimates to produce a total figure as this will not be an accurate representation of either the current or future clean energy workforce.

Power and networks[62]

The Power and Networks group was established as a pilot Task and Finish group. It was led by EDF and Energy & Utility Skills and supported by other industry bodies and employers. The Power and Networks group focused on the construction, operation and maintenance of the infrastructure needed to generate and distribute the power needs of net zero, including offshore and onshore wind and nuclear, together with electricity networks, construction, and engineering construction.[63]

Figure 6: A consolidated view from industry skills bodies of workforce demand and perceived difficulty of obtaining skills across power and network sectors to 2025



[62] The assessment has been published here: Workforce Assessment for the Power and Networks Sector.
[63] Construction and engineering construction are included separately to avoid double counting as they cut across multiple Task and Finish groups – please see page 31. Evidence on solar and smart systems and flexibility are also covered in this section.

Wind[64]

Direct employment in offshore wind was estimated at around 11,300 FTEs in 2022, and indirectly supported up to another 28,900 FTEs across the wider supply chain.[65] Industry estimated the offshore wind workforce including supply chains to be 32,000 in 2022.[66] Direct employment in onshore wind was estimated at around 6,600 FTEs in 2022, and indirectly supported up to another 13,100 FTEs across the wider supply chain.[67] Employment in both sectors will rise as wind deployment increases.

Government estimates have previously suggested that up to 90,000 UK jobs could be supported by the offshore wind sector by 2030.[68] Similarly, a forecast from the Offshore Wind Industry Council based on current projects estimates more than 100,000 skilled roles may be needed across the UK by 2030.[69] A report published by Scottish Government highlights an estimated 10,400-54,000 jobs could be supported by the offshore wind sector in Scotland by 2030.[70]

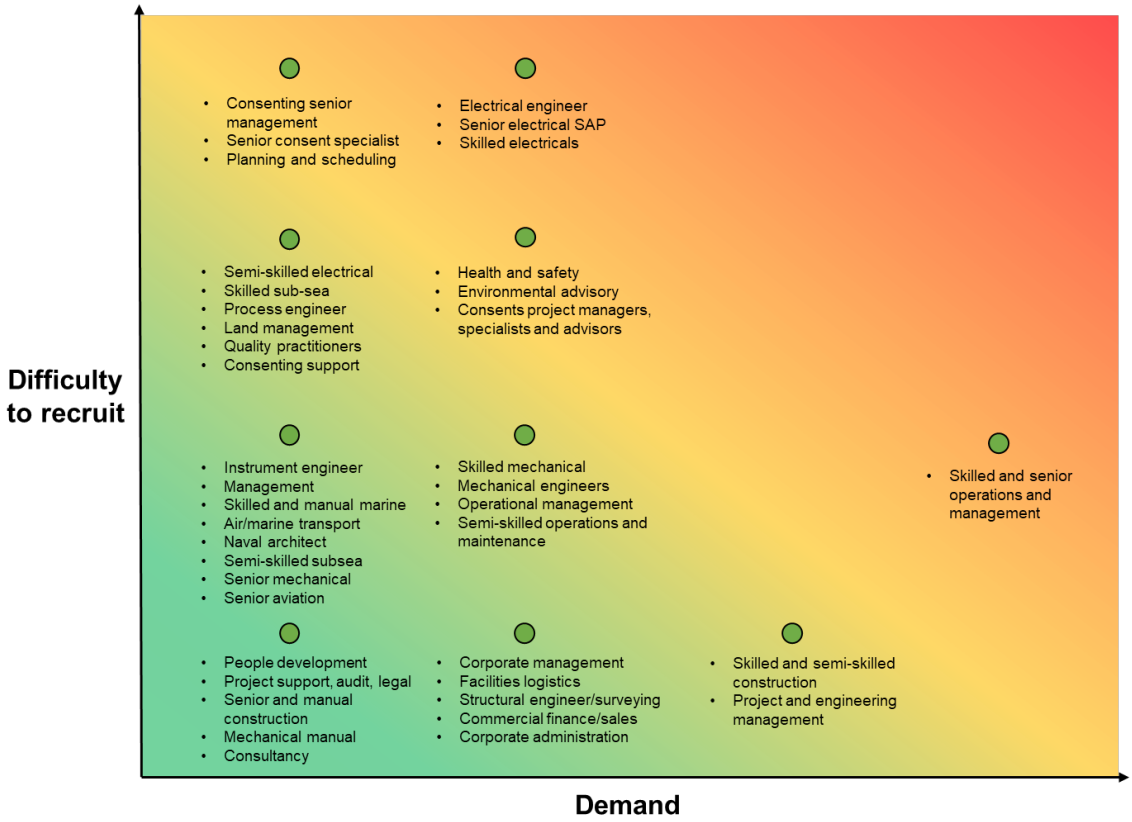
The offshore wind sector reports persistent skills gaps in high-level electrical, digital, and consenting skills, along with marine and port orientated skills, with associated occupational shortages including Senior Authorised Persons, data analysts and scientists, and regulators. In the long-term, rising demand is expected for these skills as well as electrical technical, and engineering skills, high level digital specialisms, project management, on and offshore logistics, and construction resource for floating wind projects.

Based on stakeholder engagement with the onshore wind sector in Scotland, there is significant competition for skilled and experienced workers across a range of roles, with specific skills shortages reported for wind turbine technicians, high voltage engineers, planning officers, specialty consultants, civils and construction, and digital skills.[71]

Offshore and onshore wind share many of the same skill requirements which can exacerbate labour constraints, with the exception of marine roles. There are differences in how this is applied through civil works and operations and maintenance given the non-terrestrial nature of offshore wind.

[64] The wind workforce assessment was produced in collaboration with the Offshore Wind Industry Council.
[65] ONS (2024) Low Carbon and Renewable Energy Economy, UK - The ONS advise that totalling the direct and indirect estimates represents an overestimate due to difficulties isolating direct activity in the LCREE survey.
[66] OWIC (2023) Offshore Wind Skills Intelligence Report
[67] ONS (2024) Low Carbon and Renewable Energy Economy, UK - The ONS advise that totalling the direct and indirect estimates represents an overestimate due to difficulties isolating direct activity in the LCREE survey.
[68] DESNZ (2023) Offshore Wind Net Zero Investment Roadmap
[69] OWIC (2023) Offshore Wind Skills Intelligence Report
[70] Scottish Government (2023) Offshore Wind Focus
[71] Climate X Change (2024) Mapping the current and future workforce and skills requirements in Scotland's onshore wind industry

Figure 7: Consenting and electrical roles are expected to be most difficult to recruit in offshore wind, while skilled and senior operations and management roles are projected to be most in demand out to 2030



As of 30 September 2024, the median advertised salary for the wind sector reached a rolling average of £51,000.[72]

Solar

The solar sector was estimated to directly employ 9,000 FTE in 2022.[73]

The solar sector is disparate by nature, operating across the domestic, commercial, industrial, and utility-scale markets. These operations comprise a broad spectrum of both technical and non-technical roles across the supply chain, including installation, maintenance, planning, land management, and battery storage.

