

# East Midlands Investment Zone Combined Skills Report

## Delivering Green Skills for the East Midlands Investment Zone

**Date:** October 2025

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DISCLAIMER: This report was commissioned by the East Midlands Combined County Authority (EMCCA) as part of its Investment Zone programme and undertaken as independent research by the relevant universities. The findings and recommendations presented are the result of independent academic analysis and are intended to support the development of the region's Advanced Manufacturing and Clean Industries sectors. While informed by this research, EMCCA is not bound by the recommendations.

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## Executive Summary

The East Midlands Investment Zone (EMIZ) aims to position the East Midlands County Combined Authority (EMCCA) as a hub for green technology investment. This initiative addresses skills shortages, promotes private sector growth, and aligns workforce development with sustainability goals.

The EMIZ has been allocated £160 million in funding over 10 years to support Green Industries and Sustainable Advanced Manufacturing. It will support investment proposals and business cases, for developing new technologies, skills and training, and for research, innovation roadmaps and pilot projects in support of developing the sector priorities.

In order for the EMIZ to understand and invest in skills (Level 2-7) across a range of sectors and disciplines, a series of 'Skills Sprint' reports have been commissioned. This activity has therefore been broken down into a number of discrete Work Packages (WP) listed below:

**Work Package 1 (WP1):** Nuclear

**Work Package 2 (WP2):** Zero Emission Propulsion

**Work package 3 (WP3):** Renewable Energy

**Work Package 4 (WP4):** Green Construction

**Work Package 5 (WP5):** Sustainable Advanced Manufacturing

**Work Package 6 (WP6):** Sector relevant skills e.g. Leadership and management skills required for the Green Industries transition

Academics from the University of Derby and Nottingham Trent University have completed individual reports that have addressed the skills required, in the short- and long-term, for the designated Work Package industries to grow in the EMCCA region. Each individual report included an introduction to the sector, explained the policy context surrounding the sector and then included a gap analysis of current skills pathway relevant to that sector in the EMCCA region.

The total number of low-carbon jobs supported by England's net-zero transition could increase threefold to 694,000 direct jobs by 2030, rising to over 1.18 million by 2050 (Ecuity, 2020). Whilst the Climate Change Committee (2023) estimate that the energy efficiency and low carbon heating sectors are expected to be most positively affected, followed by public transport, CCS and hydrogen energy supply, low carbon energy supply and EV and battery manufacturing.

Stakeholder workshops were held in April and May 2025 for each Work Package group to review and present their gap analysis to key stakeholders within their respective

industries. The workshops encouraged participants to express their views regarding the current skills base in the EMCCA region, and to propose recommendations to alleviate the skills gaps. These recommendations were then added into the individual reports completed by each Work Package.

The report provides specific recommendations put forward by stakeholders from each sector assigned a Work Package. The priority areas that have been made throughout the recommendations are displayed below, which highlight where stakeholders from more than one sector have mentioned this type of recommendation to rectify the skills gap in the EMCCA region.

- 1. Raise awareness and address public perceptions of green skills/industries across the region.** Informational campaigns are needed to promote these sectors to the current and future workforce.
- 2. Collaboration across the region** between businesses, universities, colleges, schools and local authorities. To ensure adequate skills provision is provided across the region, skills providers need to be working together under a regional strategy rather than competing against one another or duplicating efforts.
- 3. Accurate identification and mapping of skills for careers pathways.** This will allow future workers in the region to plan their career pathway into a green industry by understanding the qualifications and skills needed.
- 4. Starting the skills education at an early age, such as at primary school level.** This will ensure that the region is generating a future workforce pipeline equipped with the skills and knowledge to take on roles necessary in the growing industries.
- 5. Investment in teacher's development to focus on green skills and to embed Net Zero in careers guidance labelled .** Teachers and careers guidance counsellors need to understand the requirements of the region in terms of green skills, if they are to successfully educate the future workforce.
- 6. Future skills requirements include new skills/jobs and upskilling existing workforce.** The current workforce of the EMCCA region may have transferrable skills that can allow them to transition to one of the green sectors identified in this report, but upskilling will be necessary to allow this transition.
- 7. A strategy that combines Revenue investments and Capital investments** has been recommended by multiple Work Package reports.
- 8. Removing barriers to access the provisions of green skills.**

**9. Soft skills such as leadership, management and digital skills** need to be included in any strategy alongside the targeted provision of technical skills.

## Part 1: Introduction

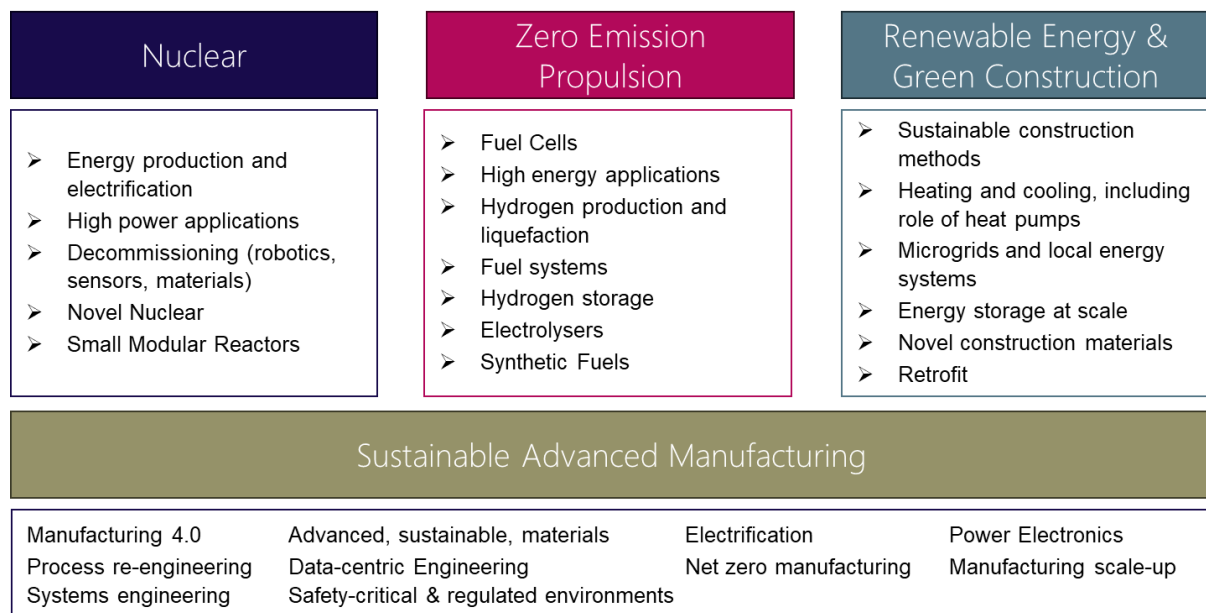
### The East Midlands Investment Zone

The East Midlands Combined County Authority (EMCCA) is focused on establishing the East Midlands Investment Zone (EMIZ) as a national region of excellence for green technology investors and businesses. It will also support investment to promote employment and productivity growth within target sectors.

Within the EMIZ programme, skills and business support will be delivered to unlock opportunities for business and to address barriers to private sector growth, creating more high-quality jobs and opportunities for residents.

The EMIZ has been allocated £160 million in funding over 10 years to support Green Industries and Sustainable Advanced Manufacturing. It will support investment proposals and business cases, for developing new technologies, skills and training, and for research, innovation roadmaps and pilot projects in support of developing the sector priorities. Figure 1.1 below shows the sectors that are being focused on for development as part of the EMIZ programme.

*Figure 1.1: Sectors focused on by the EMIZ programme*



The EMIZ will offer tax incentives to speed up new development on three designated sites: Infinity Park in Derby, Hartington-Steveley in Chesterfield, and The Explore Park in

Worksop. It will also allow the region to retain 100% of business rates receipts from additional growth on these sites for 25 years.

In order for the EMIZ to understand and invest in skills (Level 2-7) across a range of sectors and disciplines, a series of 'Skills Sprint' reports have been commissioned. This activity has therefore been broken down into a number of discrete Work Packages (WP) listed below:

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Work Packages 1 – 5 were focussed on the skills relevant to the specific sectors, whilst Work Package 6 focussed on broader skills, such as leadership and management, required for the Green Industries transition.

## Methodology

Academics from the University of Derby and Nottingham Trent University have completed individual reports that have addressed the skills required, in the short- and long-term, for the designated Work Package industries to grow in the EMCCA region. Each individual report included an introduction to the sector, explained the policy context surrounding the sector and then included a gap analysis of current skills pathway relevant to that sector in the EMCCA region.

Stakeholder workshops were held in April and May 2025 for each Work Package group to review and present their gap analysis to key stakeholders within their respective industries. The workshops encouraged participants to express their views regarding the current skills base in the EMCCA region, and to propose recommendations to alleviate the skills gaps. These recommendations were then added into the individual reports completed by each Work Package.

This report has consolidated the findings and recommendations of the individual reports from each Work Package in order to be presented back to the EMCCA.

The structure of this report follows that of the individual reports. Part 2 outlines the requirement for green skills in general as part of the transition to a green economy within the EMCCA region. In addition, each specific sector focussed on by each Work Package is introduced in more detail.

Part 3 of the report provides the policy context for the provision of green skills in relation to each sector at an international, national and regional level.

Part 4 provides the gap analysis of green skills in the EMCCA region and UK for each relevant sector.

Part 5 provides recommendations to EMCCA from each Work Package's reports as to how to address the skills gaps in each sector.

## Part 2: Green Skills and the relevant sectors

### Green Skills

Green jobs are decent jobs<sup>1</sup> related to goods and services that preserve or restore the environment (e.g. green buildings, clean transportation or solar-powered water-heating systems) and contribute to processes with fewer environmental impacts (e.g. reducing water consumption, controlling air pollution or improving recycling services) (Van Der Ree, 2019). According to this report, green jobs can be associated with traditional sectors like manufacturing and construction, or emerging sectors related to renewable energy and energy efficiency, which will provide new job opportunities.

Research has shown that the skills related to green and non-green jobs are significantly different (Consoli et al., 2016). Green jobs are intensively high-level cognitive and interpersonal and portray higher levels of standard dimensions of human capital, such as formal education, work experience and on-the-job training (Consoli et al., 2016). Green jobs are associated with higher levels of non-routine analytical skills, such as creative problem solving.

The commitment countries like the UK have made to decrease GHG emissions will lead to an expansion of the employment opportunities along the supply chains and in service sectors related to green jobs. For instance, the path to convert the production and distribution activities towards more sustainable standards needs to be created. The transition to a low carbon economy requires great attention to skills. Failing to acknowledge the existing skills and the possible need to reskill the UK workforce might jeopardise the low carbon transition and lead to skills shortages (Jagger et al. 2013; Rowley & Walker, 2020). Consequently, it is imperative to guarantee that the UK has the necessary skills to fill green jobs requirements.

In the specific case of low carbon technologies, there is likely to be a shortage of skills due to the technology's risk and uncertainty and the technology's novelty and scale and granularity, embeddedness and inertia (Jagger et al., 2013). Unless the UK workforce is equipped with the necessary skills for the transition, it might face increased costs, time, unemployment and lose competitiveness and capabilities (Jagger et al., 2013). Table 2.1 details the expected effects on employment resulting from climate change and green economy policies. The most significant impact is expected in transforming jobs (occupational profiles) related to the built environment, agriculture or transport, all sectors

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<sup>1</sup> Decent jobs are well paid, do not constitute a significant health and safety hazard, offer permanent contracts, the employer recognises unions, and offer paid training.

where energy and resources efficiency are introduced, and jobs related to sustainable or green investment.

Table 2.2: Expected effects on employment of climate change and green economy policies

| Effects                                                             | Examples                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Expected scale |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>New jobs will be created (in existing and new occupations)</b>   | <p>Solar panel technicians.</p> <p>Organic farmers.</p> <p>Recycling managers.</p> <p>Staff in eco-tourism resorts.</p> <p>Workers in natural resource conservation and restoration.</p> <p>Environmental advisers.</p> <p>Workers in bicycle shops.</p>                                                                                                                                                                                                                        | Modest         |
| <b>Certain jobs may be eliminated</b>                               | <p>Coal miners.</p> <p>Workers in the bottling industry adopting water; and material-saving technology.</p> <p>Staff of obsolete or prohibited packaging materials industry.</p>                                                                                                                                                                                                                                                                                                | Small          |
| <b>Jobs will be substituted (occupations change)</b>                | <p>Jobs in transport systems moving to rail.</p> <p>Electric cars and shared vehicles.</p> <p>Waste management jobs in landfilling/dumpsite moving to incineration and recycling.</p> <p>Jobs in quarries for construction using new building materials and re-use of leftovers and waste.</p>                                                                                                                                                                                  | Modest         |
| <b>Most jobs will be transformed (occupational profiles change)</b> | <p>Workers, operators and managers in greening sectors notable buildings, agriculture, or transport: all learning to manage new technology and operating practices.</p> <p>Workers in all sectors where energy and resource efficiency is introduced (cleaner production in manufacturing, retail services without packaging, bottle companies, changing to new materials and products).</p> <p>Staff in financial institutions adopting sustainable investment strategies.</p> | Large          |

Source: Based on findings from Van Der Ree (2019)

In the UK context, the term low carbon job narrows down the activities associated with green jobs. Low carbon jobs are related to specific economic activities that deliver goods and services related to lower GHG emissions. According to the Office for National Statistics (2021b), low carbon jobs are related to the seventeen activities divided by six Low Carbon and Renewable Energy Economy (LCREE) (see Table 2.2). Currently, low carbon jobs account for around 185,000 full-time workers. Currently, the majority of the workforce is related to energy efficiency lighting, products and energy monitoring, saving or control systems (Ecuity, 2020).

Table 2.2: LCREE groups and description of the activity

| Group                                           | Sector                                                                                                                                                 | % of the workforce in 2018 |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b>Energy-efficient products</b>                | Energy-efficient lighting.<br>Energy-efficient products.<br>Energy monitoring, saving or control systems.                                              | 71%                        |
| <b>Low-carbon electricity</b>                   | Carbon capture and storage.<br>Hydropower.<br>Nuclear power.<br>Offshore wind.<br>Onshore wind.<br>Other renewable electricity.<br>Solar photovoltaic. | 12%                        |
| <b>Low-emission vehicles and infrastructure</b> | Fuel cells and energy storage systems.<br>Low emission vehicles and infrastructure.                                                                    | 7%                         |
| <b>Energy from waste and biomass</b>            | Alternative fuels.<br>Bioenergy.                                                                                                                       | 5%                         |
| <b>Low-carbon heat</b>                          | Renewable combined heat and power.<br>Renewable heat.                                                                                                  | 3%                         |
| <b>Low-carbon services</b>                      | Low carbon financial and advisory services.                                                                                                            | 2%                         |

Source: Office for National Statistics (2021b) and Ecuity (2020)

The energy-efficient products sector has been the largest sector within the LCREE context in terms of turnover and employment since data started to be gathered in 2014 (Office for National Statistics, 2021b). Table 2.3 presents the range of activities related to this sector.

*Table 2.3: LCREE sectors and descriptions of activity with highest turnover and employment in 2019*

| Sector                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Energy-efficient lighting</b>                    | The design, manufacture and installation of energy-efficient bulbs, tubes, fittings and so on, designed to use less energy to produce the same or greater amount of light.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Energy-efficient products</b>                    | <p>The design, manufacture, and installation of energy-efficient products. Examples include:</p> <ul style="list-style-type: none"> <li>• energy-efficient doors and windows.</li> <li>• heating and ventilation, such as condensing boilers, ventilation, and heating recovery.</li> <li>• insulation such as loft, external wall, roof insulation, reducing energy consumption for heat or air conditioning by minimising leakage of heat.</li> <li>• energy-efficient building materials or technologies.</li> <li>• sustainable buildings and architecture.</li> <li>• materials with greater insulation properties or durability properties or those requiring significantly less carbon emission in their manufacture or recycling waste materials in their manufacture.</li> </ul> <p>Exclude: Smart goods such as TVs and freezers.</p> |
| <b>Energy monitoring, saving or control systems</b> | <p>The design, manufacture and installation of systems that reduce energy consumption through effective heat or energy management. Include equipment and related systems for doing this.</p> <p>Examples include:</p> <ul style="list-style-type: none"> <li>• smart heating controls.</li> <li>• condensation control.</li> <li>• control system components.</li> <li>• energy management systems.</li> <li>• energy management software.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                           |

Source: Office for National Statistics (2021b)

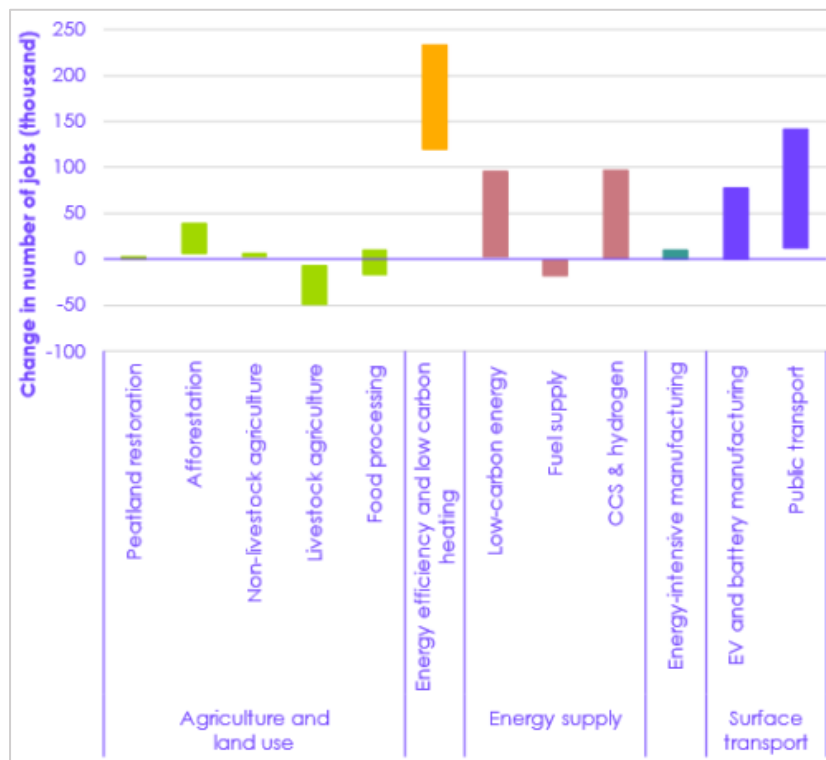
Research published by Ecuity Consulting on behalf of the Local Government Association (Ecuity, 2020) has estimated that the total number of low-carbon jobs supported by

England's net-zero transition could increase threefold to 694,000 direct jobs by 2030, rising to over 1.18 million by 2050. The Ecuity Report (2020) breaks down the roles as follows:

- Half (46%) of the total low-carbon jobs by 2030 will be in clean electricity generation and providing low-carbon heat for homes and businesses. These jobs will include manufacturing wind turbines, deploying solar PV, constructing nuclear reactors, installing heat pumps, and maintaining energy-system infrastructure.
- Over one-fifth (21%) of jobs by 2030 will be involved in installing energy efficiency products ranging from insulation, lighting, and control systems.
- Around 19% of jobs in 2030 will involve providing low-carbon services (financial, legal and IT) and producing alternative fuels such as bioenergy and hydrogen.
- A further 14% of jobs will be directly involved in manufacturing low-emission vehicles and the associated infrastructure. These jobs will include manufacturing electric vehicles (and hydrogen vehicles), manufacturing EV batteries from the proliferation of gigafactories in England and sustaining low-carbon mobility by installing electric vehicle charge-points and hydrogen refuelling stations.