It is forecast that the recruitment requirement will be particularly high for science, research, engineering and technology professionals (level 6); business and public service associate professionals (level 4 to 5); and skilled metal, electrical and electronic trades (level 3). Moreover, a high proportion of attrition due to retirement is expected across a number of occupations including skilled agricultural and related trades (level 3), and corporate managers and directors (level 7 to 8).[74]

[72] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Calculated as a 12-month rolling average, rounded to the nearest £1,000.
[73] ONS (2024) Low Carbon and Renewable Energy Economy, UK
[74] Energy & Utility Skills (2024) Workforce demand estimates – 2024 to 2030: The power industry

As of 30 September 2024, the median advertised salary for the solar sector reached a rolling average of £48,000.[75]

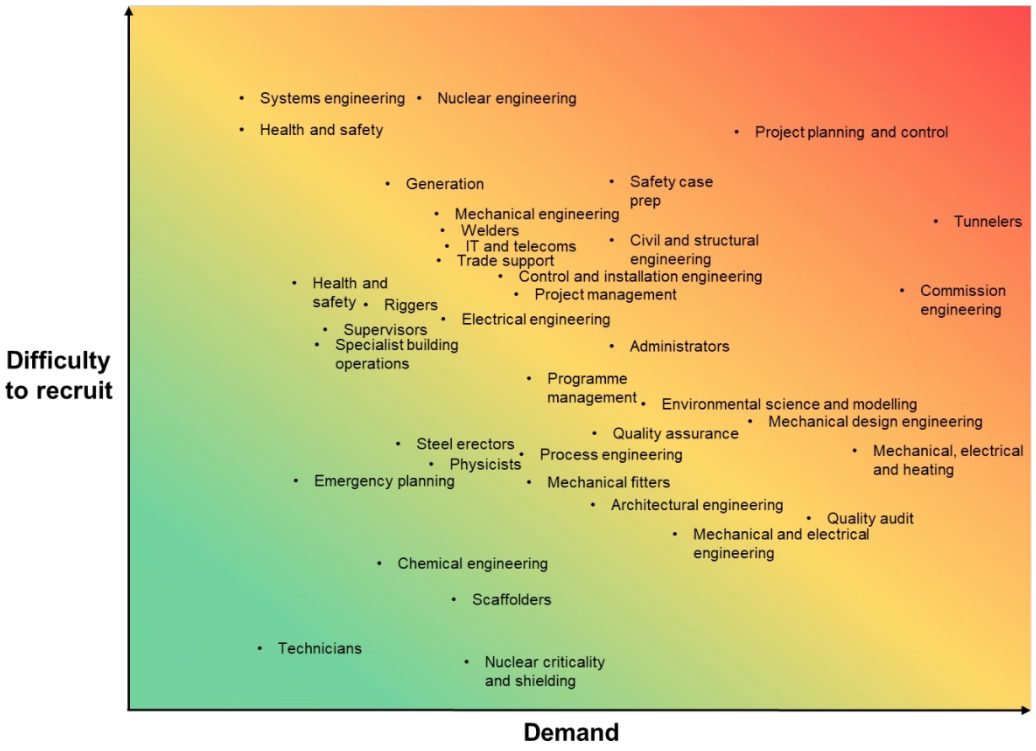
Nuclear[76]

The wider civil and defence nuclear workforce was estimated to support around 83,000 jobs in 2023, however, Nuclear Skills Delivery Group (NSDG) modelling from industry forecasts suggest the sectors could need around 120,000 employees by the early 2030s.[77] Workforce demand in civil nuclear is currently higher than in defence due to the construction of Hinkley Point C, but this is expected to change over time when construction-based peaks are replaced by a smaller specialist operational workforce.

The sector will need to consider action to increase a broad range of skills, including higher technical and nuclear skills, skills for those employed in the safe conduct and management of alpha materials like Plutonium, and transferable skills like commercial, project management and finance. An ongoing response to this challenge is in place through the National Nuclear Strategic Plan for Skills. We are working with industry to deliver year one of this 10-year programme, and are on track for doubling graduates and apprentices, and moving towards quadrupling PhDs. We have established unprecedented collaborative work including a National Communications Campaign, Regional Hubs (focused on regional demands) and a mobility scheme.

[75] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Calculated as a 12-month rolling average, rounded to the nearest £1,000.
[76] The nuclear workforce assessment was produced in collaboration with the Nuclear Skills Strategy Group.
[77] Nuclear Skills Delivery Group (2023) Nuclear Workforce Assessment - These estimates are FTE direct and indirect jobs estimates and include a modelled component for the civil supply chain.

Figure 8: Tunnelers, project planning and control, and a variety of engineering roles are all expected to be in high demand and difficult to recruit for nuclear out to 2030



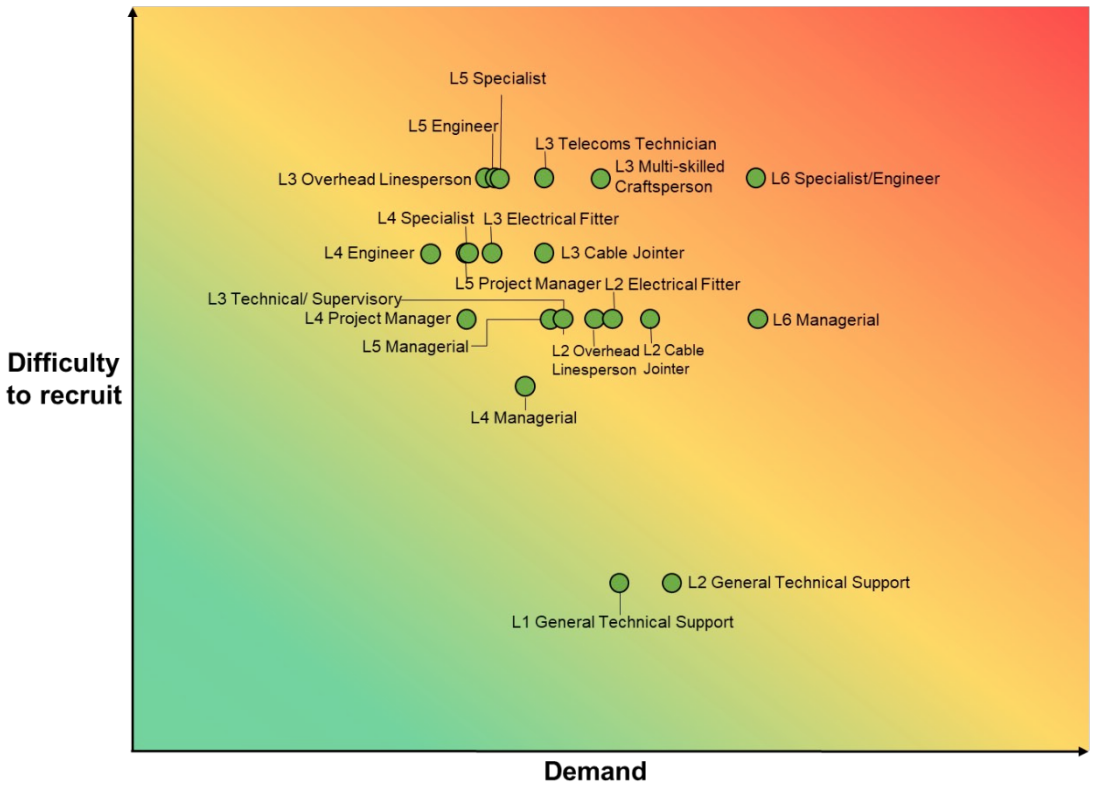
As of 30 September 2024, the median advertised salary for the nuclear sector reached a rolling average of £51,000.[78]

Electricity networks[79]

Reinforcing Great Britain's onshore electricity networks to meet net zero could directly support an additional 50,000-130,000 FTE jobs by 2050.[80] Load-related reinforcement projects will support job creation across engineering, IT professionals, physical scientist and environmental professionals, project managers, chartered surveyors and quality control, metal working and maintenance fitters. These projects will also demand a range of skills including experts in green construction, digital skills, and data analytics.

[78] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Calculated as a 12-month rolling average, rounded to the nearest £1,000.
[79] The electricity networks workforce assessment was led by EU Skills and covers transmission and distribution.
[80] BEIS (2022) Electricity Networks strategic Framework

Figure 9: Level 6 specialist/engineer, level 6 managerial and level 3 multi-skilled craftsperson are expected to have the largest workforce gaps for electricity networks out to 2030



As of 30 September 2024, the median advertised salary for the electricity networks sector reached a rolling average of £51,000.[81]

Smart systems and flexibility[82]

The ONS estimated a direct workforce of 21,200 FTE across the sector in the UK in 2022. This estimate included 5,600 employed in fuel cells and energy storage systems and a further 15,600 in energy monitoring, saving or control systems.[83]

Significant future demand for the following roles is expected: fitters and installers, energy managers, project managers, data scientists, data and digital experts, technical and energy market specialists, policy and regulators.[84] Delivering flexibility in our energy system will require a high-quality skilled workforce, with jobs that cross multiple sectors. For example, skills such as data management and software engineering are essential for a software engineer working within the transportation domain but are also necessary for interlinking an electric goods delivery fleet EV charging hub with the power system.[85]

[81] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Calculated as a 12-month rolling average, rounded to the nearest £1,000.
[82] Smart energy systems bring together a range of assets like energy generation, storage, demand, and infrastructure to reduce emissions in an integrated way.
[83] ONS (2024) Experimental estimates of green jobs, UK: 2024
[84] UKRI (2022) Smart local energy systems: Skills and capabilities
[85] EnergyRev (2023) Smart local energy systems: Training needs and provision

Other key skills in demand include managerial and coordination, technical and analysis, policy, legal and regulation, physical and trades, and soft skills. As the energy sector becomes increasingly digitalised, there will be many applications for data science such as understanding consumer demand and enabling more effective network utilisation.

As of 30 September 2024, the median advertised salary for the smart systems & flexibility sector reached a rolling average of £50,000.[86]

Heat and buildings

The Heat and Buildings with Construction Task and Finish Group was co-chaired by the Construction Industry Training Board (CITB) and the Microgeneration Certification Scheme (MCS). It covered energy efficiency and retrofit, heat pumps, biomethane, and heat networks, along with construction.

As of 30 September 2024, the median advertised salary for the heat & buildings sector reached a rolling average of £44,000.[87]

Energy efficiency and retrofit[88]

There are risks of shortages across all key occupations including assessors, solid wall technicians, roof installers, floor technicians, and cavity wall insulation technicians. Steep increases in demand are of particular concern for supply chain support staff - principally among retrofit professionals including coordinators and designers given the lack of trainers, assessors, and routes to competence within the sector.[89]

Demand is time-limited within this sector, requiring considered sequencing of demands from related construction activities. There is a reliance on self-employed sub-contractors for some trades, including external wall insulation renderers, and other sectors such as plastering and dry lining are competing for these readily transferrable skills.

Heat pumps[90]

The Heat Pump Association (HPA) estimate that as of 2023, the heat pump installer workforce is made up of between 4,000 and 10,000 trained and active installers. The HPA estimate that almost 18,000 individuals have successfully completed heat pump installation training in the UK since the beginning of 2022. Many of these trainees will have gone on to be active installers, but not all.[91] The workforce is estimated to be in line with current demand, however the HPA estimate that the number of heat pump installers will need to increase to around

[86] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Calculated as a 12-month rolling average, rounded to the nearest £1,000.
[87] DESNZ experimental analysis of Lightcast online job advertisement data (2024). Calculated as a 12-month rolling average, rounded to the nearest £1,000. Not including the construction sector.
[88] The energy efficiency and retrofit workforce assessment was led by the Installation Assurance Authority (IAA).
[89] Heat and Buildings Task and Finish Group analysis (2023) - Supply Chain Support Staff data is derived from installers to supply chain jobs ratio (manufacturing, supply, distribution, development).
[90] The heat pumps workforce assessment was led by the Microgeneration Certification Scheme (MCS), with support from the Electrification of Heat Task Group.
[91] HPA Heat Pump Statistics

70,000 FTE individuals by 2035 to keep up with future demand.[92] According to the HPA, this would mean training at least 6,600 installers a year until 2028, and 12,800 from 2028 to 2035.

Nearly 8,000 individuals completed training in 2023, so we are well in line with current workforce training needs.[93]

Experienced oil and gas heating installers already have many of the skills needed to install low carbon heating and can train to do so in one week or less. There are currently over 100,000 registered gas and oil heating engineers in the UK[94] with the competencies to install domestic boilers, however they may require support to transition to installing low carbon heating.[95]

Biomethane[96]

The UK Anaerobic Digestion (AD) sector workforce was estimated between 3,000 and 4,000 in 2018.[97] The Green Gas Support Scheme (GGSS), launched in 2021, was estimated to support 950-1,600 jobs a year during the construction of AD plants and 900-1,000 jobs during their operational lifetime of around 20 years.[98] The requirement for operational staff across AD Plants is projected to increase steadily from 2025, peaking in 2035.

Mid-level roles are expected to be most in demand, including operatives and trades, with potential shortages in technical operations, skilled mechanical and electrical trades, and administration. The biomethane sector is highly specialised, requiring a range of competencies across science and engineering. Employers also reported issues recruiting for roles requiring specialist qualifications in biomethane production and anaerobic digestion, including in high-pressure installation as well as ADR drivers, with shortages particularly prevalent at levels 3 to 4. From 2030, sector representatives envision a loss of staff due to limitations in progression beyond levels 3 to 4, with an expectation that demand will exceed supply at level 2 and possibly level 3.

Heat networks[99]

The CCC estimates heat networks could need to provide 18% of the UK's heat by 2050,[100] up from 3%.[101]

[92] HPA (2024) Projecting the Future Domestic Heat Pump Workforce - 70,000 FTE is the average estimate, with a range of 52,000 (lower estimate) - 89,000 (upper estimate).
[93] It should be noted that the HPA's modelling does not account for improvements to the efficiency of the install process, so any future reduction in the time taken to install a heat pump will reduce the projected workforce requirements. In addition, the HPA have modelled their workforce projections based on their own interpretation of heat pump technology deployment through both current and historic policy positions.
[94] Gas Safe Register data
[95] DESNZ (2023) Heating and cooling installer study
[96] The Association for Renewable Energy & Clean Technology (REA) completed a workforce assessment for activity in Anaerobic Digestion (AD) Plants, rather than activity across the Biomethane sector as a whole.
[97] ADBA (2018) Anaerobic Digestion Market Report
[98] BEIS (2021) Final Stage IA: Green Gas Support Scheme/Green Gas Levy
[99] The Heat Networks workforce assessment was led by the Heat Network Industry Council (Heat NIC) Skills Task and Finish Group, a joint industry and Government forum that exists to grow the sector.
[100] Climate Change Committee (2022) Independent Assessment: The UK's Heat and Buildings Strategy
[101] DESNZ analysis

Much of the current workforce is employed at higher skill levels, with 59% of roles classified at level 5 and above.[102] In the short-term, a growing need for surveyors, meter providers and installers is expected, as well as commercial, business development, engineering, construction, and operations workers. In the longer term there will likely be an increased demand for energy consultants, facilities, and estates managers, and those in customer service and procurement roles. With digitalisation, the sector will require more IT, software engineer, and data analytics roles.