The Climate Change Committee (CCC) conducted an analysis of the range of direct employment impacts on various sectors due to decarbonisation by 2030 based on a literature review of approximately 30 reports. Figure 2.1 shows that jobs related to energy efficiency and low carbon heating are expected to be most positively affected, followed by public transport, CCS and hydrogen energy supply, low carbon energy supply and EV and battery manufacturing.

*Figure 2.1: Range of estimates of direct employment impacts of decarbonisation by 2030*



Source: Climate Change Committee (2023)

In comparison, an analysis conducted by the World Economic Forum (2021) of global jobs using LinkedIn data identified similar sectors such as energy and mining, and transportation as the sectors showing high growth in green skills or jobs. The analysis also showed high growth in green jobs in less obvious sectors such as finance, construction, healthcare, public administration and the non-profit sector. This highlights that the demand for green skills is present across many industries.

## Nuclear

### Global Perspective

According to a post on the Center for Policy and Stability (2025), nuclear energy is on the “resurgence” globally, highlighting a global perspective around the following:

#### Growing Electricity Demand and Nuclear’s Role

In recent years, the conversation surrounding nuclear energy has intensified, with an increasing number of countries viewing it as a critical component in addressing electricity demand, energy security, and climate change.

Electricity demand is burgeoning globally, driven by technological advancements and increasing reliance on digital infrastructure. As countries worldwide expand their service sectors, with data centres and AI technologies at the forefront, the need for a stable, reliable source of power has never been more apparent. Nuclear energy, with its capacity

for round-the-clock power generation, emerges as a formidable candidate to meet these requirements.

### **Nuclear Energy's Resurgence**

The nuclear energy sector is witnessing what can be described as a renaissance. Following a decline in new projects in the aftermath of the 2011 Fukushima accident, the industry is seeing renewed interest. This year in 2025 is projected to mark the year with the highest global nuclear electricity generation ever. This indicates a robust resurgence fuelled by large-scale projects and technological advancements such as Small Modular Reactors (SMRs).

Currently, countries like China, Sweden, and France are leading the charge in nuclear energy development. China's substantial investments and project executions account for a significant portion of new global nuclear capacity, showcasing a strategic pivot to maintain and enhance their energy security.

### **Technological Innovations and Global Efforts**

The evolution of SMRs is noteworthy, offering a versatile and less financially intensive alternative to traditional nuclear plants. These reactors are gaining traction due to their improved safety profiles, economic feasibility, and adaptability to varying geographical and energy demands. Companies are increasingly securing partnerships with tech giants to power data centres with SMR technology, further enhancing the sector's development.

The conversation also extends to encompass enrichment capabilities, with an emphasis on diversification to counterbalance global reliance on countries like Russia, which dominates the uranium enrichment sector. Market diversification efforts are in progress, notably in the United States and Europe, aiming to create a more balanced and secure nuclear fuel supply.

### **Energy Security and Environmental Benefits**

Nuclear energy stands out as a reliable, low-emission energy source that aligns with global climate goals. As countries continue to forge paths toward reducing carbon footprints, nuclear energy offers a compelling solution to balance growing energy needs with environmental responsibilities. Nuclear energy is pivotal in reducing emissions without compromising energy availability—often a concern with intermittent renewable technologies like wind and solar.

The UK's strategic AUKUS defence and security partnership with the Australian and US Governments and industry, including to deliver conventionally-armed, nuclear-powered submarines, further strengthens our commitment to defence and will enhance sector growth. The UK has also joined over 20 international partners in endorsing the Net Zero nuclear declaration, calling for a global tripling of nuclear energy by 2050.

## National Perspective

According to a recent published report by Cogent Skills (2025), the UK nuclear landscape is made up of:

**Large Scale New Builds:** Most of the existing fleet of nuclear power stations will retire by the end of this decade, with only Sizewell B remaining in operation. The government is supporting Sizewell C; EDF is still awaiting the final decision on investment, which is likely to be in the summer of 2025. Whilst Hinkley Point C is expected to be commissioned in the mid-2030's.

**Extensions:** EDF has extended the lifetimes of Heysham 1 and Hartlepool by one year until early 2027, and Heysham 2 and Torness by two years until early 2030.

**Small Modular Reactors and Advanced Modular Reactors:** Great British Nuclear (GBN) is tasked with facilitating the delivery of the government's nuclear programme. Its focus will be to de-risk new nuclear development by co-funding projects at the critical early development stage and acting as an expert adviser throughout the process. The priority for GBN is to lead a competitive process to select the best small modular reactor technologies for investment.

**Defence:** The UK has maintained a Continuous-At-Sea Deterrent (CASD) since 1969 through Operation RELENTLESS, delivered by the Royal Navy. The current fleet of nuclear-powered, conventionally armed Astute Class submarines is nearing completion, and design work has commenced on the next generation SSN-AUKUS submarines, developed trilaterally with Australia and the USA. The Defence Nuclear Enterprise (DNE) is also addressing the legacy of decommissioned submarines, progressing the safe and secure disposal of nuclear liabilities. Significant infrastructure investments are underway at HMNB Clyde and HMNB Devonport: Clyde will host new docks, berths, advanced training facilities, and accommodation to support both current operations and the future Dreadnought and SSN-AUKUS fleets, while Devonport is being transformed into a submarine deep maintenance centre of excellence to support Defence's top priorities.

**Decommissioning and Waste Management:** The Nuclear Decommissioning Authority (NDA) and its group of subsidiary organisations are responsible for cleaning up the UK's

earliest nuclear sites, a mission that will span over a century. Their work involves decommissioning facilities, managing radioactive waste, and supporting the future development of a Geological Disposal Facility (GDF) to dispose of higher activity waste safely and permanently. This long-term challenge relies on innovation, skilled people, and close collaboration across the supply chain.

Sellafield Ltd is decommissioning Europe's largest and most complex nuclear site. Nuclear Restoration Services is progressing the decommissioning of Dounreay and 12 Magnox sites and preparing for the transfer of defueled EDF sites starting with Hunterston B in 2026. Nuclear Waste Services continues to develop the GDF programme while operating the Low-Level Waste Repository. Nuclear Transport Solutions ensures the safe transport of radioactive and critical materials by rail and sea, supporting both UK and international needs.

The UK Nuclear Skills Delivery Group's (NSDG) (2024) Strategic Plan for Skills highlighted that the nuclear sector plays a vital role nationally, maintaining national security, delivering a resilient future energy system, and boosting economic prosperity:

In conjunction with the published Nuclear Skills Delivery Groups Strategic Plan for Skills, the Minister for Defence Procurement and the Minister for Nuclear and Renewables established a Nuclear Skills Taskforce to 'turbo-charge' existing skills activity in the nuclear sector and to generate new initiatives to tackle challenges. The Taskforce has a mission –

*"Together, we will build the nation's capability for the nuclear sector by growing a diverse and inclusive workforce that is motivated, recognised and inspired – filling 40,000 new jobs by 2030, doubling our current rate of recruitment, in order to deliver the UK's priorities for national security and energy resilience."* (NSDG, 2024)

In response, regional nuclear skills hubs have been created to drive the skills taskforce on a local level. Hubs have been created in Scotland, North-West, Midlands (main one in EMCCA region) and South-West. These Hubs cover the more populated areas where nuclear supply chains are located.

### EMCCA Perspective

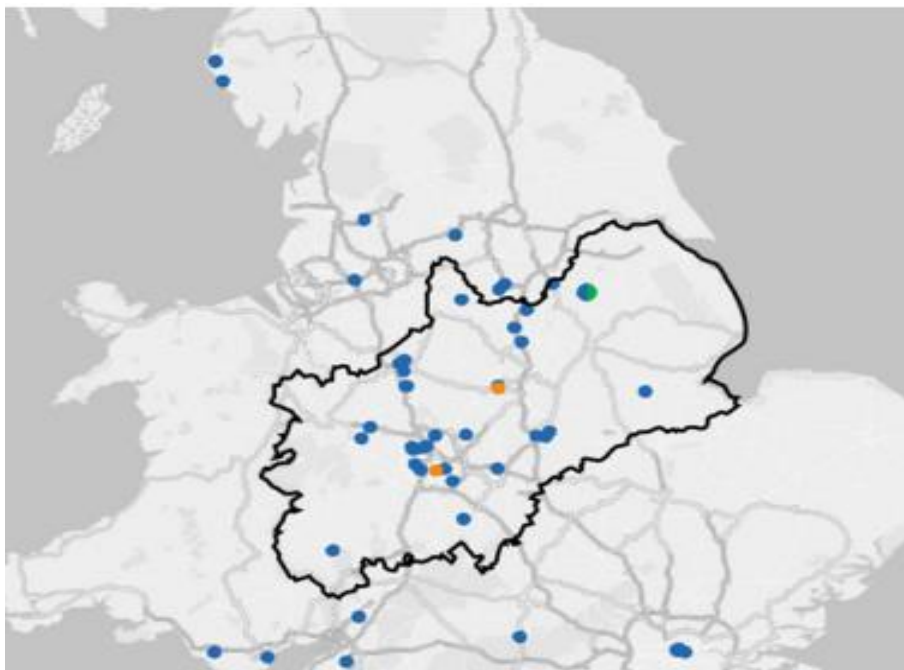
Rolls-Royce is a key stakeholder driving nuclear activity across the EMCCA region and has played a significant part in one of the main EMIZ locations in Infinity Park Derby (Midlands Engine, 2025). The collaboration between the University of Derby and Rolls-Royce in developing the Nuclear Skills Academy (est. 2022), aims to build prosperity through enhanced nuclear excellence. By answering the call for clean, safe and secure energy for defence and civil industries through nurturing innovation and embracing advanced

manufacturing. The Nuclear Skills Academy is a prime example of industry-academia partnership delivering regional skills and place-making. The City of Derby has a 60+ year history in nuclear defence driven through Rolls-Royce which provides EMCCA a world-class reputation in future fuels and low-carbon energy production.

The EMCCA region is set to host the future of nuclear, with the UK's only fusion prototype being developed in Nottinghamshire. This provides EMCCA multiple siting opportunities for SMR and AMR generation, as well as one of the only viable geological disposal site proposals in the country. Nuclear power technology is developed, tested and built in the East Midlands, and soon it will be generated here too.

The region's nuclear base is characterised by major manufacturing and advisory businesses including Rolls Royce (SMRs and submarine reactors), Cavendish Nuclear, and Ansaldo Nuclear – all of which contribute to the region's prominent standing within the global nuclear supply chain. These are underpinned by a cluster of Fit4Nuclear SMEs manufacturing high integrity, advanced, high-value components. These businesses with core capabilities such as machining, welding and forging, as well as system controls for reactors, are firmly embedded in the EMCCA region.

*Figure 2.2: Midlands Nuclear Company's business locations (blue), key nuclear R&D assets (orange) and STEP Fusion (green), with the Midlands Engine area highlighted*



Source: Midlands Engine (2025)

## Zero Emission Propulsion

Propulsion relates to mobility and so the sectors of relevance are considered to be transport:

- Aircraft and space
- Road transport (passenger, commercial and heavy goods)
- Rail (passenger and freight)
- Shipping (inland, coastal, ocean passenger and freight)
- Plant

Within each transport sector there are other sub-divisions with different power, torque and use requirements and with different journey and distances between stops. For example light rail passenger trains within cities compared to heavy haul freight trains. Some transport moves within a tightly controlled geographic area, especially plant within a quarry or construction site whereas other transport modes travel long linear distances such as inter-city trains, inter-continental aircraft and shipping.

However, for each, the propulsion can be divided into the following types based on energy source:

- Internally carried energy source with re-fuelling needs
  - Fossil Fuel
  - Bio-Fuels (using crops)
  - Advanced Bio-Fuels (using waste)
  - Battery
  - Gas (LNG)
  - Synthetic fuels
  - Hydrogen
  - Nuclear (mainly used in submarines)
  - Propellant and cryogenic (mainly used in space)
- External energy source with interface to the supply
  - HV Electricity – Overhead Line Electricity (OLE) / 3<sup>rd</sup> Rail, AC and DC systems
  - Maglev (Magnets)
- Hybrid energy sources (examples)
  - HV Electricity and Battery
  - Battery and Fossil Fuel

The external energy source links to skills and capabilities for Renewable Energy and energy transmission such as OLE design, construction and maintenance. Some of the propulsion types are not zero emission at point of use but are considered lower emission compared to current propulsion systems.

For internal energy sources there are skills linked to managing the lifecycle of production, transmission, storage and filling capability and designing the location and transmission of fuel.

The propulsion system can be divided into the following subsystems:

- Fuel Production and Transport – includes liquefaction and transport medium
- Motive Power – ICEs, Gas Turbines, Fuel Cells, Electrical Propulsion
- Energy Management – Power electronics and machines
- Drive and Transmission - for example from diesel engine to alternator (ac), rectified (dc) to inverter (ac) to traction motors, fuel cell to battery to traction motors
- Energy Storage including fuel tanks, batteries (Cryogenic systems needed for hydrogen)
- Sensors and Instrumentation – Range from environmental sensors such as altitude to engine status, including temperature and speed. Includes gyroscopes and accelerometers and thermal management
- Guidance, Navigation and Control
- Communication Systems
- Human-Machine Interface
- Automation – Some propulsion systems are automated and remotely controlled eg UAVs
- Structural systems – wheels, tyres, wings (aircraft)

## Renewable Energy

For centuries, electricity generation has relied on coal, oil and gas. However, the recent transition to green-energy generation has faced a huge challenge: the workforce is not yet fully trained or deployed for the task. Countries have invested in training the new generation to equip them with the needed skills and crucially in reskilling the existing oil-and-gas workforce to enable a just transition. The energy sector today is a major source of global employment and an outsized contributor in many regions. In the UK alone, between 250 000 and 400 000 additional low-carbon jobs are forecast by 2050, but only if skills pipelines keep pace.

Achieving Net Zero is the main goal for all countries worldwide, yet each embarks on that journey from a different starting point. National speed is shaped by technology maturity, natural-resource endowment and, most importantly, the available workforce. The United Kingdom's Ten Point Plan and Green Jobs Delivery Plan translate international climate commitments into domestic investment, regulation and market demand, setting a 2050 deadline for full decarbonisation.

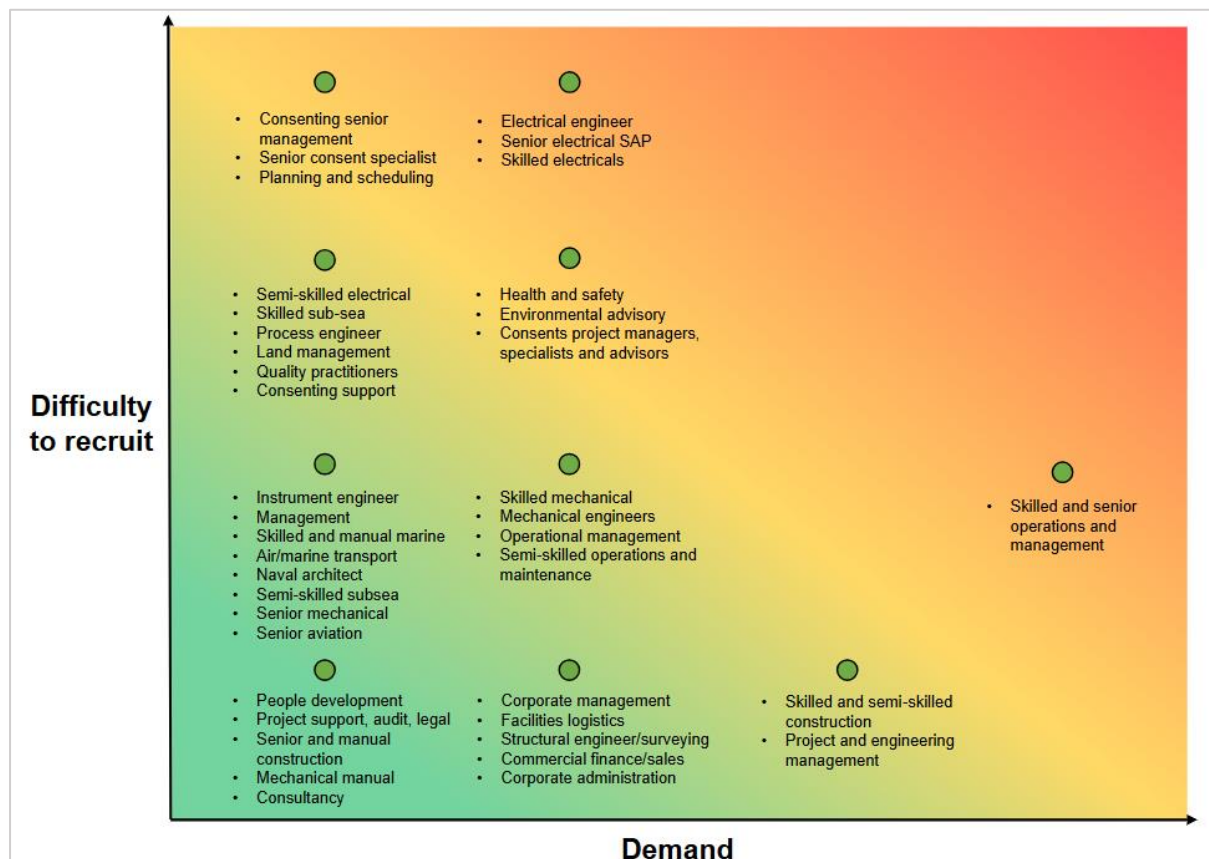
Renewable energy is comprised of various aspects of wind technology, solar power, energy storage, heat pumps, carbon capture and hydrogen, which are introduced below in turn.

## Wind Technology

Government estimates suggest that up to 90,000 UK jobs could be supported by the offshore wind sector by 2030. Direct employment in offshore wind was estimated to be around 11,300 in 2022 and indirectly supported up to another 28,900 across the wider supply chain. Industry estimated the offshore wind workforce including supply chains to be 32,000 in 2022. Direct employment in onshore wind was estimated at around 6,600 in 2022 and indirectly supported up to a further 13,100 across the wider supply chain.

The offshore wind sector reports persistent skills gaps in high-level electrical, digital, and consenting skills, along with marine and port orientated skills. Figure 2.3 shows that electrical engineers are expected to be the most difficult profile to recruit for offshore wind, while skilled and senior operations and management roles are expected to be in most demand through to 2030.

*Figure 2.3: Difficulty to recruit versus the demand in different jobs related to Wind expected in 2030*



Source: UK Government (2024a)

## Solar Power

The solar sector is estimated to directly employ 9,000 FTE in 2022. As a sector, it 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.

Microgrids and local energy systems, especially those heavily reliant on solar PV and solar thermal technology, require a robust skill set to facilitate widespread adoption and maintain reliability at community and industrial scales. For solar PV, a shortage in the number of electricians coming through electrotechnical training could impact recruitment in the solar sector.

Given that the installation of solar PV systems relies heavily on the skills of competent and certified electricians, this shortage could have a significant impact on the pace of deployment. Therefore, the East Midlands needs to develop strategies both to upskill existing electricians in the specific techniques required for solar PV installation and to increase the overall number of qualified electricians entering the workforce in the region. It is important to recognize that solar thermal technology, which focuses on harnessing

solar energy for heating purposes, requires a distinct set of skills compared to solar PV. The key skills for solar thermal deployment include expertise in system design, installation, and ongoing maintenance. Digital skills including data analytics, software management, and digital control systems to operate and manage microgrid stability, demand response, and smart energy integration are also highly demanded.

The future demand for solar PV and thermal skills in the East Midlands is inextricably linked to ambitious national renewable energy targets and the projected growth of the solar industry. Projections indicate a substantial 50% year-on-year increase in UK solar deployment for 2025, signalling a period of significant expansion. This growth trajectory aligns with the UK government's stated goal of achieving 40GW of solar energy capacity by 2030, a target that necessitates a considerable surge in solar panel installations across all regions, including the East Midlands.