Skills gaps are most notable in specialist roles. Heat network development managers face high skills gaps as they often possess strong project management or engineering skills, but rarely both. Project delivery managers and control systems specialists typically lack relevant experience of procurement and working in the sector. New entrants as well as energy master planners transferring from other sectors often lack whole systems knowledge of heat networks. Transferring from neighbouring sectors is easier for those in skilled labour roles rather than at senior levels where experience of heat networks is expected.[103]

CCUS & hydrogen

The CCUS & Hydrogen Task and Finish group was led by BP and the Hydrogen Skills Alliance.[104]

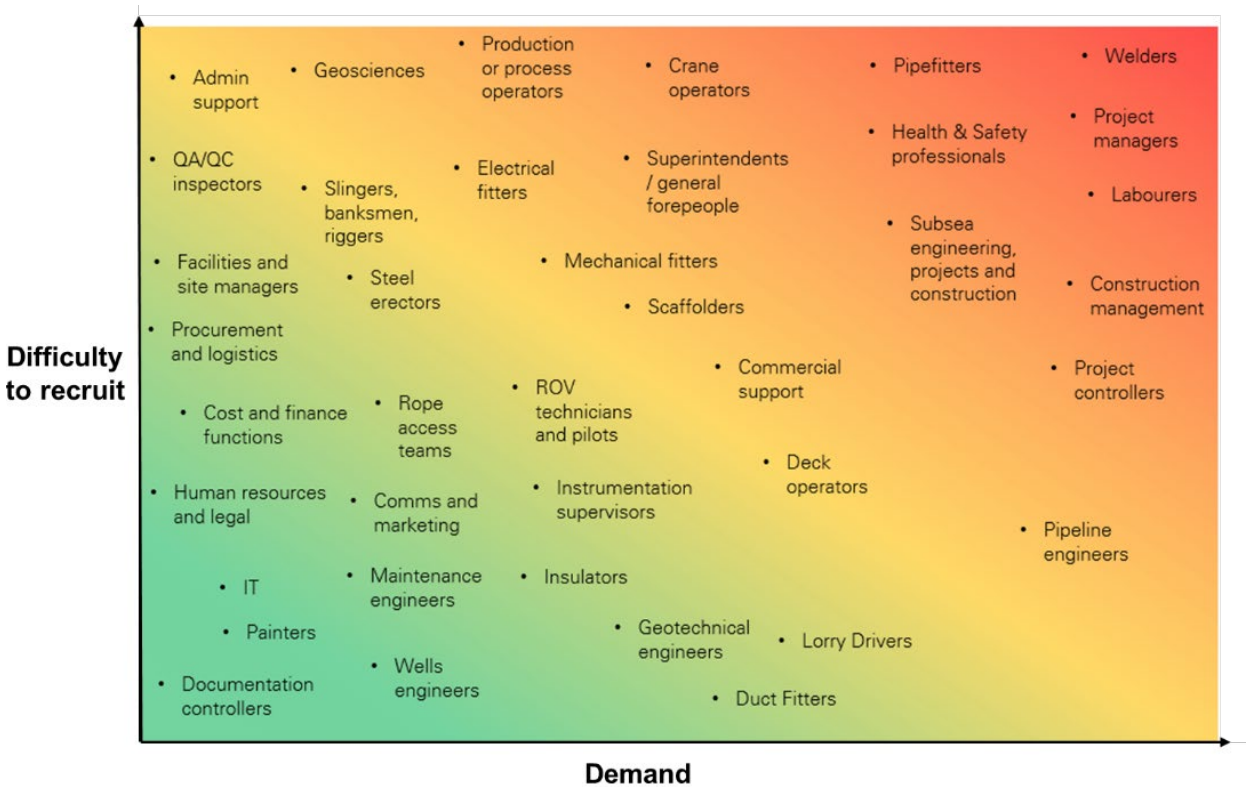
Hydrogen and CCUS are critical for the UK in reaching clean energy and wider net zero targets and are seen as major drivers of a sustainable economy. While they are both significant growth sectors, they are currently nascent, so the workforce is expected to grow quickly with a rapid scale up required over the 2020s. High skills overlaps with infrastructure developments in other sectors, including net zero projects, happening concurrently may exacerbate shortages.

CCUS[105]

The CCUS workforce consists of workers involved across all stages of carbon capture, utilisation, and storage projects as well as the associated supply chain, including technology development, manufacturing, site construction, system installation, and operations and maintenance. The wider CCUS sector is expected to enable broader job creation in other industries as they decarbonise. Government's ambitions could support up to 50,000 jobs by 2050 across the entire CCUS sector and related supply chains.[106] Many of these jobs will be concentrated in the UK's industrial regions.

[102] Heat NIC (2023) Gathering workforce diversity data
[103] BEIS (2020) Heat networks skills review
[104] The Task and Finish group was established to cover CCUS, but the activity undertaken by the group was framed around CCS, primarily to minimise overlap with other groups.
[105] CCS workforce assessment was produced by the Carbon Capture & Storage Association, bp and the ECITB. The assessment has been published here: Green Jobs Delivery Group – CCS Task and Finish Group.
[106] BEIS (2019) Energy Innovation Needs Assessments - Please note that these estimates were based on the previous 80% greenhouse gas reduction target and did not reflect the increased net zero ambition.

Figure 10: Welders, project managers, labourers and pipefitters are all expected to be key occupations for CCUS out to 2030



Although not covered by the heatmap, civil engineering roles are a high priority for construction, project management, and pipeline engineering. Onshore construction will be the main driver of workforce demand in the short to medium term to deliver CCUS infrastructure – including among semi-skilled crafts and labour.[107]

Hydrogen[108]

The industry-led Hydrogen Task and Finish Group estimated that the hydrogen workforce for production-related activities was around 2,000 in 2022.[109] Industry also estimated that 28,500 direct jobs and 64,500 indirect jobs could be supported across all areas of hydrogen by 2030, while hydrogen to power is estimated to support 3,500 direct and 6,000 indirect jobs by 2030.[110] The workforce as a whole is involved with wider activities within hydrogen operations including storage, distribution, and usage. People working in hydrogen end uses work in a range of different sectors, e.g. hydrogen vehicles (automotive sector), hydrogen to power (power sector), and hydrogen in industry (relevant industrial sector). The main drivers of future

[107] LSE (2021) Seizing sustainable growth opportunities from carbon capture, usage and storage in the UK
[108] The hydrogen workforce assessment was produced by the Hydrogen Skills Alliance. The assessment has been published here: Green Jobs Delivery Group – Hydrogen Task and Finish Group.
[109] Hydrogen Task and Finish Group analysis (2024)
[110] Hydrogen Skills Alliance (2024) Green Jobs Delivery Group – Hydrogen Task and Finish Group: Findings and Recommendations Executive Summary. Note that this is industry-led analysis, including jobs from hydrogen production, transmission, distribution, storage and end use. It is not directly comparable with government analysis on hydrogen jobs. Government analysis does not include jobs in hydrogen end use and is based on different underlying deployment scenarios. DESNZ analysis from 2022 indicated that the hydrogen sector could support 12,000 jobs in 2030.

demand within the hydrogen workforce are planned construction of new production facilities, the extent of hydrogen adoption by end users, and net zero policies.

Employers identified engineering roles across construction, maintenance, design, chemicals, and electricals as the occupations with the most acute challenges, as well as regulatory and process safety experts. The most common challenge amongst employers was finding candidates with the necessary skills or qualifications, as well as a lack of standards that indicate high quality and appropriate training, qualifications, and benchmarks in the hydrogen sector. Additionally, given the nascency of the sector there is a lack of expertise in the training provider sector to curate and defuse a hydrogen curriculum.

Since hydrogen is an emerging industry, there is a significant gap between current labour supply and future labour demand. Industry will likely need to either recruit staff from adjacent industries with similar skills or develop young talent into the workforce from higher education or other routes, like apprenticeships. As the sector establishes itself, the initial volume of trainees will be low, but must scale up at a rapid pace to realise ambitions in the sector. The sector will require proactive development of training infrastructure in advance of the market.

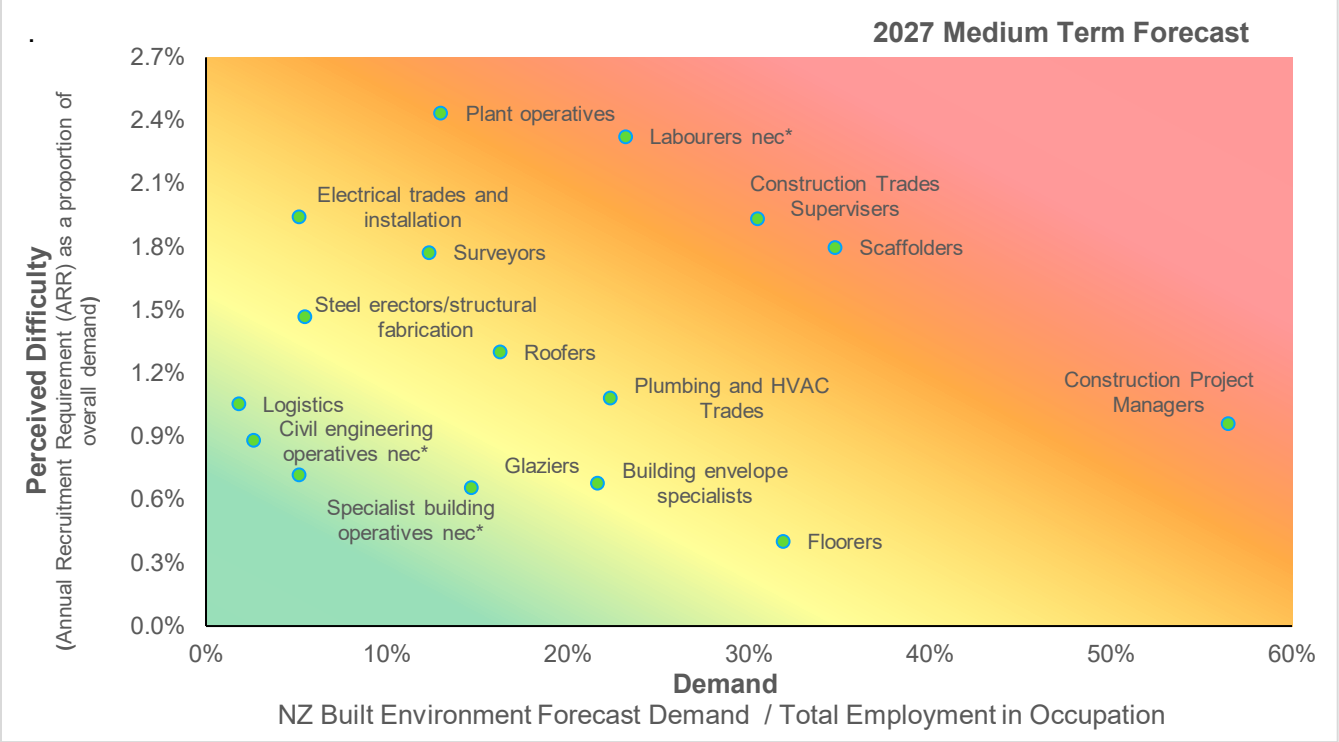
Cross-cutting sector: Construction[111]

The construction sector is critical for scaling up infrastructure across a number of clean energy sectors and has therefore been presented as a cross-cutting sector.[112] The heatmap is based on workforce demand consistent with a fabric first approach to deliver the CCC's net zero balanced pathway to 2050.[113] Readers should be aware government policies supporting the country's pathway to net zero may, when implemented, lead to a different mix of jobs and skills required compared to those presented here.

Decarbonising the construction process requires skills related to using new or low carbon technologies and products, improving efficiency and productivity, and eliminating waste. Construction is a significant user of industrial Non-Road Mobile Machinery (NRMM), while there will also be greater use of telematics and broader digitalisation to improve fuel efficiency.