It is forecasted that the recruitment requirement in the solar sector will be particularly high for science, research, engineering and technology professionals, level 6; business and public service associate professionals at level 4 to 5; and skilled metal, electrical and electronic trades, which is a level 3. This is detailed in the section below on the training and education needed to support the transition to net zero technology in the UK.

## Energy Storage

Energy storage is a critical component of the UK's transition to renewable energy. The UK's energy storage capacity is growing rapidly, with a focus on both long duration energy storage (LDES) and grid-scale battery storage. The UK is actively investing in energy storage to support its transition to a net-zero energy system, with both pumped hydro and battery storage playing key roles, and the government has set ambitious targets for capacity growth. The government is actively supporting innovative energy storage technologies to improve energy security and efficiency.

The East Midlands is focusing on developing skills to support energy storage and clean energy initiatives, particularly through the Future Energy Skills Hub (FESH). Key skills for energy storage deployment include technical expertise in advanced manufacturing and clean energy technologies, electrical and mechanical engineering, design, installation and maintenance of energy storage systems, as outlined in qualifications such as the City & Guilds Level 3 Award in Electrical Energy Storage Systems. Skills in artificial intelligence, data science, energy modelling and system optimisation software and tools, and an understanding of smart grid technologies and their integration with storage systems are also essential.

The East Midlands Freeport and its partners, including the East Midlands Institute of Technology, are investing in training programmes and degrees in areas such as sustainable engineering, renewable energy systems and artificial intelligence to build a skilled workforce.

## Heat Pumps

The Heat Pump Association (HPA) estimates that as of 2023, the 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. 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 70,000 individuals by 2035 to keep up with future demand. 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.

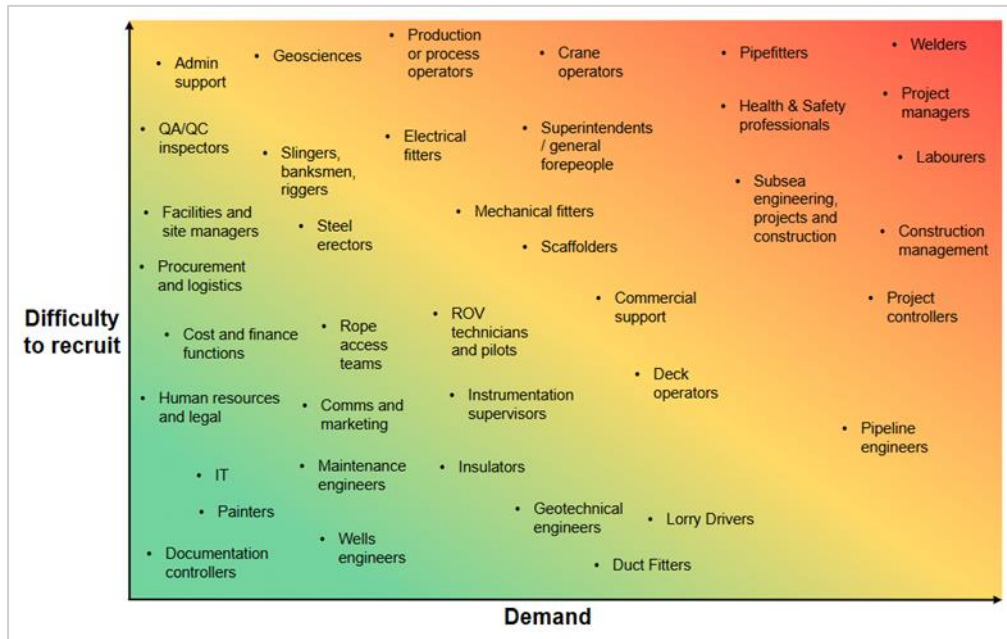
Experienced oil and gas heating installers already have many of the skills needed to install low carbon heating and can train to do so in one week or less. There are currently over 100,000 registered gas and oil heating engineers in the UK with the competencies to install domestic boilers, however they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

For heat networks, 25% of workforce are aged over 50. The mean age is 37.1 for females and 42.5 for males and only 19% of workforce are female. There is relatively limited representation from ethnic minorities. There is a limited provision of heat network modules in higher education, limiting opportunities to gain whole systems understanding.

## Carbon Capture, Usage and Storage

The Carbon Capture, Utilisation and Storage (CCUS) sector is expected to enable wider job creation in other industries as they decarbonise. The government's ambitions could support up to 50,000 jobs by 2050 across the CCUS sector and related supply chains. Many of these jobs will be concentrated in the UK's industrial regions. The workforce will include 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. According to the recent statistics, it has been reported that welders, labourers as well as pipefitters are all expected to be the most in-demand occupations by 2030 to achieve the national UK target, as seen in Figure 2.4.

Figure 2.4: Difficulty to recruit versus the demand in different jobs related to Carbon Capture, Usage and storage expected in 2030



Source: UK Government (2024a)

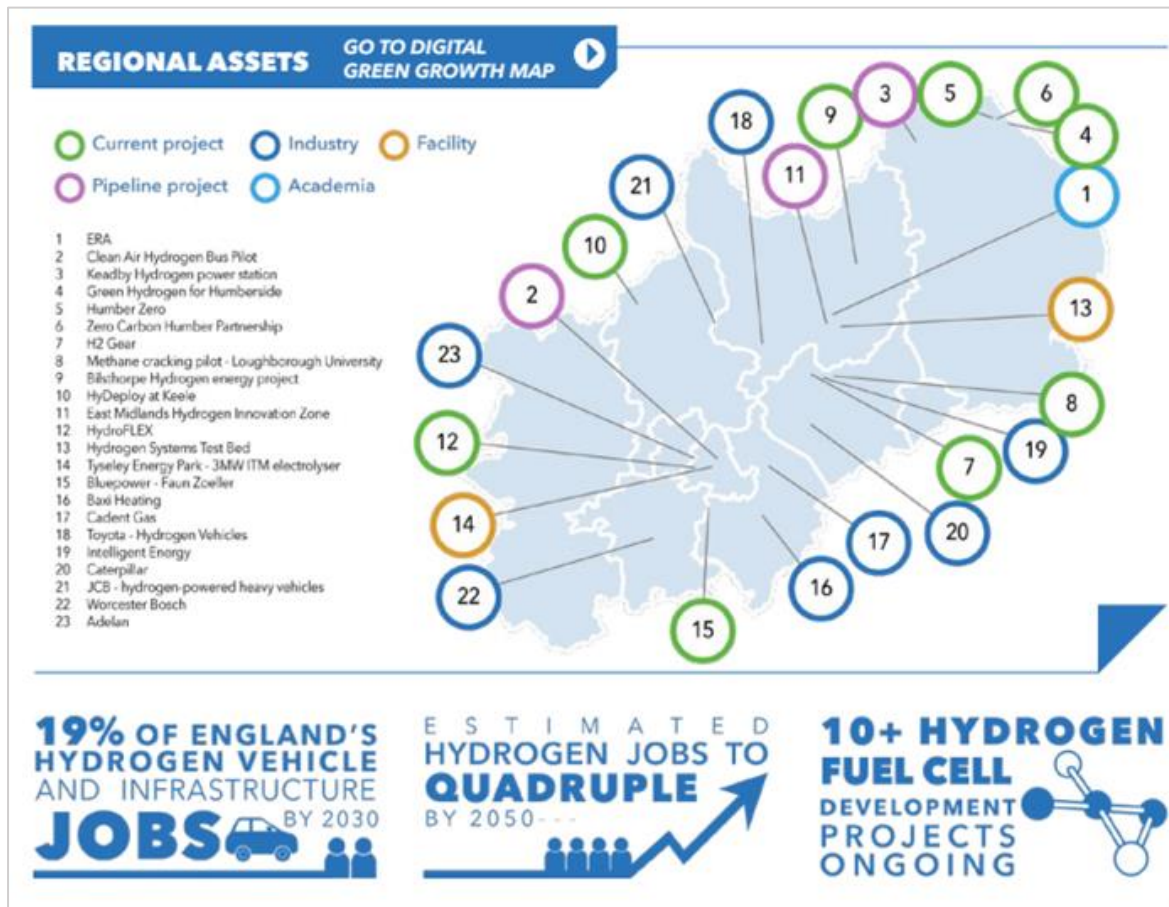
## Hydrogen

Hydrogen technology has developed significantly in recent years. In the UK, the hydrogen workforce for production-related activities was around 2,000 in 2022 while this number is to jump to 28,500 direct jobs and 64,500 indirect jobs across all areas of hydrogen by 2030.

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

Thanks to exceptional business, industry and academic innovation, the Midlands is already pioneering next generation, cost-effective hydrogen technologies, with powerful potential to scale up. A pan regional hydrogen task force will ensure that the Midlands Engine, of which the EMCCA region sits within, capitalises on the opportunities presented by hydrogen, playing a national leadership role in decarbonising transport, logistics and heating, creating jobs and accelerating net zero UK. Figure 2.5 shows the regional assets within the East Midlands related to hydrogen technology.

Figure 2.5: Regional assets of the East Midlands related to Hydrogen Technology



Source: Midlands Engine (2021)

## Green Construction

The EMIZ programme is particularly relevant considering the new UK governments' commitment to construct 1.5 million new homes within five years and a commitment under their Warm Homes Plan to support investment into upgrades of existing homes. These plans encompass several key policy interventions, including a comprehensive overhaul of the planning system to accelerate housing development, targeted financial support for first-time buyers, and significant investment in infrastructure such as transport and energy networks to facilitate large-scale housing projects. The anticipated expansion of the housing sector is expected to drive increased demand for green construction skills, particularly in sustainable building practices and the integration of renewable energy technologies.

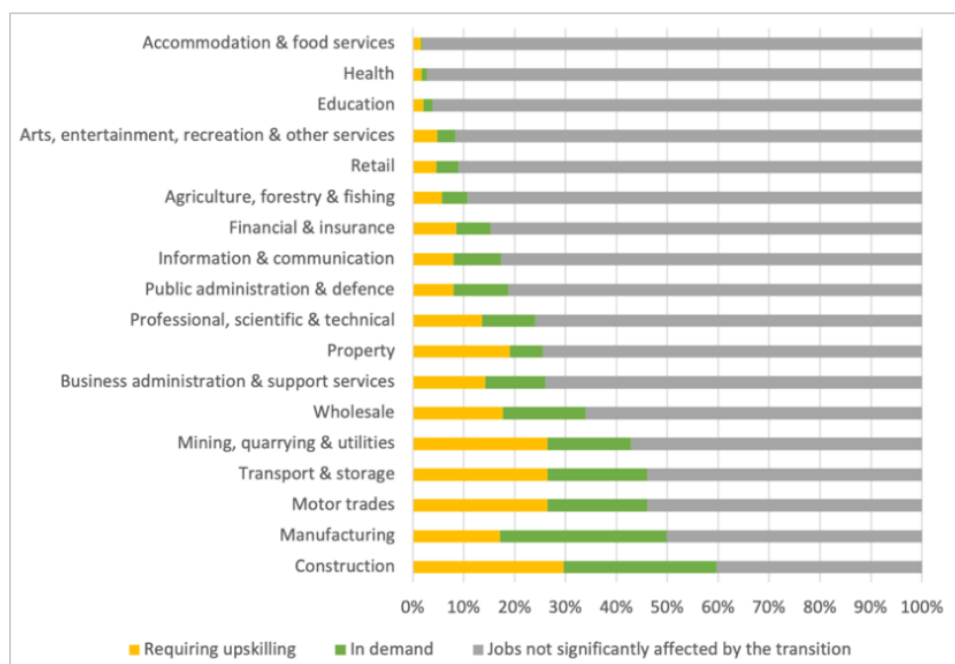
Within this context, Work Package 4 – Green Construction is dedicated to identifying and addressing the competencies required for sustainable construction. This section provides a comprehensive review of the policy context for green skills within the construction sector combined with insights from the Sprint B Innovation Skills Roadmap before presenting

findings from a stakeholder workshop and research to present a set of recommendations to inform EMCCAs skills investment.

It is essential to note that green jobs cross all roles in construction and mainstream learning, including the national curriculum, apprenticeships and professional qualifications, green jobs are not specialist subjects (Construction Leadership Council, 2017). To underpin what is meant by 'green jobs' here, the environmental policy landscape must be presented. The UK Government still has a legally binding target for net-zero greenhouse gas emissions by 2050. This progressed from the previous 80% target, from 1990 levels in 2019, with the Paris Agreement confirmed at the Conference of Parties. To date sustainable construction and retrofit has prioritised reducing operational emissions from the building stock with current movement toward embodied emissions, both accounting for around 40% of global greenhouse gas emissions (IEA, 2024). Heat decarbonisation and energy security have led to the ban of all new gas boilers by 2025.

According to the Place-Based Climate Action Network (PCAN, 2019) they have found that one in five workers, and 6.3 million jobs in total, will be affected by the transition to a net-zero carbon economy, with around 3 million workers requiring upskilling and around 3 million in high demand. A particular sector they highlight to be impacted is the construction sector, followed by manufacturing and transport, as the sectors where most focus is needed both to seize the employment boost of the green economy and in terms of skills and retraining (see Figure 2.6).

*Figure 2.6: Jobs requiring upskilling, jobs in demand, and jobs not significantly affected by the transition, by sector*



Source: Based on findings from PCAN (2019)

Sector boundaries for industries, specially manufacturing and construction are fluid. As noted by Relly et al. (2022) the construction sector is a diverse industry, covering everything from local independent sole traders to major infrastructure projects. Its economic output varies annually (reflecting economic cycles) and constitutes about 7-10% of national GDP. Output can also be classed in terms of new construction or repair and maintenance of buildings - see Table 2.4. Relly et al. (2022) note that the sector has about 45,000 firms, of which over 95% are small and medium-sized enterprise (SMEs); over 80% of firms in the sector are micro enterprises with 1-3 employees (ONS, 2021c).

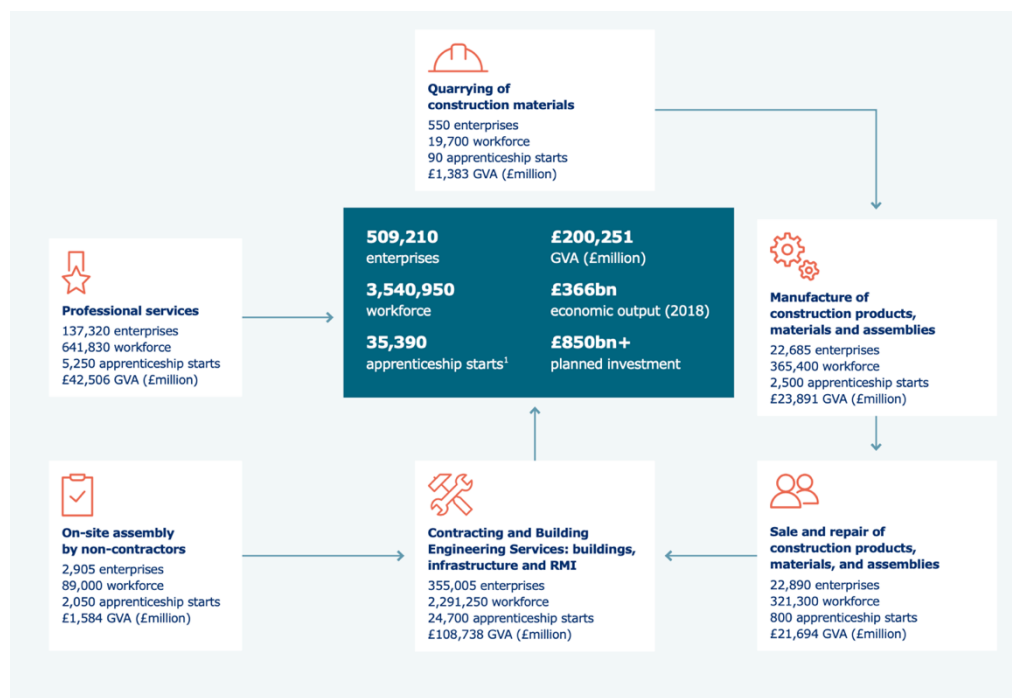
Table 2.4: UK construction annual output, 5-year averages 2016-2020

| £bn (% of total)       | Housing    | Industrial & commercial | Infrastructure | Totals – new and R&M |
|------------------------|------------|-------------------------|----------------|----------------------|
| New construction       | 37.9 (24%) | 47.1 (30%)              | 19.2 (12%)     | 104.1 (66%)          |
| Repair and maintenance | 28.8 (18%) | 17.1 (11%)              | 8.4 (5%)       | 54.3 (34%)           |
| Totals by sector       | 66.7 (42%) | 64.2 (41%)              | 27.6 (17%)     | 158.5 (100%)         |

Source: Relly et al. (2022) using data from the ONS (2021c)

In its 'Industry Skills Plan' (Construction Leadership Council, 2021), the Construction Leadership Council take a broad definition of the construction sector to include the associated supply chains and professional services that enable the industry to function (see Figure 2.7). The construction and built environment sectors account for approximately 40% of the UK's greenhouse gas emissions, but according to the Construction Industry Training Board (CITB), can influence over half of the UK's emissions.

Figure 2.7: An overview of the construction sector



Source: Construction Leadership Council (2019)

The UK construction sector is characterised by primarily low skills, including vocational training based on voluntarism and short courses (Killip, 2020). According to the same author, if the UK construction sector continues its low skills equilibrium, it will fail to implement the low carbon agenda, including the large-scale deployment of energy efficiency retrofits and low carbon technologies. Besides performing a specific skill, low carbon jobs will need to understand the bigger picture as each situation will be different. In the case of the construction sector, employees need to be able to manipulate tools and materials and analyse and create solutions based on theoretical principles and a common shared responsibility for good-quality outcomes (Killip, 2020). Also, according to Killip (2020), low-carbon projects require the integration of multiple tasks at the project level. It is essential that the people involved in projects share processes and practices among project teams to support learning.

These academic reflections chime well with research produced for the CITB that maps out very clearly the scope and scale of skills and jobs required to enable the governments net-zero strategy to be delivered. Adopting an energy efficiency first approach, the CITB projects a steep increase in employment up to a peak of around 350,000 FTE workers in 2028. After an initial drop in employment in 2029, they believe that, after completing most of the retrofit works, employment is sustained by repair and replacement at an average of around 240,000 FTE. Construction Project Managers peak at just over 86,000 in 2028 (includes Retrofit Co-ordinator roles). Specifically, they note the following key roles:

- Construction Trades Supervisors peaks at just under 24,000 in 2028.
- Building Envelope Specialists peak at around 33,000 in 2028 (this includes Insulation Installers).
- Plumbing and HVAC trades will require over 59,000 in 2028, peaking at 91,500 in 2045.
- Asbestos Awareness training – 15,000 by 2025;
- Heat Pump Installer training – 19,500 needed by 2028;
- Trustmark Retrofit Co-ordinator – peaking at just over 7,000 in 2027.

The report *Levelling Up and Greening Out: A Just and Holistic Transition to Low Carbon Jobs* by Bull and Domingues (2021) explored the challenges and opportunities associated with transitioning to low-carbon employment in the United Kingdom, with particular attention to the Midlands and Bolsover regions. Commissioned by Bolsover District Council, the study provided an in-depth analysis of how these areas can effectively navigate the shift towards a more sustainable economy.

A key issue highlighted in the report is the widespread shortage of professionals with expertise in sustainable construction, which is slowing the industry's progress towards net-zero targets. Furthermore, the availability and accessibility of sustainability-related training vary across the United Kingdom, leading to regional disparities in workforce readiness. The increasing demand for specialists in areas such as energy modelling, circular economy principles, and sustainable building certification further emphasises the need for targeted skills development. However, the absence of widely recognised sustainability certifications for construction workers presents a barrier to workforce mobility and upskilling efforts. To address these challenges, the report advocates for government-led investment in training schemes, with public funding and incentives playing a key role in closing the skills gap within the green construction sector.