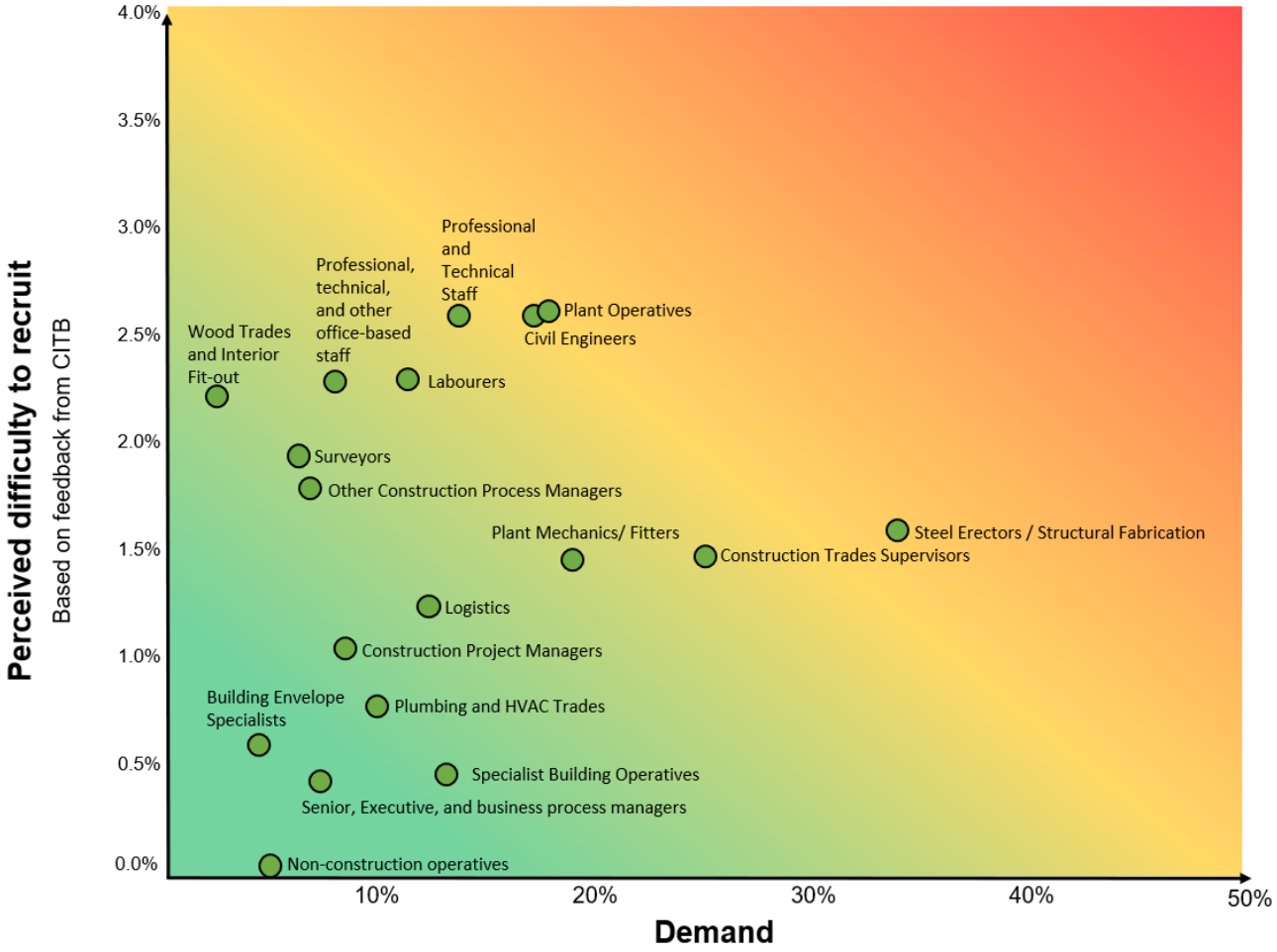
[111] The Construction and Industry Training Board (CITB) led on construction workforce assessments for: 1) Heat and Buildings, and 2) Power and Networks – while the Engineering Construction and Industry Training Board (ECITB) led on an engineering construction workforce assessment for Power and Networks.
[112] Care needs to be taken to avoid misinterpretation or double counting of data given there will be some overlap between this analysis and other sectors.
[113] CCC (2020) The Sixth Carbon Budget

Figure 11: For construction in heat and buildings, construction project managers, labourers, construction trade supervisors and scaffolders are expected to be the key occupations to fill to 2027



Occupations forecast to have greatest additional demand requirements include construction project managers, plumbing and HVAC trades, labourers, and building envelope specialists. Retraining of the existing workforce, rather than new recruitment, is expected to be the greatest challenge, particularly to meet demand for level 4 construction managers and level 3 supervisors. Additional recruitment for new entrants will be required across high-demand specialist trades at levels 2 to 3, including most installer roles.

Figure 12: For construction in power and networks, steel erectors and structural fabrication workers, plant operatives, civil engineers, and professional and technical staff are expected to be the most in demand and difficult to recruit out to 2027

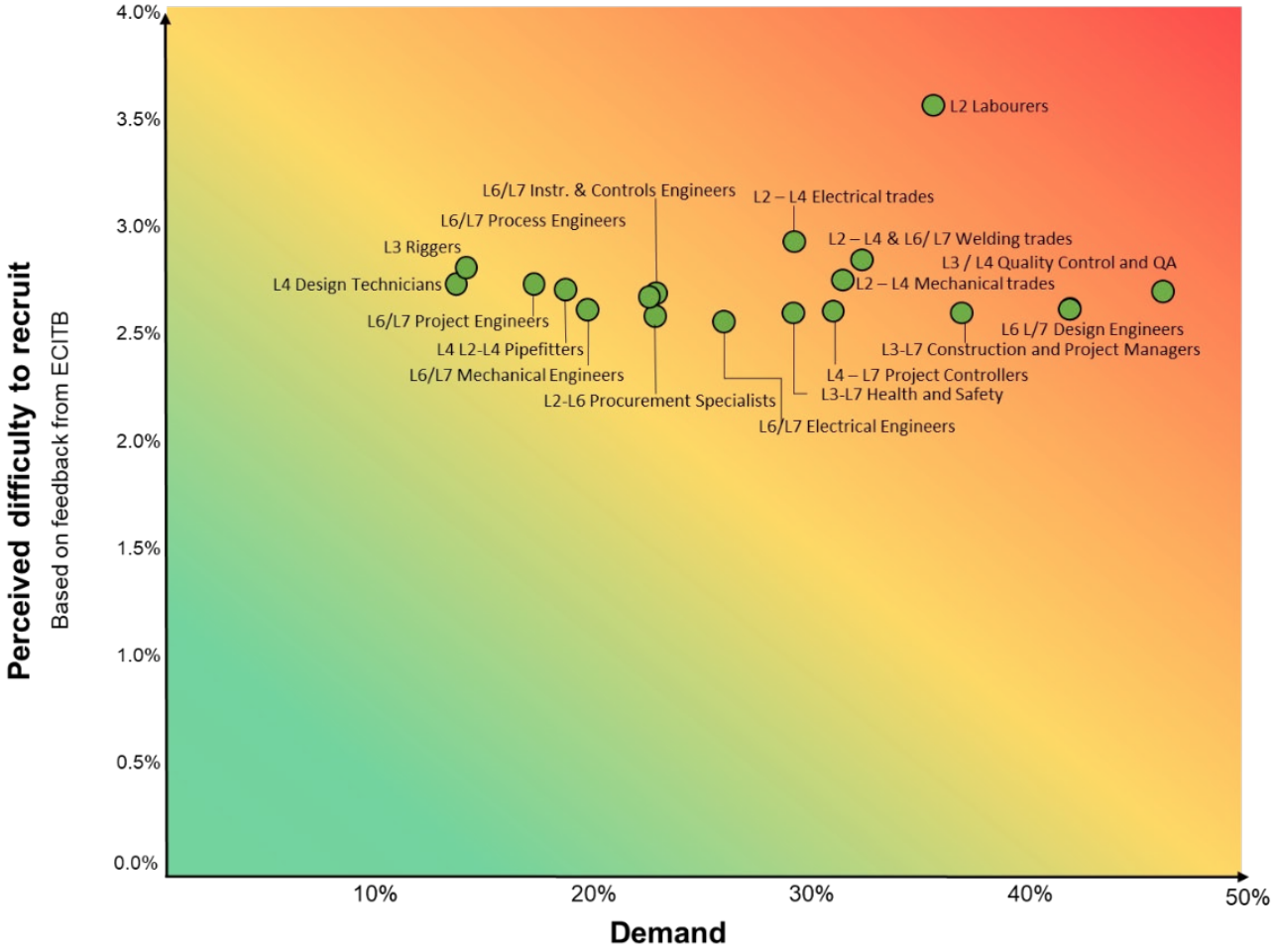


Engineering construction in power and networks[114]

In 2019, engineering construction across all sectors employed nearly 190,000 people (0.6% of total UK employment), with a supply chain approximately as large.[115]

[114] ECITB supported the power and networks Task and Finish group.
[115] ECITB (2019) Labour Market Outlook

Figure 13: For engineering construction in power and networks, level 3-4 quality control and QA, level 2 labourers and level 6-7 design engineers are expected to be key occupations out to 2030.



Clean energy jobs statistics and analysis in government

The Office for Clean Energy Jobs makes use of statistics and research published by government departments and agencies across the UK to understand skills and labour supply trends across the clean energy workforce. Key sources are outlined below.

The Office for National Statistics publishes estimates of the Low Carbon and Renewable Energy Economy and Green Jobs. DESNZ works closely with ONS to ensure the relevance of these estimates, including to Clean Energy sectors. We will continue to find solutions on how best to overcome the challenge of measuring jobs in Clean Energy, and the characteristics of the jobs and people in them, alongside finding ways to improve the datasets further.

The updated Energy Innovation Needs Assessments will estimate the economic potential, including the number and type of jobs supported, in key clean energy sectors over the 2030-2050 period. These will be based on assumptions about technology deployment required to meet net zero and the size of domestic and export markets the UK can capture.

DfE can track movement into employment and further learning following achievement of specific further education courses, which is published annually in the Further Education Outcomes statistics release. This also includes earnings figures in the year after achievement, and the sector of employment. However, it is not possible to track occupations i.e. whether someone is doing a role related to their course in that sector. If certain qualifications are identified as related to the green sectors, DfE can track participation and outcomes on these.

DfE has also published plans for the development and maintenance of a UK-specific Standard Skills Classification (SSC), which will provide a common language to describe green skills and allow better linking of skills with jobs and qualifications, supporting improved recruitment and training by business. The work on the SSC will be taken forward by Skills England.

DfE has linked the Longitudinal Education Outcomes data (LEO) dataset with the Annual Survey of Hours and Earnings (ASHE), enabling us to follow a subset of the population through their education and into work and, for the first time, know what job they are doing. This has been used to inform the supply of skills for jobs in science and technology, and there is potential for this data to be applied to clean energy jobs.

DFE regularly publish statistics that can support monitoring of the pipeline of clean energy labour and skills through the skills and education system. This includes apprenticeships and T-level statistics in England. Similarly, statistics are published with coverage of Scotland, Wales and Northern Ireland. UK Higher Education Statistics are published by the Higher Education Statistics Agency. DFE's Employer Skills Survey and the parent, pupil and learner panel omnibus surveys omnibus survey provide additional sources to support pipeline monitoring.

Skills England has published new statistics showing the relative demand for occupations in the UK, using a series of labour market demand indicators. There is potential for this to be used to show the demand for clean energy occupations relative to other occupations.

IfATE has launched a project to develop a data-led digital tool ("Skills Compass"), working in partnership with the Workforce Foresighting Hub. The project will enable early detection of changing skills needs across the labour market and support the timely development of skills responses to meet these. The vision for this tool is to take in a range of LMI and foresighting data sources to identify changing and emerging skills needs, compare them against IfATE's occupational standards and existing training, and generate recommendations and insight for the use in the revision and development of those standards or other shorter-term interventions, like the development of new qualifications, or providing advice to regional authorities to support their skills planning. Green emerging skills insight will be a key data input and insight output. The tool will explicitly seek to bring in structured data from green sources as it develops and translate that into occupation specific insights.

DWP measures Sector-based Work Academy Programmes (SWAPs) at local level, by identifying jobs that have a major component of their role that is green. SWAPs Management Information is published quarterly with an Impact Assessment due for publication in the near future, which looks at the impact SWAPs has on an individuals' long-term employment likelihood. The green job component of this data is not reported externally.

Innovate UK's Workforce Foresighting Hub provide insights and recommendations for industry, policy makers and educators to address skills shortages and strengthen the UK's ability to adopt innovative technologies and solutions. Through this approach Innovate UK has published a number of reports supporting the UK's clean energy transition including floating offshore wind and the use of high voltage dynamic cabling; hydrogen and the use of gaseous storage tanks; and sustainable construction through the adoption of manufacturing-based production in construction. Innovate UK continues to support the adoption of innovative technologies and solutions in pursuit of clean energy through workforce foresighting, working with the skills system to meet the needs of innovative businesses.

In Scotland, the Climate Emergency Skills Action Plan (CESAP) 2020-2025 identified building a better understanding and evidence of future skills needs as a priority. CESAP set out the Scottish Government's current and future planned research to 2025 to develop evidence on the green workforce. Supported by Skills Development Scotland, additional research developed a new, inclusive definition of green jobs, which was used to estimate the extent of and demand for green jobs in Scotland, including by occupation and sector.

In Wales, the Net Zero Skills Action Plan set out the Welsh Government's key priority actions. These cover data improvement, such as building understanding of sector specific skills requirements and improving links with industry to support knowledge transfer of skills system opportunities. Welsh Government has since held a consultation into the current and future skills needs of sectors in Wales and the key employer challenges to accessing a skilled workforce, and its outcomes have informed Emission Sector Skills Summaries and draft Emission Sector Skills Roadmaps. Work is now progressing on Clean Energy Sectors Skills Roadmaps, which will include key projects, skills requirements and workforce size forecasts for sectors associated with clean energy.

The Department for the Economy in Northern Ireland commissioned Energy and Utility Skills to conduct research investigating the skills required for a transition to an advanced zero emission economy in Northern Ireland. Published in June 2023, this covered the sectors outlined in the Northern Ireland Climate Change Act. Its findings showed that across the industry groups that

broadly align with the green industries, the number of jobs is projected to increase by 15.2% - from 105,000 in 2020 to 121,000 in 2035.

Following this report, a Green Skills Delivery Group was established and tasked with taking its recommendations and developing an achievable and measurable Action Plan. To assist with the identification of current and future skills needs, the Group commissioned the production of occupational heatmaps. The purpose of the heatmaps was to graphically present a summary of the challenge facing various occupations and perceived level of difficulty acquiring skills across Northern Ireland's "green" industries, to help inform the relevant actions. The Action Plan is nearing completion and will be officially launched in January 2025. The Green Skills Delivery Group will establish sub-groups to oversee the implementation stage.

The department are also commissioning research to use economic models, such as the Computable General Equilibrium [CGE], to understand the potential economic impacts from new investments in the local economy associated with offshore wind, energy efficiency and decarbonisation of heat interventions. This future scenario modelling includes estimates on economic metrics such as GVA and Full-Time Equivalent employment across sectors of the Northern Ireland economy.

The Office for Clean Energy Jobs will continue to work closely with Government departments and agencies to improve the data and evidence base on the clean energy workforce to ensure the UK has the skills needed to deliver the Clean Energy Mission.

Methodology

Workforce assessment process

The Power & Networks Task and Finish Group (TFG), led by EDF and Energy & Utility Skills, was established as a pilot group to assess workforce demand and skills gaps across power and network sectors. This work began in November 2022 and included the co-creation of heatmaps for critical occupations which provided the framework methodology for the subsequent TFGs.