## Sustainable Advanced Manufacturing

The manufacturing sector plays a pivotal role in the UK economy, contributing over £200 billion annually, employing 2.7 million people (HVM Catapult, 2020), and accounting for over 40% of the country's exports. The UK government recognises advanced manufacturing as an area of significant potential growth over the long-term for the UK economy and is considered as one of five areas key to ensuring that pay, employment and productivity rise in every area of the UK by 2030 (UK Government, 2022).

Advanced manufacturing is broadly defined as: *"production processes that integrate advanced science and technology, including digitalisation and automation, into manufacturing,"* (UK Government, 2023). It encompasses the convergence of cutting-edge technologies, enabling the development of next-generation industrial products, adaptable manufacturing processes, and innovative business models. While applicable across all manufacturing sectors, advanced manufacturing is particularly associated with medium- and high-technology industries, such as automotive, aerospace and semiconductors, where precision, efficiency, and scalability are essential. Sustainable Advanced Manufacturing builds upon these technological advancements but with an explicit focus on minimising environmental impact. It integrates **Digitalisation** such as automation, data and AI in factories and supply chains (also referred to as Industry 4.0). It also integrates **Decarbonisation**, for example: renewable and low-emission energy technologies and efficient processes, and as well as **Circularity**; material reuse and recycle. This results in advancing the production of high-value, eco-conscious industrial systems and products that align with future technological and environmental requirements, ensuring both economic growth and climate resilience.

The shift towards sustainable advanced manufacturing is driven by both global climate imperatives, such as the UK's legally binding commitment to achieve net-zero greenhouse gas (GHG) emissions by 2050, and evolving consumer demand for ethically and sustainably produced goods. The UK government has designated sustainable advanced manufacturing as one of the eight high-growth sectors critical to economic security and industrial resilience. The government has committed to targeted interventions and major investment cycles aimed at expanding this sector, attracting private investment, and driving long-term economic growth (UK Government, 2023a, 2024b). The new Labour government has indicated to continue the initiatives such as 'Made Smarter' and Investment Zones are pivotal in encouraging innovation, digitalisation, and sustainability.

The EMIZ is a part of the UK government's strategic initiatives designed to establish the region as a national hub in advanced manufacturing and green industries sectors (UK Government, 2023a). EMIZ is expected to drive economic growth by creating high-value employment opportunities across the region through advancing private sector expansion, addressing lack of R&D and innovation, and workforce readiness.

The growth and global competitiveness of the sustainable advanced manufacturing sector depend on the early adoption and effective exploitation of innovation. This requires cutting-edge R&D, translation of innovation into growth, and strong knowledge networks, all of which hinge on the availability of a highly skilled workforce capable of driving industrial transformation (Calza et al., 2024). While the UK boasts a world-class research base and a strong capacity for technological innovation, its ability to translate these strengths into industrial competitiveness is constrained by persistent technical skills shortages (HVM Catapult, 2020). The UK's skill mismatch in the advanced manufacturing sector is gradually increasing and is higher than its peer economies, with 42% of manufacturing vacancies classified as skills shortage vacancies, which is significantly above the national average of 36% (UK Government, 2023b).

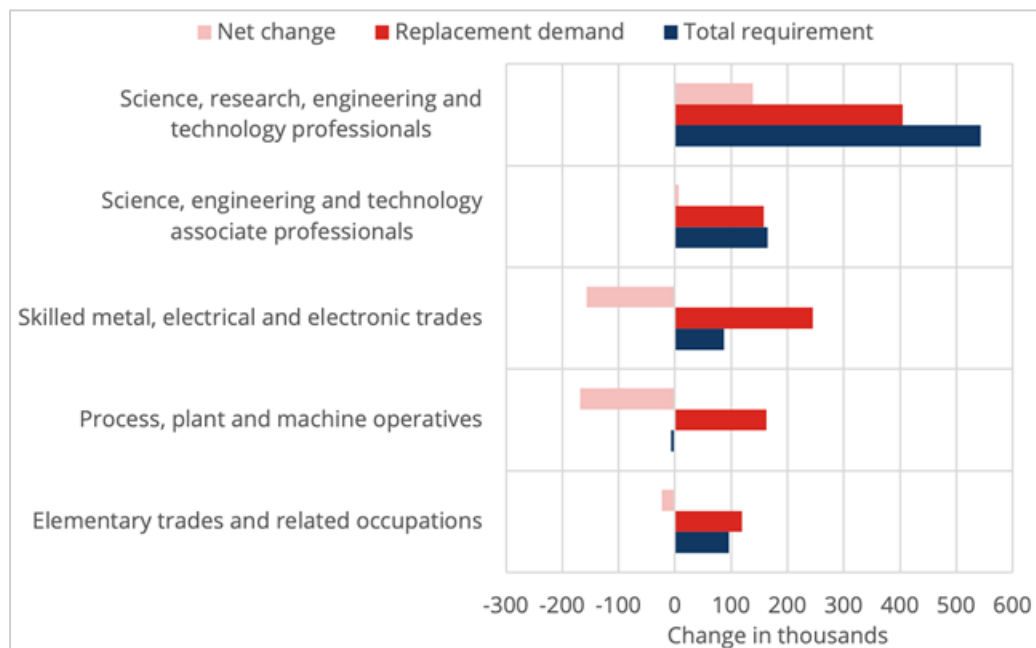
### The Changing Skills Landscape

Skills shortages are not new to the UK manufacturing sector. However, the drive towards digital transformation and the net-zero transition is reshaping workforce requirements at an unprecedented pace requiring high-level qualification (MakeUK, 2022a), which is resulting in continually widening skills gap. The UK's skilled labour shortage has surged to its highest level in three decades (Sharp, 2020), costing the economy an estimated £21 million in lost GDP daily (MakeUK, 2022b).

These high-level qualification roles are often classified as green jobs due to their focus on minimising the environmental impact of manufacturing. They require specialised skills in process optimisation, resource efficiency, sustainable materials development, and circular economy implementation.

Figure 2.8 illustrates the projected changes in employment across different manufacturing occupations based on an analysis from L&W analysis of Working Futures (2020). The demand for science, research, and engineering professionals is expected to grow, indicating the growing need for new skills in response to advancements in manufacturing. In contrast, a negative net change indicates the decline in the manual occupation due to uptake of automation and digital technologies.

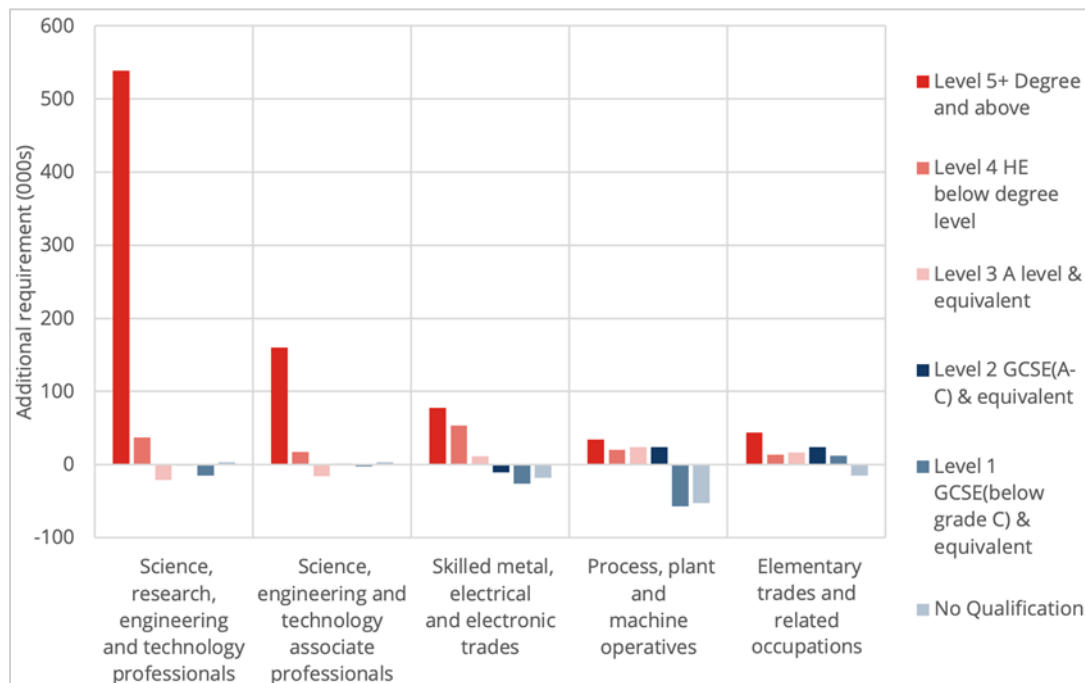
Figure 2.8: Forecasted change in employment for manufacturing occupations



Source: L&W analysis of Working Futures (2020), cited in WorldSkills UK (2023)

Figure 2.9 highlights the projected workforce demand across different manufacturing occupations, segmented by qualification levels. The figure indicates an increased demand for higher-level job roles (level 5 and above) but also highlights the "missing middle". The "missing middle" refers to the gap in educational pathways between low-level vocational training and full university degrees. These higher technical qualification roles are vital for manufacturers to support (i.e., deploy, operate and maintain advanced technologies) the uptake of innovation (Lewis, 2020).

Figure 2.9: Forecasted additional employees required by occupation and qualification level



Source: L&W analysis of Working Futures (2020), cited in WorldSkills UK (2023)

The decline in manual labour within the manufacturing sector is not solely due to technological advancements but also reflects shifting career perceptions among younger generations. Many young people perceive manufacturing jobs as 'dirty,' which are physically demanding, low-status, and less desirable. To address this challenge, manufacturers are increasingly adopting smart technologies and automation as a solution to the skills gap. According to The Manufacturer's (2024) survey, 44% manufacturers reported that skill shortage in manual operation have accelerated their transition to automation and digital technologies. Meanwhile, 47% stated that their adoption of advanced manufacturing technologies was primarily driven by the need to gain a competitive edge.

This evolution highlights the changing nature of skills required in modern manufacturing, where expertise in digital tools, automation, and advanced equipment maintenance is becoming increasingly critical. As traditional roles diminish, demand is rising for professionals with digital skills, capable of working with smart factories, AI-driven systems, and data analytics. Addressing this shift requires a comprehensive, collaborative approach, with industry, government, and educational institutions working together to develop a future-ready workforce that meets the evolving demands of the manufacturing sector. Also, the wider literature review indicates the need to increase enrolments across all levels

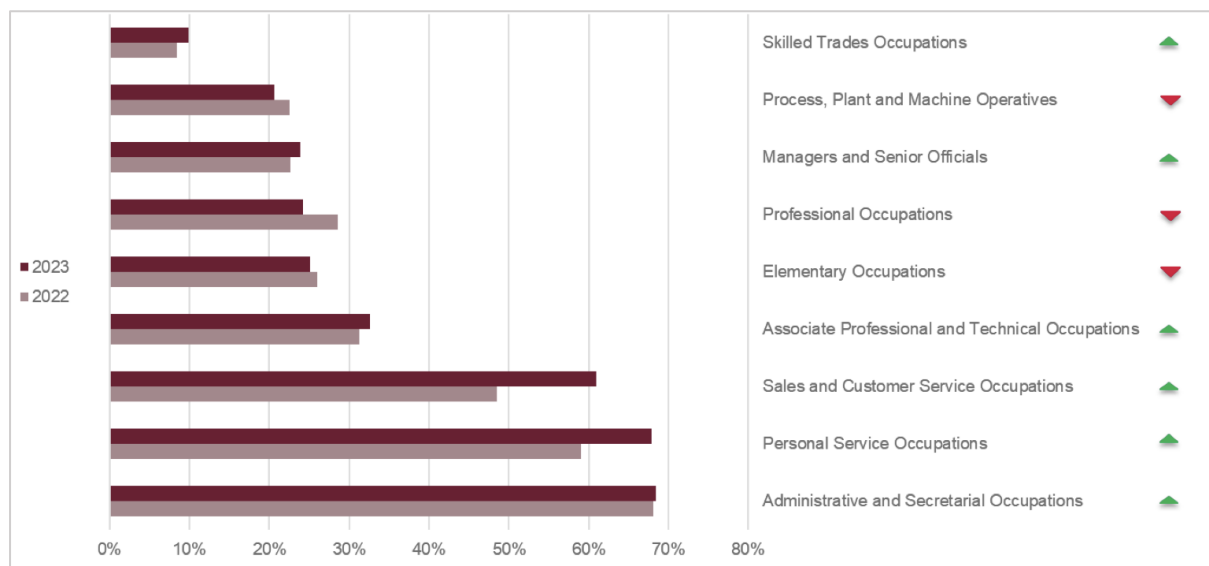
of qualifications, rather than just re-profile existing workforce numbers to higher qualification levels (WorldSkills UK, 2023).

The changing skills landscape is not only strengthening industrial resilience but also creating high-value, well-paid jobs promoting long-term social mobility across the UK. As the sector evolves, demand for highly skilled professionals in automation, digital manufacturing, and green technologies is rising, offering potential for social mobility through accessible career pathways through structured skills programs and apprenticeships.

## Gender Disparities

One of the key challenges in closing the skills gap is increasing female participation, particularly in technical and engineering roles. Despite the growing demand for skilled workforce, women make up only 26.1% of the UK's manufacturing workforce (Office for National Statistics, 2024c), with even lower representation in higher-paid technical roles as shown in Figure 2.10 (Castañeda-Navarrete et al., 2024). Bridging this gender gap is essential for expanding the talent pipeline, raising innovation, and strengthening the UK's long-term industrial competitiveness.

Figure 2.10: Women's share in manufacturing by occupation, 2022 and 2023



Source: Office for National Statistics (2024c), cited in Castañeda-Navarrete et al. (2024)

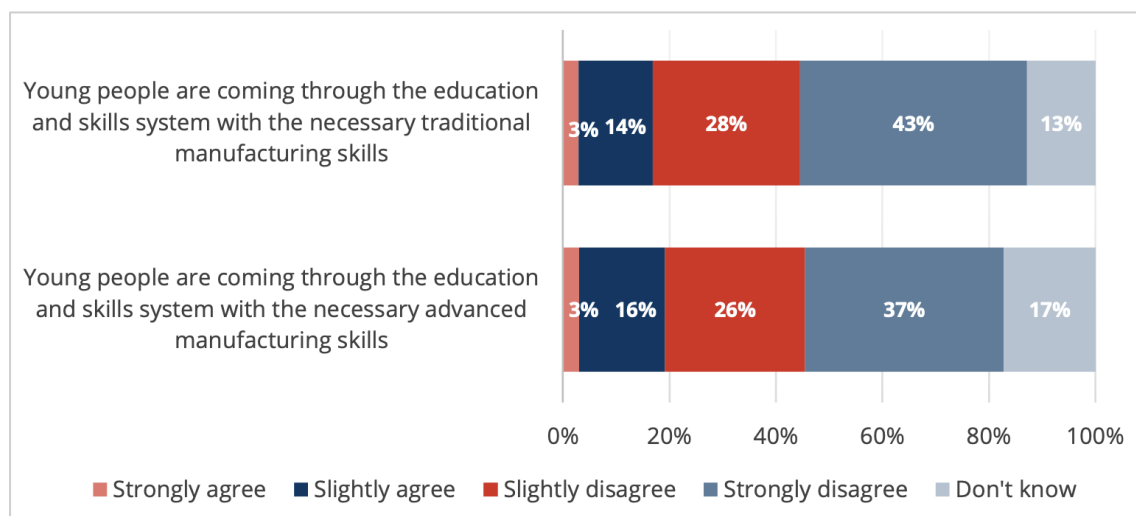
It is widely reported that a major barrier to female participation in highly skilled manufacturing roles is a lack of awareness and guidance regarding career pathways, required qualifications, and industry expectations (WorldSkills UK, 2023). Many young women reported that limited exposure to manufacturing careers, as well as a perception of the industry as male-dominated, dirty, and dangerous discourages them from pursuing opportunities in the sector (Deloitte, 2020). Young women are three times less likely than

young men (18% vs 54%) to pursue a career in manufacturing. Addressing these misconceptions and improving access to career information is crucial to attracting more women into advanced manufacturing. However, achieving gender diversity requires more than just awareness campaigns. A systemic shift is needed, including targeted recruitment efforts, workplace flexibility, reskilling initiatives, and structured career progression (Castañeda-Navarrete et al., 2024).

## Aligning education and skills with industry needs

A recent survey revealed widespread concern over the UK skills system's ability to meet industry demands. According to the findings (see Figure 2.11), 63% of manufacturers reported that the young workforce lacks advanced manufacturing skills, while 70% highlighted deficiencies in traditional skills (WorldSkills UK, 2023). This aligns with findings by Madonsela (2022), which identified the UK as having the highest rate of underqualification and skills mismatch among G20 countries, further exacerbating challenges in workforce readiness.

Figure 2.11: Education and skills alignment with industry needs



Source: Young persons survey cited in WorldSkills UK (2023)

The primary factor for this misalignment is the lack of industry engagement with the skills providers to help them address industry skills needs, for example, through curriculum design, work placements or careers advice. As a result, providers are not always aware of current skills gaps and demand due to a disconnect between colleges and employers regarding what each party needs from the other (WorldSkills UK, 2023). Other contributing factors include a shortage of teachers with up-to-date industry experience, inadequate access to modern training equipment, and outdated curricula that fail to keep pace with technological advancements.

## Part 3: The Policy Context for Green Skills

### International Context

#### COP 28

To increase the share of renewable energy in the energy mix, a global initiative was launched at the COP 28 in Dubai in 2023 with the creation of a joint roadmap where participant countries have agreed to accelerate their energy transition by tripling their renewable energy capacity and doubling their energy efficiency improvements by 2030.

According to the International Energy Agency's Net Zero by 2050 report, this transition to renewable energy will shift around 5 million workers from fossil fuel jobs to green ones, and more than 30 million workers worldwide will need to be retrained and re-skilled to ensure the transition to renewables is completed on schedule. The sector will also create around 14 million new jobs at a global level across a range of technologies.

Achieving Net Zero is the main goal for all countries worldwide. Below is a list of individual goals different countries are aiming for in order to achieve Net Zero:

- India has set an ambitious renewable energy target of 450 GW by 2050. This is expected to create a surge of investments in the sector, providing an important opportunity for job creation. The Indian government estimates that net employment will increase by an additional 30% by 2030.
- South Africa aims to achieve over 6,000 MW of renewable energy projects by 2030 while creating significant job opportunities in the solar and wind sectors, estimated at over 300,000 jobs especially in the green technology, waste management, and energy efficiency.
- Morocco has developed a green energy plan that aims to ensure that 52% installed renewables generation capacity in electricity by 2030. This is expected to lead to over 50,000 new jobs in the clean energy sector in the country.
- Côte d'Ivoire plans to rapidly increase its electricity generation capacity by 2030, by increasing the share of renewables to 42%, including 16% from non-hydro sources. Given that the current share of renewables in the power mix is less than 1%, the industry is expected to see significant growth, which will bring sizeable new job opportunities.
- The Philippines aims to produce around 35% of its power generation from green energy by 2030 and 50% by 2040.
- Austria's government has prioritised rapid expansion of wind, solar, hydropower and biomass as it aims to source all its electricity from renewable energy by 2030.