Further TFGs were set-up to cover other clean energy sectors including Heat & Buildings and Hydrogen & CCUS, as well as sectors relevant to the wider Green Jobs Delivery Group (GJDG) such as Manufacturing, Nature, and Waste. Additional engagement was undertaken by DESNZ to develop workforce demand and skills gaps evidence bases for Water, Solar, Onshore Wind, and Smart Systems & Flexibility[116]. Members of TFGs included a range of organisations such as skills bodies, trade associations, standards organisations, and industry councils who could represent and provide valuable insight into their relevant sectors and workforces. Further information on the membership of the GJDG can be found here: GJDG membership.

In Summer 2023, DESNZ in collaboration with DfE, DWP, and Defra designed a workforce assessment template on the current and expected workforce needs and challenges across green sectors. Industry-led TFGs were then commissioned by DESNZ to carry out workforce assessments and returned detailed quantitative and qualitative evidence by sector, which has been summarised in this annex. Evidence was collected through a range of approaches, including industry surveys, data modelling, workshops, employer interviews, and desk-based research. Evidence was collected on the following topics:

- Insights into labour market challenges
- Projected labour demand and supply
- Workforce gaps, their drivers and what industry and government is already doing to address these
- Industry engagement with existing employment offers

Heatmaps were produced for a range of sectors across TFGs, utilising varied approaches to map out assessments of anticipated demand against difficulty to recruit for critical occupations in the net zero transition. The heatmaps provide an indication of the relative importance of different occupations and difficulties recruiting within each sector but given the range of different approaches used, they cannot inform cross-sector comparisons. These approaches are outlined below.

[116] As this report provides an assessment of the clean energy skills challenge, evidence gathered for the manufacturing, nature, waste, and water sectors hasn't been included here.

Power & networks heatmaps

Aggregated power & networks heatmap (Figure 6)

To reflect critical occupations across power and network sectors, the aggregated occupation heatmap (Figure 6) was produced using quantitative data on workforce demand and qualitative data on stakeholders' views on the difficulty of obtaining workers with the required skills.

As the approach to data gathering and analysis differs across sectoral skills bodies, the following aggregation approach was used:

X-Axis:

The X-Axis of the aggregated heatmap reflects total annual demand increase as a percentage of the total workforce in existing power and networks sectors, extrapolated from current workforce data within each skills body. Within this, it incorporates replacement and expansion demand data. The demand axis is not graded as the approach to analysing and plotting demand differs across each skills organisation.

The source information for demand modelling used by each skills body is detailed under each individual section below. The published Power & Networks workforce assessment can be found here.

Y-Axis:

The Y-Axis of the aggregated heatmap reflects stakeholders' perceived difficulty to recruit critical occupations. The assessment of difficulty is based on industry knowledge of market recruitment issues and was validated by industry stakeholders.

Offshore wind heatmap (Figure 7)

X-Axis:

Demand is based on OWIC's 2023 Skills Intelligence Report, with data modelled from Renewable UK's EnergyPulse database on pipeline projects and anticipated investment data. The approach assumes the profile of the workforce remains largely the same, with uniform increases in demand across all job roles as investment rises.

Y-Axis:

Perceived difficulty to recruit was estimated by OWIC in conjunction with a number of employers across the sector.

Civil nuclear power generation heatmap (Figure 8)

X-Axis:

Workforce demand for around 100 occupations is collated by the Nuclear Skills Strategy Group (NSSG) on a regular basis directly from nuclear operators, developers, and major asset holders; this data was used to form the x-axis of the heatmap.

Y-Axis:

Perceived difficulty to recruit is based on engagement with nuclear employers by the NSSG to identify occupations they find difficult or expect to find difficult to recruit. These have been prioritised via a RAG rating according to the frequency with which they were raised, and the level of concern expressed.

Power transmission & distribution heatmap (Figure 9)

X-Axis:

Data from the 2022 National Skills Academy for Power (NSAP) Transmission and Distribution workforce planning exercise is used to show average annual workforce demand as a percentage of the total workforce. Data is based on replacement demand only (retirements plus staff turnover).

Y-Axis:

This is informed by a subjective estimate of the perceived difficulty in acquiring the required skills, in the required volume, by employers from the wider labour market. This is based on feedback from the National Skills Academy for Power (NSAP) Transmission and Distribution Network Group.

Construction in power & networks heatmap (Figure 12)

X-Axis:

The demand data for power and networks activity is derived from modelling investment into power and networks from the Infrastructure and Projects Authority (IPA) pipeline. The demand measure incorporates an aggregated sector view and therefore includes other non-Power & Networks activity drawing resource into the x-axis measure of demand.

The CITB Labour Forecasting Tool (LFT) is used for demand modelling. The tool forecasts the labour requirements over time and by occupation. The Construction Skills Network (CSN) models forecast demand and supply of workers separately. The difference between demand and supply forms the recruitment requirement. The forecast total workforce levels are derived from expectations about construction output and productivity.

Y-Axis:

Perceived difficulty is based on the CSN annual recruitment requirement (ARR) as a proportion of overall industry demand. The ARR is a net requirement that takes into account workforce flows into and out of construction, due to factors such as movements between industries, migration, sickness, and retirement. The ARR values show where extra recruitment above existing flows is needed to meet forecasted demand.

More information on CSN's modelling can be found here: Focusing on the skills construction needs.

Engineering Construction in Power & Networks Heatmap (Figure 13)

X-Axis:

Demand data is taken from the ECITB model for workforce planning developed in 2023, based on lists of forthcoming projects and data collected as part of its 2021 Workforce Census. The model also incorporates an additional layer of demand, which takes into account the demand likely to arise from projects not yet included in the project pipelines. This is important in order to provide a more complete picture of the outlook to 2030.

Y-Axis:

A quantitative measure of perceived difficulty to recruit is used and is based on the ratio between gross recruitment requirements during the period under consideration and total demand for labour. Gross recruitment requirements are a measure based on an analysis of the gaps between supply and demand.

CCUS heatmap (Figure 10)

Full details on the data analysis and heatmapping approach can be found in Annex B of the Green Jobs Delivery Group - CCS Task and Finish Group report. To summarise:

X-Axis:

Level of demand is calculated as a percentage of job counts in overall project data.

Y-Axis:

Perceived difficulty to recruit is based on the ratio of recruitment requirements in ECITB data to job counts in project data, with a logarithmic scale for clarity.

Construction in heat & buildings heatmap (Figure 11)

X-Axis:

Data on labour demand is modelled based on predicted investment in Net Zero according to the Climate Change Committee's 2025 and 2027, balanced scenario forecasts, taken from Building Skills for Net Zero, against forecast overall sector demand. Forecasts of overall sector labour demand are taken from Construction Skills Network (CSN).

Y-Axis:

The view of perceived difficulty is based on the CSN annual recruitment requirement (ARR) as a proportion of overall industry demand. The ARR, which provides the basis of the measure of perceived difficulty (y-axis), is a net requirement that takes into account workforce flows into and out of construction, due to factors such as movements between industries, migration, sickness, and retirement. The ARR values show where extra recruitment is needed to meet forecasted demand; it is over and above existing flows that are occurring.

More detail on the forecasting model can be found in the appendix of the Building Skills for Net Zero research report and more information on CSN's modelling can be found here: Focusing on the skills construction needs.

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