## The Paris Agreement

The Paris Agreement, adopted in 2015 under the United Nations Framework Convention on Climate Change, remains the cornerstone of international climate policy in 2025, particularly in Europe, despite the United States' recent withdrawal (The Guardian, 2025c). Its primary goal is to limit global temperature increases to well below 2°C above pre-industrial levels, while striving to restrict warming to 1.5°C (UNFCCC, n.d.). Despite progress in renewable energy expansion and emissions reduction commitments, research indicates that current policies could still result in a 2.4°C temperature rise by the end of the century, highlighting the need for stronger policy frameworks and enhanced global cooperation (Reuters, 2025b). Financial support and technology transfer are critical for implementation. Developed nations have pledged \$100 billion annually to assist developing economies in their transition to low-carbon pathways. However, actual disbursements have consistently fallen short, with only 75% of the pledged funds materialising over the past five years, exacerbating climate vulnerabilities in the Global South. The introduction of carbon trading mechanisms under Article 6 has enabled emissions offsetting through sustainable investments, though concerns persist about potential loopholes that may delay meaningful decarbonisation (The Guardian, 2024).

Non-state actors, including cities, corporations, and civil society, play an increasingly influential role in climate action. Subnational governments and businesses contribute significantly to emissions reduction efforts, accounting for nearly 40% of implemented measures, highlighting a shift towards decentralised climate governance. The built environment, responsible for approximately 39% of global carbon emissions, remains a key focus (Ritchie, 2020). Sustainable construction practices and workforce development in energy-efficient building techniques are essential for achieving net-zero targets. Despite rising demand for skilled labour in green construction, training programmes remain insufficient to meet projected needs, necessitating greater investment in vocational education and industry partnerships. The Paris Agreement's success depends on enhanced financial commitments, regulatory enforcement, and broad participation from both state and non-state actors. Addressing emissions from the construction sector and investing in workforce development will be crucial in achieving long-term climate goals.

## The European Union Green Deal and Skills Agenda

Building on the Paris Agreement, the European Green Deal, introduced in 2019, is the EU's framework for achieving climate neutrality by 2050 (European Commission, 2025a). It aims to decouple economic growth from resource use while ensuring a just transition. By 2025, the Green Deal has significantly shaped regional climate policies, influencing

legislative measures, industrial practices, and skills development initiatives (European Commission, 2025a).

The EU's Skills Agenda, launched alongside the Green Deal, focuses on equipping workers with competencies in sustainable technologies, digitalisation, and energy efficiency (European Commission, 2025c). However, persistent skill shortages, particularly in construction, renewable energy, and circular economy sectors, hinder progress (World Employment Confederation-Europe, 2025). Demand for workers trained in retrofitting buildings for energy efficiency continues to outstrip supply. The Pact for Skills furthers industry-education partnerships, yet barriers such as regional disparities in training access and slow curriculum integration persist (European Commission, 2025c).

The built environment remains central to the Green Deal, as buildings account for 40% of the EU's total energy consumption and 36% of CO<sub>2</sub> emissions (Climate Action Tracker, 2025). Policies such as the Energy Performance of Buildings Directive (EPBD) and the Renovation Wave Strategy (RWS) aim to accelerate decarbonisation (European Commission, 2025b). However, funding delays and workforce shortages hinder implementation (World Employment Confederation-Europe, 2025). The EU has expanded investment in vocational education and lifelong learning, but more efforts are needed to ensure inclusive access to green job opportunities (European Commission, 2025c). Social equity remains a challenge. Lower-income populations face disproportionate difficulties in accessing green jobs and reskilling programmes, necessitating stronger just transition measures (Marelli et al., 2025). Strengthening investment in training, streamlining regulatory frameworks, and advancing public-private partnerships will be crucial in advancing Europe's green transition while maintaining economic resilience (European Commission, 2025a).

### Energy Performance of Buildings Directive and Renovation Wave Strategy

As previously discussed, the EPBD was first introduced in 2002 and subsequently updated, establishes the regulatory framework for improving building energy performance across the EU (European Commission, 2025d). The RWS was launched in 2020, aims to renovate 35 million buildings by 2030, effectively doubling annual renovation rates to enhance energy efficiency, reduce emissions, and stimulate economic growth (European Commission, 2025e). While these initiatives have made progress, challenges related to funding, workforce shortages, and regulatory inconsistencies persist (The Guardian, 2025d).

The EPBD mandates minimum energy performance standards, zero-emission building requirements, and energy performance certificates (EPCs) to guide renovations. Recent

updates stipulate that from 2030, all new buildings must be zero-emission, with public buildings required to meet this standard by 2028 (European Commission, 2025f). The RWS complements the EPBD by introducing financial mechanisms such as the European Green Deal Investment Plan and the Social Climate Fund to support these ambitious goals (European Commission, 2025g). However, bureaucratic delays and fragmented regulations have hindered effective funding distribution (The Guardian, 2025d).

Workforce capacity is another critical issue; a shortage of skilled labour slows energy-efficient construction projects, particularly in retrofitting and smart building integration (Financial Times, 2025a). The EU's Skills Agenda supports vocational training and digital upskilling, but demand for professionals in sustainable construction continues to exceed supply. Social equity remains a focus, as energy poverty disproportionately affects lower-income households. Policymakers have introduced targeted subsidies and community-led renovation projects to address these disparities (European Climate Foundation, 2025).

Additionally, innovative construction techniques, such as prefabrication, modular construction, and bio-based materials like timber and hempcrete, are being explored to improve cost-effectiveness and sustainability. Circular economy principles, including material reuse and recycling, are increasingly integrated into renovations (Bruegel, 2025).

### Other Noteworthy Net-Zero International Reports and Initiatives

There are several other policies/initiatives internationally that are noteworthy, including insights from the International Labour Organisation (ILO) Green Jobs Programme, the United Nations Sustainable Development Goals (SDGs), and the Royal Institution of Chartered Surveyors (RICS) Sustainability Report (2024), all of which provide valuable perspectives on the international context of the green construction. The ILO Green Jobs Programme (2019) emphasises the creation of employment opportunities that contribute to preserving or restoring the environment. While the programme addresses various economic sectors, its principles are particularly relevant to construction, advocating for policy development that promotes environmental sustainability alongside social development and decent work. Additionally, the programme highlights the necessity of identifying and advancing the skills required for green jobs, which are essential in facilitating the transition to sustainable construction practices. These initiatives emphasise the need for policies that integrate environmental and social objectives, complemented by targeted skill development to support the green transition.

The SDGs, adopted in 2015, provide a universal framework for sustainable development, with several goals directly influencing the advanced manufacturing and construction sector's trajectory towards net-zero emissions. Goal 8 aims to promote sustained and

inclusive economic growth and decent work for all. It emphasises the need for higher productivity, innovation, and entrepreneurship while ensuring fair wages, safe working conditions, and equal opportunities. In the context of sustainable advanced manufacturing, the transition to Industry 4.0 and net-zero manufacturing is transforming jobs, requiring reskilling and upskilling programs to help workers adapt to automation, digitalisation, and green technologies. While some traditional manufacturing roles may decline, new high-skilled jobs in robotics, AI-driven production, and sustainable engineering are emerging. Goal 9, which focuses on industry, innovation, and infrastructure, encourages the development of resilient infrastructure and the promotion of inclusive and sustainable industrialisation (United Nations, 2015). Goal 11, which aims to make cities inclusive, safe, resilient, and sustainable, necessitates the adoption of environmentally responsible construction methodologies. Goal 12 focuses on reducing waste, improving resource efficiency, and promoting sustainable supply chains. Sustainable advanced manufacturing supports this goal through circular economy principles, green manufacturing practices, and lifecycle assessments of products to minimise environmental impact. Furthermore, Goal 13 calls for urgent climate action, requiring significant reductions in carbon emissions across all industries, including construction and manufacturing. Collectively, these goals advocate for policies and roadmaps that steer the construction industry towards sustainability and resilience.

The RICS Sustainability Report (2024) provides an in-depth analysis of sustainability in the built environment, highlighting an increasing demand for green buildings, particularly in Europe, where interest has risen by 63% (RICS, 2024). Comprehensive regulations and standards have significantly impacted green building practices, with 52% of respondents acknowledging their influence. However, the report identifies several key challenges, including high initial costs, skills shortages, and cultural resistance to change. A notable gap exists in measuring embodied carbon emissions, as many professionals do not currently undertake such assessments, suggesting a need for standardised measurement approaches. Additionally, biodiversity considerations are frequently overlooked, with 20% of respondents reporting that biodiversity is not factored into their projects. The report stresses the necessity for credible policy interventions to shape real estate and construction practices towards sustainability. Addressing the green skills gap through enhanced training and education is essential to equipping professionals with the necessary competencies for sustainable construction. Standardising the measurement of embodied carbon and integrating biodiversity considerations into projects are also critical steps towards a net-zero future.

The transition to sustainable construction practices requires a workforce equipped with specialised skills. Key competencies include green technology proficiency, with an emphasis on implementing renewable energy systems such as solar panels and heat pumps. Expertise in energy efficiency is also essential, particularly in retrofitting buildings to enhance insulation and reduce energy consumption. Additionally, digital competence, particularly in Building Information Modelling (BIM), is crucial for planning and managing sustainable construction projects. Studies have demonstrated that BIM can significantly reduce greenhouse gas emissions in construction projects. Several countries outside the UK have adopted innovative strategies to achieve net-zero emissions in construction. In Norway, Oslo has mandated that city-managed construction projects be free from toxic emissions, leading to the widespread adoption of electric machinery. By 2023, 98% of Oslo's construction equipment was fossil-fuel-free, primarily powered by electricity and biofuels (The Guardian, 2025b). Sweden is developing the world's largest timber-built city, Stockholm Wood City, which will provide 2,000 new homes and 7,000 office spaces by 2027. Using cross-laminated timber is expected to halve carbon emissions compared to traditional materials (Time, 2025a). In Germany, Heidelberg's Bahnstadt district exemplifies a carbon-neutral neighbourhood, with buildings that consume 80% less energy than typical structures, demonstrating the potential of community-driven efforts in promoting sustainability (Time, 2025b).

## The National and Regional Context

### The Office for Clean Energy Jobs

The Department for Energy Security and Net Zero (DESNZ) has set up The Office for Clean Energy Jobs (Department for Energy Security & Net Zero, 2024) to focus on ensuring provision of a skilled workforce to meet the UK government's Clean Energy Mission. The scope considered power and networks, heating and buildings and hydrogen and carbon capture. Although the considerations are broader than mobility and propulsion, they do relate to the sources of energy that inform propulsion choices and so it is expected that the nature of skills identified are also relevant to propulsion. Key contextual observations are:

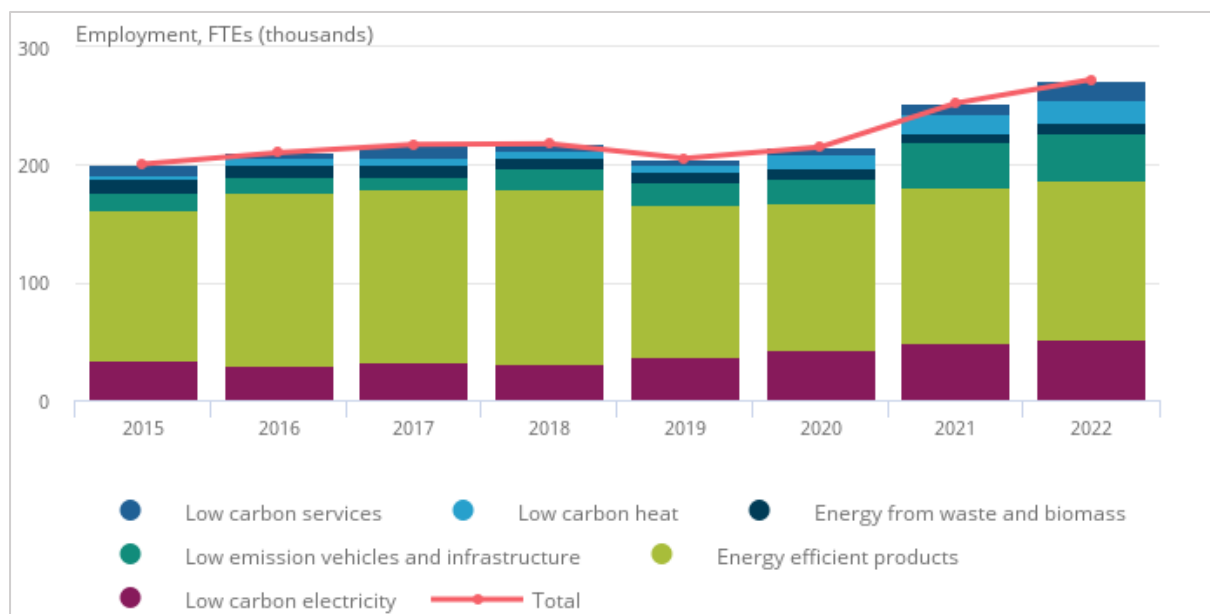
- Wide-ranging skills demand
  - Level 6 engineers
  - Level 2-4 welding and mechanical trades
  - Level 6-7 welding engineers (labour supply a particular concern)
  - Level 2-4 electrical trades
  - Level 3-8 Managerial Roles

- Challenges from:
  - Competition for skills across sectors, particularly in STEM
  - Lack of awareness of the types of career opportunities
  - Lack of diversity, e.g. around 20% women in nuclear and offshore wind and ethnic minorities only 7% of offshore wind.
  - Ageing and retiring workforce
  - Constraint on training capacity
  - High cost of employment (due to rises in the living cost, taxes, NI)
  - Immigration policies to recruit high-level technical skills from overseas
  - Significant gap between labour supply and demand in hydrogen sector as it's an emerging area and it will require proactive development of training infrastructure to advance the market.

Some skills can be met through reskilling from oil and gas sectors but it is not clear this will be sufficient to meet demand.

The Office for National Statistics (2024b) indicate growing demand for employment relating to low emissions vehicles and infrastructure in the context of low carbon employment as a whole.

Figure 3.1: UK LCREE Employment between 2015 and 2022



Source: Office for National Statistics (2024b)

More specific to transport, the government has set out a strategy for decarbonising transport (Department for Transport, 2021) which includes zero tailpipe emissions by 2035, increasing charging infrastructure, encouraging a modal shift of freight to rail and finding solutions for "last mile" in urban areas, and implementing appropriate place-based

solutions. There is intent for the UK to be “a global leader in low carbon fuel production, including SAF and renewable hydrogen.” (Department for Transport, 2021)

### Powering our Net-Zero Future

Just like the other countries, the UK is also committed to the transition to green energy, and aims to achieve Net Zero greenhouse gas emissions by 2050. To achieve this target, National Grid estimates that by 2050, approximately 400,000 roles will need to be filled to meet the increased demand for renewable energy production, with 260,000 of these being entirely new positions. According to the climate change committee, this number could fluctuate between 135,000 to 725,000 net new jobs to be created but this will be across all low-carbon technologies sectors by 2030 with the energy efficiency and low carbon heating sector seeing the largest increase in jobs.

The clean energy workforce in the UK is therefore growing strongly with the number of jobs in the low carbon and renewable economy growing more than five times faster than overall UK employment between 2020 and 2022. The UK’s low carbon economy could grow by an estimated 11% per year between 2015 and 2030 - four times faster than the rest of the country economy.

The UK’s transition to renewable energy faces challenges due to a skills gap in the clean energy sector. In ‘Powering our Net-Zero Future’ (UK Government, 2020a), the UK government argued that more than 6 million people are in jobs that will be affected by the transition to clean energy and in November 2020, launched a ‘Green Jobs Taskforce’ to support the drive to create two million new “green collar” jobs in the UK by 2030 to help fulfil the nation’s legal commitment to achieve net zero emissions by 2050. This aims to both reskilling and upskilling the current workforce working in the oil and gas sector. It is estimated that 1 in 5 jobs in the UK will experience a shift in demand for skills through the transition to net zero, with around 3 million workers needing some reskilling by 2030.

The ‘Ten Point Plan’ to support a green industrial revolution aims to mobilise £12 billion of government investment, and potentially three times as much from the private sector, to create and support up to 250,000 green jobs (UK Government, 2020b).

### The Labour Party Commitments: Net-zero in the Construction Sector

The Labour Party has outlined a series of commitments aimed at transforming the UK’s construction sector. Central to their agenda is the delivery of 1.5 million new homes in England over the next five years (Labour Party, 2024). This ambitious target will be supported by immediate updates to the National Policy Planning Framework, reinstating mandatory housing targets, and ensuring planning authorities maintain up-to-date Local Plans. To facilitate this, additional funding will be allocated to local authorities for the

recruitment of planning officers, financed by an increased stamp duty surcharge on non-UK residents (PBC Today, 2024).

The party also plans to prioritise the development of previously used land through a 'brownfield first' approach, expediting approvals for urban brownfield sites. In cases where development on greenbelt land is considered, Labour proposes releasing lower quality 'grey belt' areas, adhering to 'golden rules' to ensure such developments benefit both communities and the environment. Strategic housing growth will be mandated for Combined and Mayoral Authorities, which will be endowed with enhanced planning powers. The creation of several new towns is also envisaged to meet housing demands. To expedite delivery, Labour intends to reform compulsory purchase compensation rules and address issues hindering the construction of homes affected by nutrient neutrality, all while maintaining environmental protections. Strengthening planning obligations is another priority, aiming to ensure new developments provide more affordable homes, with a particular emphasis on increasing the availability of social rented housing (PBC Today, 2024).

In the realm of energy efficiency, Labour's Warm Homes Plan proposes an additional £6.6 billion investment over the next parliamentary term. This initiative aims to upgrade five million homes, offering grants and low-interest loans to support improvements such as insulation, solar panels, batteries, and low-carbon heating solutions. The objective is to reduce energy bills and enhance sustainability. Collaboration with the private sector, including banks and building societies, is planned to further finance these home upgrades. Additionally, Labour commits to ensuring that homes in the private rented sector meet minimum energy efficiency standards by 2030, potentially saving renters hundreds of pounds annually (PBC Today, 2024).

To address the skills shortage in the construction industry, Labour proposes the establishment of Skills England. This initiative aims to transform post-16 education and vocational training by guaranteeing every 18- to 21-year-old access to training, apprenticeships, or employment assistance. The goal is to cultivate a skilled workforce aligned with Labour's Industrial Strategy. Skills England will collaborate with businesses, training providers, unions, and government bodies to tailor training programmes to the evolving demands of the labour market. Further education colleges are set to be transformed into specialised Technical Excellence Colleges, promoting stronger ties between education and industry to enhance job prospects for young people. Labour also plans to reform the current Apprenticeships Levy by introducing a flexible Growth and Skills Levy, ensuring that funded courses deliver tangible value to both learners and employers (UK Construction Week, 2024).

Collectively, these commitments reflect Labour's comprehensive strategy to address housing shortages, enhance energy efficiency, bolster skills development, and improve infrastructure within the UK's construction industry.

## National Infrastructure and Construction Pipeline

The UK Government's National Infrastructure and Construction Pipeline (2023c) outlines planned investments totalling £700 billion across the transport, energy, and housing sectors to stimulate long-term economic growth. The strategy places a strong emphasis on sustainable construction, net-zero commitments, and workforce development to mitigate skills shortages in green industries (Green Jobs Taskforce, 2021). Key components supporting the green construction skills agenda include investments in energy and sustainability. Retrofitting initiatives targeting public buildings and social housing aim to improve energy efficiency, aligning with PAS 2035 standards (UK Government, 2021).

The construction workforce development agenda includes increased funding for apprenticeships and vocational training in green construction technologies, complementing the UK's net-zero strategy (UK Government, 2021). Digital skills are also prioritised, particularly in BIM and remote sensing technologies, to support energy-efficient design practices (United Nations, 2015). Furthermore, public-private partnerships are being expanded to enhance employer-led training and placement programmes in sustainable construction (D2N2 LSIP, 2023). Regional investment is anticipated to contribute significantly to employment growth, with pipeline projects expected to generate over 425,000 job opportunities, many of which will require green skills training. Support for regional hubs, such as the EMIZ, is central to the promotion of sustainable construction and workforce development (Midlands Net-Zero Hub, 2024). Additionally, investment in modern methods of construction (MMC) and offsite manufacturing is intended to enhance both sustainability and efficiency in the sector (Labour Party, 2024).

## Future Homes Standard and Green Construction Regulation

The Future Homes Standard (FHS), scheduled for full implementation by 2025, represents a major revision of UK building regulations, aiming to significantly improve the energy efficiency and sustainability of new homes. It mandates the replacement of key sections of the Building Regulations, including Part L (conservation of fuel and power), Part F (ventilation), and Part O (overheating) (Bull, Coulson & Simpson, 2024). The FHS will require new homes to be future-proofed with low-carbon heating and high-energy efficiency, ensuring at least a 75% reduction in carbon emissions compared to homes built under current regulations (UK Government, 2021). To meet these requirements, the construction workforce must develop expertise in advanced building techniques and technologies. This includes the installation and maintenance of low-carbon heating

systems such as air-source and ground-source heat pumps, alongside airtight construction methods to minimise heat loss and improve thermal performance. Additionally, the FHS emphasises the importance of whole-life carbon assessments, requiring professionals to evaluate and mitigate emissions associated with materials, construction processes, and long-term building operation. The transition will also necessitate an increased focus on mechanical ventilation with heat recovery systems to ensure adequate indoor air quality while maintaining energy efficiency.

Other significant regulatory and strategic developments affecting the green construction skills agenda include the National Retrofit Strategy. The Construction Leadership Council (CLC) launched the National Retrofit Hub (2023) to accelerate the development of low carbon retrofit skills (Bull, Coulson & Simpson, 2024). The Net-Zero Buildings Standard (2024), a unified framework proposed by key industry bodies such as the Royal Institute of British Architects, RICS, and the Institution of Civil Engineers, aims to establish clear benchmarks for net-zero construction (Bull, Coulson & Simpson, 2024). Additionally, Biodiversity Net Gain (2024) introduces new planning laws requiring developments to enhance biodiversity by at least 10% (Bull, Coulson & Simpson, 2024).

### The UK's Modern Industrial Strategy - Invest 2035

Invest 2035 is a long-term plan aimed at furthering sustainable economic growth by prioritising high-potential sectors, including advanced manufacturing. The strategy emphasises creating a pro-business environment by tackling barriers to investment, such as infrastructure, regulatory challenges, and workforce skills shortages. A key aspect of the strategy is ensuring that growth is inclusive, sustainable, and regionally distributed. Invest 2035 integrates industrial policy with other national priorities, such as the transition to net zero, digital transformation, and economic resilience. The strategy also introduces a statutory Industrial Strategy Council to provide long-term stability and reduce policy volatility. It aims to secure international investment while strengthening domestic supply chains to mitigate global economic disruptions.

The Invest 2035 emphasises workforce development as a key driver of net zero, sustainable manufacturing, and digitalisation, ensuring the UK remains globally competitive. Addressing the skills gap in green technologies, the strategy supports initiatives like the Industrial Strategy Skills Commission and Made Smarter programme, which equip workers with expertise in AI, IoT, energy-efficient production, and circular economy practices.

As of March 2025, the recent developments due to reduced support from the United States under President Donald Trump resulted in a shift in government's priority towards

enhancing defence capabilities. The government's National Wealth Fund, initially focused on green initiatives, now also supports defence investments, which can potentially slow down the green transition initiatives (Financial Times, 2025b).

## Advanced Manufacturing Plan

The Department for Business and Trade published Advanced Manufacturing Plan in 2023 (UK Government, 2023a). It set out the government's commitment to the long-term success of UK manufacturing, and has been widely welcomed by the industry leaders as it marked the end of a prolonged absence of a formal industrial strategy. It plays a pivotal role in the UK's Modern Industrial Strategy, Invest 2035.

### The key area of the Advanced Manufacturing Plan include:

- **Driving Industrial Growth and Innovation:** The plan provided £4.5 billion in funding over five years to support key industries, including automotive, aerospace, clean energy, and life sciences. This investment is expected to stimulate further private-sector investment, innovation in AI, robotics, and digital manufacturing, and overall industrial productivity.
- **Supporting Net Zero and Sustainable Manufacturing:** A major focus of the plan is industrial decarbonisation, with initiatives like the £960 million Green Industries Growth Accelerator to drive advancements in hydrogen, carbon capture, and offshore wind technologies. These measures help the UK meet its net-zero targets while making manufacturing more energy-efficient.
- **Addressing Skills Gaps and Workforce Development:** With 42% of manufacturing vacancies classified as skills shortage vacancies, the plan includes £50 million for a two-year apprenticeships pilot and the Green Jobs Action Plan (2024) to upskill workers in areas such digital and sustainable manufacturing. This ensures the workforce is prepared for Industry 4.0 and the transition to low-carbon manufacturing.
- **Strengthening Supply Chains and Economic Resilience:** By improving supply chain resilience and global trade partnerships, the plan aims to protect UK industries from geopolitical disruptions and trade uncertainties. It focuses on securing critical components, reducing regulatory barriers, and attracting foreign investment, positioning the UK as a leading hub for advanced manufacturing.
- **Enhancing Regional Competitiveness:** AMP integrates with regional initiatives such Investment Zones, focusing on regional innovation clusters to boost private sector

investment, R&D, and skills development in knowledge-intensive growth sectors (advanced manufacturing, green industries, life sciences, and creative industries). Each Investment Zone is expected to create thousands of high-skilled jobs. This ensures regional economic growth and supports local supply chains.

## Centres of Excellence in Advanced Manufacturing

The UK government developed several centres of excellence in advanced manufacturing operated through UKRI. The most prominent one is the High Value Manufacturing Catapult (HVMC). HVMC was established in 2011 by the UK government (as a part of its 2010-2015 Industrial Strategy) to drive innovation and industrial transformation in the UK's manufacturing sector. It serves as a network of seven world-class research and technology centres (WMG, MTC, AMRC, NMIS, CPI, NCC) each specialising in different aspects of advanced manufacturing, materials, and digital technologies. HVMC provides state-of-the-art facilities, expertise, and funding support to help businesses - ranging from SMEs to multinational corporations - develop and commercialise cutting-edge manufacturing technologies. Its goal is to bridge the gap between early-stage research and industrial application. Each of the seven HVMC centres integrates skills development into its activities, ensuring that industry professionals, students, and apprentices gain the necessary expertise in advanced materials and technologies including industrial automation and digitalisation.

The East Midlands region has various centres of excellence established at universities (such as Institute for Advanced Manufacturing and the recently launched Zero Carbon Innovation Centre at University of Nottingham and Intelligent Automation Centre at Loughborough University) focusing on low TRL R&D but lacks comparable centres of excellence dedicated to advanced manufacturing at mid-high TRL. However, recent development indicate progress in this area. The Ashfield District Council in collaboration with Nottingham Trent University and West Nottinghamshire College have successfully secured government funding to establish the Automated Distribution and Manufacturing Centre (ADMC). The ADMC will serve as a centre of excellence in robotics and automation, providing industry-led expertise in automation, robotics and digitalisation for the manufacturing and distribution sector. This initiative presents a significant opportunity to bridge the skills gap, drive innovation, and support industrial growth in the region (Automated Distribution & Manufacturing Centre, 2025).

## Part 4: Gap Analysis of the Current Green Skills Pathways within EMCCA

### Nuclear

#### Nuclear Occupational Roles within the EMCCA region

The job title Nuclear Engineer is reasonably rare, with a total of 202 jobs advertised across the country in 2024. Nine of these were in the EMCCA region, five of which were at Rolls-Royce, with one each at ARM and Atkins Réalis.

Across the UK, the companies with the most advertised roles for this job were: AECOM (19), BAE Systems (14), Babcock International (8), Atkins Réalis (7) Amentum (6), and Rolls-Royce (5). Whilst it was not possible to determine the amount specifically in the EMCCA region, we know that AECOM, BAE Systems, Babcock International (under Cavendish Nuclear), Rolls-Royce and Atkins Réalis do have registered offices in EMCCA or wider Midlands.

Widening the search a little brings in more related roles, such as Nuclear Mechanics, Nuclear Licensing Engineers, and Nuclear Safety Engineers. With this broader search, and manually excluding nuclear medicine related roles, we find a total of 51 unique job adverts in the EMCCA region, just under half of which are at Rolls Royce (25) with BAE Systems (9) in Sutton-in-Ashfield as the largest advertisers of jobs in the area. The top specialist skills asked for in these job adverts are Nuclear Power (49% of job adverts), Nuclear Safety (31%), Nuclear Engineering (27%), and Export Control (10%). While we have data from the Job Adverts, the Standard Occupational Coding (SOC) framework is not detailed enough to identify specifically nuclear related occupations.

Destination Nuclear has been set up in partnership with the sector to make a real difference to promote the career opportunities available in the present and future. Destination Nuclear believe -

- The nuclear sector plays a critical role in providing clean, reliable energy to the UK
- Play a vital role in enabling the UK to continue to protect its people by maintaining critical defence capabilities
- Enjoy competitive salaries and benefits: Nuclear jobs come with market-leading salaries and excellent benefits packages
- Be part of a growing sector: The nuclear sector is experiencing an exciting period of growth with investment in skills across the UK

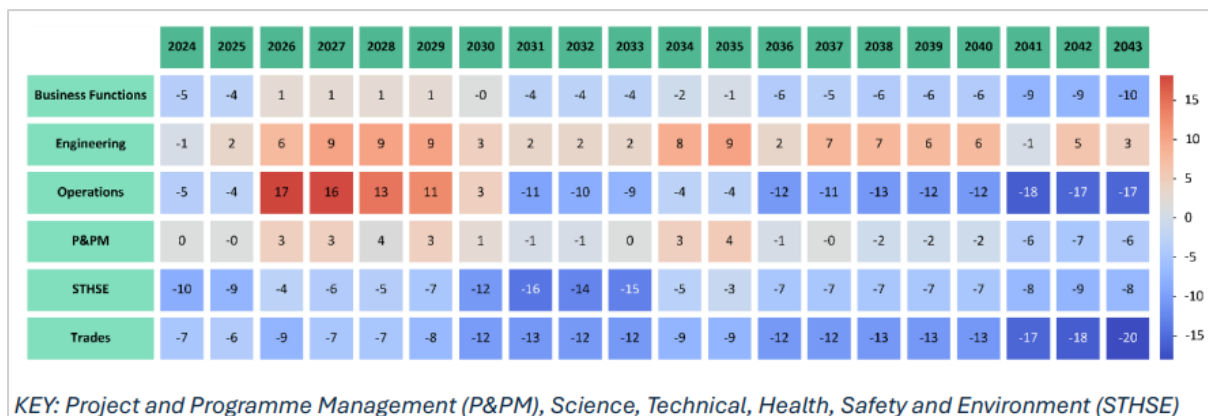
- Work in some of the UK's most exciting programmes with cutting-edge technology:  
The nuclear sector is at the forefront of technological innovation

The roles being advertised on Destination Nuclear; the majority won't be specifically nuclear related. Roles being advertised for the nuclear industry in general are -

- General engineering
- Welding and mechanical trades
- Electrical trades including instrumentation control systems
- Planning, programme and project management
- Managerial roles and other occupations
- Digital, automation and AI

The recently published Cogent Skills (2025) Nuclear National Workforce Assessment has predicted the change in function demand across the nuclear sector.

Figure 4.1: Cogent Skills Predicted Changes in Nuclear Functions from 2023 until 2043



Source: Cogent Skills (2025)

In 2026, in Operations, there is a 17% increase in demand from 2023 reported in 2024. The demand for functions has changed most notably for Operations and Engineering functions from 2025 to 2029 and a significant decrease in the demand for Operations and Trades functions from 2041 and beyond. The shift in demand is likely to be caused by changes in the demand profile from both the civil and defence sectors.

## Nuclear Apprenticeship Standards

There are six nuclear related standards at levels 2 to 6 (excluding medical nuclear), with a further potential standard at level 7 (going through approval). Of the six approved standards, four have apprentices enrolled on them. We list the standards in Table 4.1.

*Table 4.1: Nuclear Apprenticeship Standards, employers' involvement in their development, plus starts by training providers across England*

| Level | Apprenticeship Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2     | <p><b>Nuclear Operative:</b> <a href="https://www.instituteforapprenticeships.org/apprenticeship-standards/st0291-v1-0">https://www.instituteforapprenticeships.org/apprenticeship-standards/st0291-v1-0</a></p> <p><b>Occupational Profile:</b> The Nuclear Operative is responsible for the hands on operation of plant systems and equipment on a nuclear facility and associated off site plant. This will involve working within a variety of environments within nuclear facilities, either operational work or decommissioning work (a process of removing all radioactive, non-radioactive and contaminated plant and equipment), necessitating the use of innovative methods and equipment, where required, and the practical skills associated with this</p> <p><b>Employers Involved:</b> Sellafield Ltd, National Skills Academy for Nuclear, Magnox Ltd, EDF Energy, Westinghouse Springfields Fuels Ltd, LLW Repository Ltd, Nuvia, Nuclear Institute, Cogent Skills, Cavendish Nuclear, Wood</p> <p><b>Training Provider Stats:</b> Two providers offer this standard across the England, with neither based in the local region. Genii Engineering and Technology Limited, based in Cumberland, had 42 starts in 24/25, and Bridgwater and Taunton based in the Southwest had 10.</p>                                                                                                                                                                                                                                                                              |
| 4     | <p><b>Nuclear Welding Inspection Technician:</b><br/><a href="https://www.instituteforapprenticeships.org/apprenticeship-standards/st0292-v1-0">https://www.instituteforapprenticeships.org/apprenticeship-standards/st0292-v1-0</a></p> <p><b>Occupational Profile:</b> A Nuclear Welding Inspection Technician (NWIT) performs a quality control and welding inspection role for the nuclear industry. They ensure the safety and integrity of nuclear related fabrications to meet the exacting quality requirements specified in nuclear industry regulations, specifications, standards and detailed engineering documents. These are unique to the sector, hence the knowledge, skills and behaviours required to deploy this role are specific for the nuclear industry.</p> <p><b>Employers Involved:</b> Sellafield Ltd, Magnox Ltd, Research Sites Restoration Ltd, Low Level Waste Repository Ltd, Westinghouse Springfields Fuels Ltd, Amec Foster Wheeler, National Nuclear Laboratory, Cavendish Nuclear Ltd, West Cumberland Engineering Ltd, Morgan Sindall, Nuvia Ltd, EDF Energy, Costain Limited, National Skills Academy for Nuclear, Cogent Sector Skills Council, The Nuclear Institute, British Institute of Non Destructive Testing, The Welding Institute, Radwise Ltd, Doosan Babcock Ltd, Hargreaves Ductwork Ltd, Jacobs, Tata Steel Projects, Bureau Veritas UK</p> <p><b>Training Provider Stats:</b> Only Genii Engineering and Technology Limited have any starts onto this standard with a modest 4 starts in 24/25 with 8 the previous year.</p> |

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| 5 | <p><b>Nuclear Technician:</b> <a href="https://www.instituteforapprenticeships.org/apprenticeship-standards/st0380-v1-0">https://www.instituteforapprenticeships.org/apprenticeship-standards/st0380-v1-0</a></p> <p><b>Occupational Profile:</b> Nuclear Technician will have a good technical understanding of processes and procedures for the day to day operational requirements in nuclear facilities and will use the knowledge, skills and behaviours developed to carry out a broad range of technical, scientific and engineering tasks to operate systems and equipment safely, efficiently and in an environmentally sustainable way, meeting the requirements set out by the employer and industry regulators.</p> <p><b>Employers Involved:</b> Sellafield Ltd, National Skills Academy for Nuclear (NSAN), EDF Energy, Nugeneration Limited (NuGen), Ultra Electronics Limited, Jacobs UK Limited, BAE Systems Marine Limited, Westinghouse Springfields Fuels Ltd, The United Kingdom Atomic Energy Authority (UKAEA), , LLW Repository Lt, EDF Energy, GEN II Engineering &amp; Technology Training Ltd, Nuclear Institute (NI), Institute of Measurement and Control (InstMC), Institute of Chemical Engineers (IChemE), Institution of Mechanical Engineers (IMechE), Royal Society of Chemistry (RSC)</p> <p><b>Training Provider Stats:</b> Three providers based in the Northwest have a reasonable number of enrolments onto this standard. Wigan and Leigh had 42 starts on this standard in 24/25, Genii Engineering and Technology Limited have only 1 start so far in 24/25 but had 54 the previous year, so it is possible that their starters began later in the year as we only have first quarter data from 24/25. Similarly, Lakes College West Cumbria don't have any 24/25 enrolments so far but did have 33 the previous year.</p>                                                                                                                                                                                                                                                                                                                                                                     |
| 6 | <p><b>Nuclear Scientist Nuclear Engineer:</b><br/><a href="https://www.instituteforapprenticeships.org/apprenticeship-standards/st0289-v1-0">https://www.instituteforapprenticeships.org/apprenticeship-standards/st0289-v1-0</a></p> <p><b>Occupational Profile:</b> On completion, a Nuclear Scientist and Nuclear Engineer Degree Apprentice will be able to use the knowledge, skills and behaviours developed to enable systems and equipment to operate safely, efficiently and in an environmentally sustainable way, meeting the requirements set out by the employer and those of the Professional Body Institutions. They will have a fundamental and core knowledge of engineering / science principles and practices and will be able to demonstrate discipline skills commensurate with their employed job role that typically will include design, plant performance enhancements, operational management, project management and maintenance of safety standards utilising analytical thinking to provide innovative solutions. They will also demonstrate good communication and team skills and the ability to communicate in a variety of forms to all levels within an organisation.</p> <p><b>Employers Involved:</b> Sellafield Ltd, National Skills Academy for Nuclear, EDF Energy, Ministry of Defence, UK Atomic Energy Authority, Jacobs UK Limited, BAE Systems Marine Limited, Ultra Electronics, Westinghouse Springfields Fuels Ltd, LLW Repository Ltd, GEN II Engineering &amp; Technology Training Ltd, University of Cumbria, Manchester University, Nuclear Decommissioning Authority, Magnox Ltd, National Nuclear Laboratory, Office for Nuclear Regulation, Nuclear Institute, Royal Society of Chemistry, Society of Operations Engineers, Institute of Measurement and Control, Institution of Chemical Engineers, Nuclear Industry Association</p> <p><b>Training Provider Stats:</b> The University of Derby is the only provider to offer this in the EMCCA region with 88 starts in 24/25. Almost as large as Derby, Bridgwater and Taunton College had a large 24/25 cohort of 83 based in the Southwest, and Blackpool and Fylde College based in the Northwest had 37 starts in 24/25.</p> |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | <p><b>Nuclear Reactor Desk Engineer:</b><br/> <a href="https://www.instituteforapprenticeships.org/apprenticeship-standards/st0784-v1-0">https://www.instituteforapprenticeships.org/apprenticeship-standards/st0784-v1-0</a></p> <p><b>Occupational Profile:</b> This occupation is found in the engineering sector, in the commercial nuclear power industry and within the Ministry of Defence Royal Navy submarine fleet. Nuclear power in the United Kingdom (UK) generates around one fifth of the country's electricity. The UK currently has 15 operational commercial nuclear reactors at seven plants, 14 advanced gas-cooled reactors (AGR) and one pressurised water reactor (PWR). Reactor desk engineers are based within the main control room of a nuclear facility or the manoeuvring room in a nuclear submarine environment. The demand for this role is increasing with the advent of new nuclear build and developing technologies.</p> <p><b>Employers Involved:</b> EDF Energy, Royal Navy</p> <p><b>Training Provider Stats:</b> Currently no starts on this standard</p> |
| 7 | <p><b>Nuclear Technical Specialist:</b><br/> <a href="https://www.instituteforapprenticeships.org/apprenticeship-standards/st0779-v1-0">https://www.instituteforapprenticeships.org/apprenticeship-standards/st0779-v1-0</a></p> <p><b>Occupational Profile:</b> Standard going through development and approval</p> <p><b>Employers Involved:</b> To be confirmed</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

It is worth noting that Rolls-Royce Submarines Limited (RRSL), through the NSA in partnership with the University of Derby, have only adopted the Level 6 Nuclear Scientist Nuclear Engineer Degree Apprenticeship, so there is only one local employer using the nuclear standards at present in the EMCCA region. From September 2025, RRSL's supply chain will start using the Level 6 Nuclear Scientist Nuclear Engineer Degree Apprenticeship as well. Conversations with these employers will remain confidential at present, but all do have locations in the EMCCA region.

RRSL currently recruit apprentices on specific standards in welding, pipe welding, mechatronics, fitter, maintenance, software engineering, business management and project management specifically for their nuclear operation.

## Survey into Young People's Attitudes to Nuclear Energy and Careers in the Nuclear Power Industries

As part of the Work Package, it was essential to gather views of young people about their insights of the nuclear power sector. There is a recognition that the nuclear industries and related sectors will need a pipeline of talented young people to develop careers in the area as it grows.

The survey opened on the 22nd of April and ran for a two-week window. It was mainly delivered in tutorial sessions, with the tutors giving a simple overview and an explanation of why their views were being sought. The groups were from settings in the EMCCA region

and ranged from schools, including a University Technical College, a Sixth Form College and FE Colleges.

Total responses were 302 and the ages ranged from 14 – 19 years old, with the mean age being 16.5 years.

The young people were from Derby City and Derbyshire but when analysing any comparisons or differences between the counties, proportions were used not overall numbers.

The survey was carried out using Microsoft teams and copilot.

### **Key Findings**

Overall, the responses suggest that while many young people associate nuclear power with risk, a significant number also recognise its potential as a clean, powerful and innovative energy source.

Young people are interested in working in the industry in both technical and other roles and a personal connection may also positively influence interest.

Young people are not fully informed but would like to know more about safety, sustainability and waste management involved with nuclear energy.

### **Attitudes Towards Nuclear Power**

First Thoughts: Many respondents associate nuclear power with negative concepts like bombs, radiation, and danger. However, some also think of it as a clean and efficient energy source. 17% mentioned energy in their responses.

Interest in Power Generation: 27% of respondents were very interested in how electricity is generated, with 55% of respondents were interested in how electricity is generated but don't actively follow the subject, while others show varying levels of interest.

### **Awareness and Information Sources**

Global Issues: Cost of living, climate change and mental health are the most important global issues for respondents.

Informed About Fuel Debate: Responses vary from very informed to very uninformed, with many feeling only somewhat informed or unsure.

Information Sources: School/college, news (TV, newspapers, internet), and social media are the primary sources for information about new fuel developments.

### **Perceptions of Energy Sources**

Energy Sources in the UK: Respondents ranked in order of most used energy sources in the UK as gas, wind, coal, solar, nuclear, biomass, and hydroelectric.

Skills for Nuclear Industry: Logical thinking, teamwork, attention to detail, and scientific skills are seen as important for working in the nuclear energy industry.

### **Career Interests**

Qualifications Needed: 31% of respondents answered that A-levels can be the minimum point of entry necessary to work in the nuclear industry, with the next highest being 21% of respondents though a degree would be a required entry point.

Career Types: Technical engineering roles, environmental roles, and non-technical roles like HR and management are of interest. 75% of respondents said they would consider a career in the nuclear industry or would like to find out more, with 25% saying they would not like to work in the industry.

Maths Skills: Many respondents think good maths skills are necessary for technical areas in the nuclear industry.

### **Personal Connections and Knowledge**

Knowing Someone in the Industry: 17% of respondents know someone who works in the nuclear energy industry.

Companies Named: Rolls Royce is frequently mentioned, along with other companies like EDF, Shell, and NASA.

### **Young people's association question**

The first question was an opinion question. It was an open-ended question designed to capture initial associations, perceptions or emotions the young people have when they think of the term nuclear power. It serves as a qualitative insight into the young people's perception, common associations and awareness levels. Understanding these views will help with the recommendations for next steps, potentially designing outreach and communication strategies on misconceptions or knowledge gaps.

Most of the young people expressed concerns in the open text questions.

The young person's first response to nuclear energy typically revolved around the following issues:

- Safety and environmental impact: High-profile nuclear accidents, such as Chernobyl and Fukushima. The potential of catastrophic consequences if something goes wrong.

- Nuclear Waste: The disposal of nuclear waste was a major concern. Responses included used nuclear fuel remains radioactive and hazardous for thousands of years, and finding safe, long-term storage solutions is challenging
- Radiation Risks: Some responses included a fear of radiation exposure from nuclear power plants but also bombs.
- High costs: Building and maintenance were mentioned as well as decommissioning and storage of nuclear waste

The positives expressed reflected optimism, innovation and sustainability with responses related to:

- Clean energy and sustainability: "Clean energy", "No carbon emissions, highly energy efficient"
- Efficiency and Power: "Most powerful source of generation", "Powerful but hazardous", "Clean energy, high efficiency"
- Innovation and interest: "Very interesting and amazing", "Magic rocks which can produce basically infinite clean energy"

There were some balanced views that acknowledged both benefits and risks:

- "Good energy source bit if it goes wrong, it's a massive problem"
- "Dangerous renewable energy that if handled wrong could cause a massive catastrophe"

### **Areas of difference**

When considering the responses for any significant difference between answers for age and county there were minor ones, with most aligning, such as global issues, perceived skills needed to work in the industry, interest. Slight difference in responses to the sources of information and companies' questions, where Nottingham had a heavier reliance on social media and had a wider range of companies listed, but not always accurately.

### **Mathematics Attainment in the EMCCA region**

Technical engineering related roles require a core underpinning of mathematical skills. There are challenges around standard achievement in GCSE/Level 2 in Mathematics across the EMCCA region. Statistics from 2024 across the EMCCA region, highlight that only 59.9% of pupils in Derbyshire and 55.5% in Nottinghamshire achieved a 'Standard Grade' which is grade 4.

The attainment statistics for mathematics in the EMCCA region mean that circa 40-45% of young people would have to achieve functional skills in mathematics at level 2 by the end of any level 3 engineering apprenticeship standard. This will reduce the numbers of

young people exploring level 3 engineering apprenticeships, as having to study functional skills alongside an apprenticeship, plus starting a new job role, will be very challenging for them. Furthermore, most engineering employers wouldn't recruit an engineering apprentice without a strong attainment in mathematics full-stop, so a mathematics support plan for the region needs to be explored to develop young peoples' attainment and improve their chances of being recruited in the nuclear sector.

### Discussion from stakeholder workshop

A Nuclear Stakeholder Workshop was held at the Nuclear Skills Academy, University of Derby, on Monday 28<sup>th</sup> April 2025. The purpose of the workshop was to seek input from companies aligned to the nuclear sector as to the short-, medium- and longer-term skills requirement.

### Framing

In framing the workshop discussions, four 'perspectives' were used as the lens through which to consider the skills needs, i.e.:

- **Trends and Drivers** – What were the driving force behind the skills needed? What have been/are foreseen to be the trends in the skills needed?
- **Systems, Products and Services** – What are foreseen as the future directions for developments within and across the nuclear sector in terms of the systems, services and/or products?
- **Technology, Process, Methodology and Capability** – Over the coming years, what changes/developments/advancements are anticipated in terms of the technologies within the nuclear sector? With such developments, what capability requirements are these anticipated to necessitate?
- **Enablers and Resources** required from a skills perspective – To achieve the capabilities anticipated, what skills are considered needed to deliver these requirements?

The workshop focused on two key areas of discussion. Firstly, what **technical skills** did the industry view as being needed over the coming years, and secondly, what **non-technical skills** were seen as required over the short-, medium- and long-term.

In framing the workshop the discussions, it was recognised that the nuclear sector has a demand for a technically skilled workforce, i.e. employees who have the '*hard skills*' needed, those that are technology based and/or engineering focused. In considering the nuclear sector, delegates were directed to consider all aspects of the sector, for example:

energy production and electrification; high power applications; decommissioning (robotics, sensors, materials); novel nuclear; small modular reactors; etc.

Likewise, it was also recognised that whilst it is referred to as 'the nuclear sector' this comprises of a series of companies all of which have the need for '*corporate skills*' needed so that the business can operate effectively and efficiently. In this regard, there is a need for 'non-technical' skills, such as finance, human resources, IT, marketing, procurement, policy, etc.

There was no judgement or hierarchy made with regards the primacy of need for technical or non-technical skills requirement. The terms were used as a means of categorising and framing the discussions to elicit deeper understanding as to the type of skills and capabilities anticipated to be needed within the nuclear sector by those who are already working and operating within nuclear-based companies.

Indicative timelines were applied to the notion of short-term i.e. the next 2-3 years (up to 2027), medium-term, i.e. the next 5-8 years (up to 2033), and longer-term, i.e. the next 9 years plus (beyond 2034).

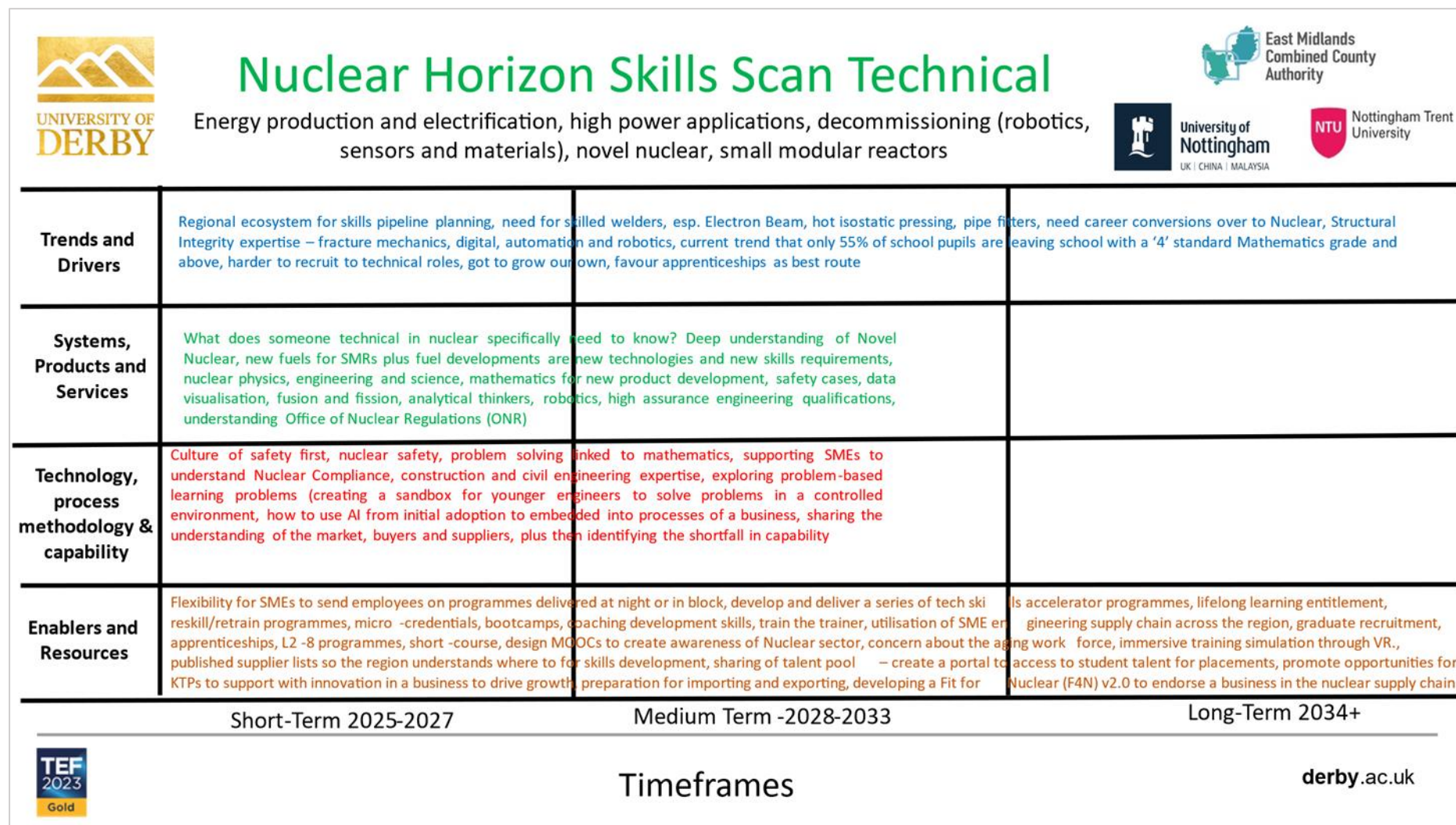
Discussions were facilitated and feedback was captured and collated through post-it note comments throughout the workshop. The outturns were compiled and consolidated in main themes and is presented in Figures 4.2 and 4.3.

## **Outturn**

### **Technical skills.**

With regards the technical skills, new technologies, approaches and methodologies in areas of welding, fitting, machining and material science were highlighted as core areas for new capabilities. In addition, technical skills in safety and nuclear physics were needed. Advancements in data science, artificial intelligence, automation and data visualisation were seen as emerging skills required within the future nuclear workforce. In delivering such skills, delegates proposed enquiry-based, problem-based, applied learning approaches. As new, smaller, more 'local' nuclear energy production emerges through small modular reactors and novel nuclear technologies, delegates foresaw skill needs in civil engineering, novel construction (e.g. off-site production, on-site construction) and low-carbon construction (e.g. technologies to decarbonise concrete production whilst retaining structural integrity). Delegates also noted the skills needed in applied mathematics and computational skills for modelling and simulations, including opportunities for XR (mixed-reality) applications.

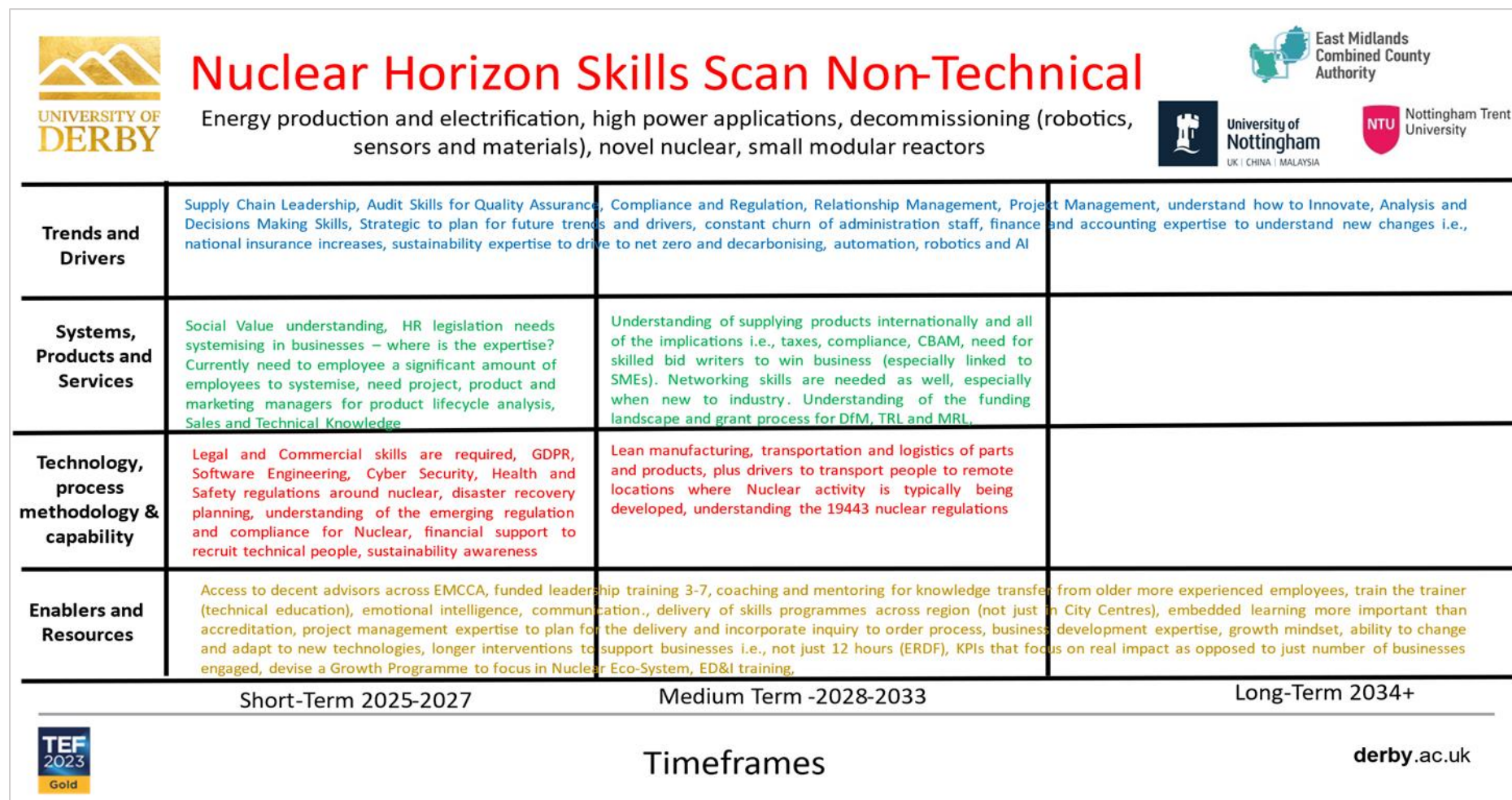
Figure 4.2: Nuclear Skills Scan - Technical



## Non-technical skills

In considering the 'corporate skills' needed, delegates identified that to advance the nuclear sector ecosystem new capabilities in supply chain management and leadership will be required alongside project management skills, contract management and procurement skills. In this, delegates acknowledged the geo-political environment in which nuclear energy production resides and therefore skills in diplomacy, policy and political intelligence are/will be required. Strategic leadership skills will continue to be required with delegates recognising that new 'corporate' technologies will need to be embraced in, for example, AI and automation of processes. Financial management skills in fields such as taxation and levies have recently come to the fore, which delegates saw as capabilities in which the sector may well need to strengthen over the medium term. Recognising the scale of funding needed to drive the nuclear sector forward, delegates identified bid-writing skills as being required particularly in the supply chain and within the sectors SMEs. Based on the security aspects associated with the nuclear sector, capabilities in cyber security and data protection, along with legal capabilities in intellectual property, protection of commercial expertise and commercial law were seen as key requirements both now and for the future. Delegates also acknowledged there is a need to 'market' the nuclear sector in new ways, particularly in the civil nuclear sector, to engage constructive public discourse in the acceptance of new approaches to nuclear as part of the future energy production landscape.

Figure 4.3: Nuclear Skills Scan – Non-Technical



## Zero Emission Propulsion

At a national level the National Electrification Forum and Framework (HVM Catapult, 2021) has been set up to address skills gaps in electrical technologies across multiple sectors. For hydrogen there are several regional skills mapping reports. For example, hydrogen skills in Scotland (Weir, 2023). This considered actions over short (1-2 years ) and medium term (2-5 years), with regional focus on skills development linked to hydrogen hubs. It acknowledged that the detailed understanding of the skills, skills gaps and new and emerging job roles was relatively low but this was generally in relation to generation of hydrogen. It was noted that Germany and France had launched graduate programmes focussed on the hydrogen economy driven by unstable geo-political issues related to energy supply.

The Scottish report identified that over 2025 to 2030 the Scottish hydrogen economy would require 6,614 skilled jobs per annum, mostly dedicated to hydrogen production facility design, installation and commissioning (40% of hydrogen jobs). Around 1,169 jobs were anticipated for hydrogen storage.

Just outside the EMCCA region Loughborough University are developing a green hydrogen facility at East Midlands Freeport which is anticipated to drive skills at levels 7-8 (Loughborough University, 2025). Loughborough University also led the HyDEX Skills Programme which involved surveying organisations to identify hydrogen skills gaps. The resulting report identified five key areas where training was required: Policy and Regulation, System Integration, Energy Modelling Tools, Climate Change and Sustainability and Future Industry Growth, with hybrid delivery CPD concluded as a favoured approach to learning (HyDEX, 2023).

Although Loughborough is just outside the EMCCA region, an independent report focussed on the East Midlands specifically commented on the need for collaboration between regional stakeholders to improve skills provision driven by demand from propulsion innovation activities (Nelles, 2023).

The ATI skills review (Aerospace Technology Institute, 2022), although considering national needs from a specific sector perspective, noted that the significant volume in new skills needed would be particularly challenging as such skills are needed across sectors at the same time and all transport modes, with the addition of defence and energy sectors, competing for skills.

In a conference about Jet Zero ambition (MAA, 2022), Midland Aerospace Alliance, one of the largest aerospace clusters in the world that has members from both Midlands and East

Midlands, highlighted the skills critical to Jet Zero by 2050. Achieving this demands a diverse range of advanced skills across the aerospace sector, particularly in the East Midlands, which plays a central role in the UK's net zero ambitions. Key skill areas include electric and hybrid-electric propulsion systems, hydrogen fuel cell technology, sustainable aviation fuel (SAF) development, emissions measurement and management, and sustainable materials engineering. The transition also requires skills in digital simulation, systems integration, and regulatory compliance, as well as cross-sector collaboration to adapt innovations from adjacent industries. As greenhouse gas emissions become a core performance metric, supply chain specialists and sustainability professionals will be critical in aligning operations with emerging environmental standards.

Education provision in propulsion within the EMCCA region specifically is focussed on core STEM skills. The specifications for the courses would need to be assessed to determine the specific degree to which they cover new and emerging propulsion technologies to address the identified skills needs. Where links to propulsion specifically are clear these are highlighted in bold in the Table 4.2. In addition, HyDEX (2025) notes that the University of Birmingham deliver a Fuel Cell and Hydrogen Technologies CPD course.

Table 4.2: Academic Skills Provision in STEM related to Propulsion

| Academic Institution      | Courses and Related Academic Innovation Facilities                                                                                                                                                                                                                                                                                                                                |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Derby College</b>      | <p>Level 3-6</p> <p>T-Levels – Engineering and Manufacturing, Management and Administration</p> <p>Apprenticeships – Engineering and Manufacturing</p> <p>Degrees – Engineering, Digital Skills and Computer Science</p>                                                                                                                                                          |
| <b>Nottingham College</b> | <p>Level 3-6</p> <p>T-Levels:</p> <ul style="list-style-type: none"> <li>• Design and Development for Engineering - Mechanical Engineering</li> <li>• Maintenance, Installation and Repair - <b>Light and Electric Vehicles</b></li> <li>• Maintenance, Installation and Repair - Mechanical</li> <li>• Digital Data Analytics</li> <li>• Digital Support and Security</li> </ul> |

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | A range of BEng Engineering Degrees including, General, Manufacturing, Mechanical, Electrical and Electronic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Chesterfield College</b>        | <p>Level 1-6</p> <p><b>Vehicle Repair</b>, Computing and Information Technology, Engineering</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Derby University</b>            | <p>Level 6-8</p> <p><b>Aerospace Engineer Degree Apprenticeship – includes Thermofluids, thermodynamics, control and instrumentation</b></p> <p><b>Motorsport Engineering – includes powertrain engineering – 5EN510 Propulsion 1 – covers power units, energy storage, thermal management.</b></p> <p><b>Electrical, Mechanical and Manufacturing</b> Bachelors and Masters Courses</p> <p><b>Nuclear Apprenticeships</b></p> <p><i>Could be adapted to cover hydrogen, battery and fuel cell and increase power electronics.</i></p> <p><b>IMechE Rail Challenge provides practical focus on battery and electric traction and control principles.</b></p> <p><b>Formula Student provides powertrain practical focus for motorsport.</b></p> <p><b>Rail Research and Innovation Centre – hardware-in-the-loop and motorsport laboratory.</b></p> |
| <b>Nottingham Trent University</b> | <p>Level 4-8</p> <p><b>Clifton Campus:</b></p> <p>Range of BEng and MEng engineering courses such as <b>Aerospace Engineering, Electrical and Electronic Engineering, and Mechanical Engineering.</b></p> <p><b>Mansfield Campus:</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                 |                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | A range of Higher National Diploma (HND) and Higher National Certificate (HNC) qualifications such as <b>Electrical and Electronic Engineering for England, and Mechanical Engineering for England.</b> |
| <b>University of Nottingham</b> | <p>Level 6-8</p> <p><b>Aerospace</b>, Electrical and Electronic, Mechanical, Materials and Manufacturing Engineering</p> <p><b>Hosts Power Electronics, Machines and Control Research Group.</b></p>    |

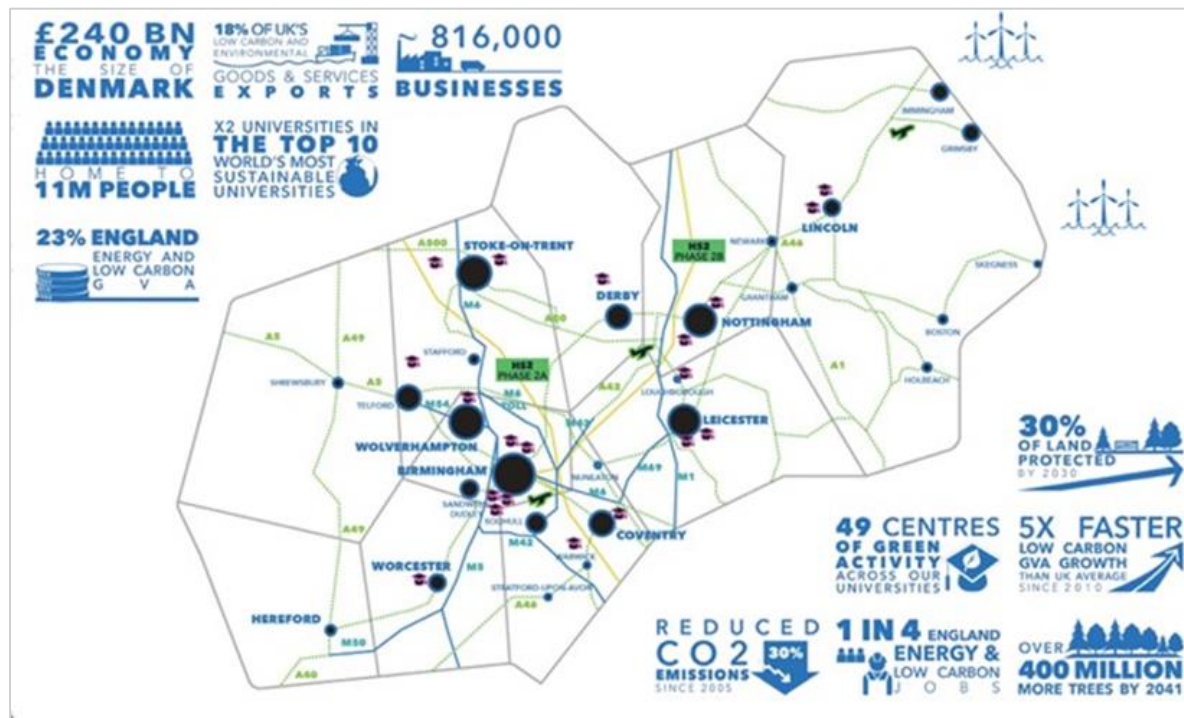
## Renewable Energy

The Midlands epitomises both the challenges and opportunities of the clean energy transition as it is home to a quarter of the UK's fossil fuel generation capacity, has a high concentration of energy-intensive industries whilst it has England's highest regional rate of fuel poverty.

The UK Government's (2020b) 'Ten Point Plan for a Green Industrial Revolution' will mobilise £12 billion of government investment, and potentially three times as much from the private sector, to create and support up to 250,000 green jobs across the UK. The Midlands is central to achieving the Government's ambition to become a clean energy superpower. It sets out the opportunities for investment, job creation and innovation, building on the Midlands' position as home to 19% of the UK's total installed renewables capacity, with wind, solar and bioenergy being the most significant sources and more concentrated in the East Midlands.

To contribute to the national 'Ten Point Plan for a Green Industrial Revolution', the Midlands has brought together 65 local authorities to accelerate both the Midlands and the UK's path to Net Zero as shown in Figure 4.4 below. This is the Midlands Engine Partnership, a pan-regional force that includes one Combined Authority, 20 universities, 9 Local Enterprise Partnerships and over 800,000 businesses. The objective of this partnership is to bring together diverse stakeholders from the region to think together and develop jointly a greener future for the region while contributing to the growth of the regional economy.

Figure 4.4: The Midlands Engine partners



Source: Midlands Engine (2021)

By 2041, the Midlands Engine aims to achieve the following:

- 196,000 job opportunity between new and reskilling ones which will increase the Gross Value-Added which will help close the regional £76 billion productivity gap,
- Collective actions will drive forward sustainable, green solutions, accelerating decarbonisation towards net zero targets set regionally and nationally,
- Delivery will aid and underpin levelling up through activity aligned to the UNESCO Sustainable Development Goals.

## Challenges in the Renewable Energy Job Market: Barriers to Growth and Development

While each sector within the renewable energy industry is unique in the barriers it faces in terms of jobs and skills needs, there are common challenges that cut across clean energy sectors, as well as common 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 for a range of roles, but skilled workers in these roles will also be in demand from other competing sectors.

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 identified by 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 nascent nature of the sector there is a lack of expertise in the training provider sector to curate and defuse a hydrogen curriculum.

### 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, while Public First found that only 27% of all young people having heard the term 'green jobs' are able to explain what it means.

### Equality and diversity

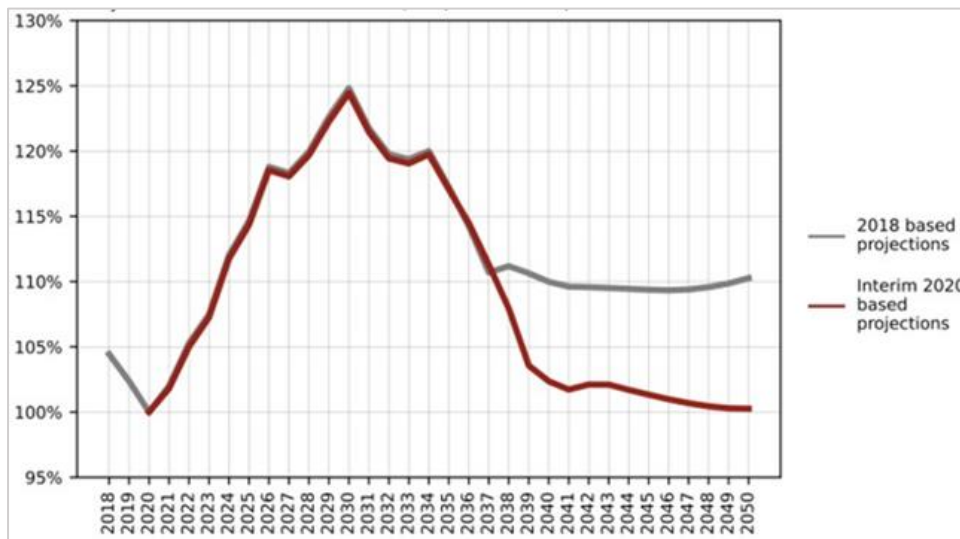
Looking at example occupations critical to clean energy sectors, it is estimated that only 26% of the total STEM workforce is female; for engineering roles, this falls to just 15.7%. Women are also significantly underrepresented in the training courses that lead to clean energy jobs, such as STEM based apprenticeships and university degrees, which means the immediate pipeline of workers will not resolve this issue.

### Ageing and retiring workforce

The UK has an ageing workforce, with 1 in 3 workers aged over 50. This is also true across many clean energy sectors such as engineering construction where 38% of the workforce is aged over 50, and heat pumps with two-thirds of the installer base aged over 45. 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. The Office for National Statistics (2020) published its UK population projections. The data (see Figure 4.5 below) predicts an increase in the number of 18-year-olds until 2040 before

returning to 2020 levels. This is important as it suggests that the labour pool for new clean energy jobs is likely to hold or increase from 2020 levels.

Figure 4.5: Projected 18-year-old population in the UK workforce by 2050



Source: Office for National Statistics (2022)

Table 4.3 regroups all different renewable technologies discussed above with their main characteristics, trends, as well as the workforce challenges.

Table 4.3: Workforce Characteristics, Sector Trends and Challenges of different renewable technologies

| Sector               | Workforce Characteristics                                                                                                                                | Sector Trends                                                                                                                                                                                      | Key Workforce Challenges                                                                                                                                                                                                                                                                                         |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Offshore Wind</b> | <p>Average workforce age of 40 (2023)</p> <p>20.6% of workforce are female (2023)</p> <p>7% of workforce are from ethnic minority backgrounds (2023)</p> | <p>Almost 30% of the workforce is in Scotland; followed by Humber (16%) and London (15%) (2023)</p> <p>2.6% of the workforce are apprentices (surpassing sector target of 2.5% by 2030) (2023)</p> | <p>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.</p> |

|                     |                                                                                                                                                                                                                                                                                      |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Onshore Wind</b> | 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.                                                                                                                                                                                         |
| <b>Solar</b>        | 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.                                                                                                                                                                                                                                                                   |
| <b>Heat pumps</b>   | 2/3rds of the installer workforce aged 45 or over (2023)<br>95% are male and white (2023)<br>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.                                                                                                                                                                      |
| <b>CCUS</b>         | Requires both onshore construction and offshore workforce – high overlap of skills with other sectors including oil and gas.<br><br>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.<br><br>Poor awareness of opportunities in the sector, including how existing training pathways could lead to CCUS jobs.                                                                                                                                                                        |
| <b>Hydrogen</b>     | Many of the roles needed in the hydrogen economy are STEM roles, which will be impacted by STEM skills shortages across the wider economy.<br>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.<br>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.<br>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.<br><br>Limited clarity between training and jobs, and poor awareness of opportunities in the sector. |

## Required Workforce to support the Net Zero Transition

Achieving the UK's net zero target by 2050 will require a wide range of technical, practical and digital skills across many sectors. The transition to a low-carbon economy will require

skilled workers in areas such as renewable energy, energy efficiency, green transport, sustainable agriculture, and carbon capture.

There are a few key occupations that are expected to be in higher demand across all clean energy sectors at the national level and therefore in the East Midlands area as well. 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 several 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.

**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, while Natural England have said the same for over 80% of the time they need to extend a deadline for a planning application. 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.

**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 to 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.

Table 4.4 below regroups the main sectors in which the UK is investing and relying for its Net Zero transition by 2050. For each technology, the skills needed as well as the key roles are presented along with the training required.

*Table 4.4: Summary of required skills and key roles for the different renewable energy technology sectors*

| Technology          | Skills Needed                                                                                                                                                                                                                                | Key Roles                                                                                                                      | Training and Education                                                                                                                             |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Wind Energy</b>  | Wind turbine installation, maintenance, offshore platform operations, energy storage systems, electrical engineering.                                                                                                                        | Wind turbine technicians, energy engineers, project managers.                                                                  | Apprenticeships in renewable energy, vocational training in electrical engineering or mechanical engineering, degree programs in renewable energy. |
| <b>Solar Energy</b> | Solar panel installation and maintenance, solar energy system design, electrical systems integration.                                                                                                                                        | Solar technicians, system integrators, project engineers.                                                                      | Degrees or vocational courses in renewable energy, mechanical or electrical engineering.<br><br>Apprenticeships solar technologies.                |
| <b>Hydrogen</b>     | <b>Hydrogen Production:</b><br>Electrolysis, hydrogen storage and distribution, fuel cells.<br><br><b>Hydrogen Infrastructure:</b><br>Design and maintenance of hydrogen refuelling stations, pipeline construction, and storage facilities. | Hydrogen production engineers, fuel cell developers, hydrogen infrastructure engineers, safety specialists in hydrogen systems | Engineering degrees (chemical, mechanical, electrical) with specialized training in hydrogen production and fuel cell technologies                 |

|                                                        |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                       |                                                                                                                                                                   |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Carbon Capture, Utilization, and Storage (CCUS)</b> | <b>CCUS Technologies:</b> Carbon capture processes, storage site design, monitoring, and safety.<br><b>Geological Storage:</b> Knowledge of CO <sub>2</sub> storage site selection, geological surveys, and environmental monitoring.                                                                                                                                              | CCUS engineers, geologists, environmental scientists, project managers specializing in CCUS projects. | Environmental science or engineering degrees, supplemented with training in CCUS technologies and storage systems.                                                |
| <b>Energy Efficiency and Green Buildings</b>           | <b>Energy-Efficient Building Design:</b> Sustainable construction, smart building technologies, and integration of energy-efficient systems.<br><b>Retrofit:</b> Retrofitting buildings for energy efficiency, installing insulation, upgrading heating systems.<br><b>Energy Auditing:</b> Assessing energy use, identifying savings opportunities, and recommending improvements | Energy efficiency consultants, retrofit specialists, green architects, building energy auditors.      | Degrees in sustainable architecture, civil engineering, or environmental science. Certification programs in energy efficiency auditing and green building design. |

## Education, Degrees, and Apprenticeships to prepare the future Workforce

Studies have shown that there is a significant shortfall of skilled workers in the clean energy sector. For instance, only 30% of the 600,000 workers needed globally by 2026 for wind projects have received training. To mitigate this, the UK has launched tailored apprenticeship programs, sector-specific training pathways, and strategies to make the workforce more inclusive are being implemented.

The growing number of Net Zero-relevant qualifications and standards in the UK is an inevitable reflection of fast changing roles and skills requirements in key sectors, such as energy generation and construction. However, it is highly doubtful that, without strategic coordination and investment, this expansion can translate into the level, quality and accessibility of provision required to meet the Net Zero skills needs of all sectors at the right time and in the right place. As well as issues of lag time between demand for new qualifications and their creation, there is the risk that a multitude of new standards and qualifications emerge for specific Net Zero tasks (e.g. heat pump installation), but that these are not considered as part of an integrated 'whole-occupation' portfolio (e.g. encompassing energy efficiency assessments, insulation, ventilation, underfloor heating, heat pump maintenance etc.).

A range of skills are needed for workers to contribute effectively. Typically, skills range from basic functional skills through to skills at the level of a doctorate or equivalent. In England, for instance, there are typically nine qualification levels ranging from 1 to 9 corresponding to this range of skills. A levels, T Levels, advanced apprenticeships and vocational qualifications are typically Level 3 for example, while honours degrees or degree apprenticeships are Level 6.

- **Vocational and Technical Training (Levels 2-4):** For roles such as technicians, installers, and maintenance workers in renewable energy, energy efficiency, and electric vehicles.
- **Undergraduate Degrees (Levels 5-6):** For engineers, system designers, and energy analysts in sectors like renewable energy, hydrogen, and carbon capture.
- **Postgraduate Education (Levels 7-8):** For R&D roles, policy analysts, and senior management roles focused on green technologies, sustainability, and carbon reduction strategies.
- **The apprenticeship programs:** The apprenticeships programs have been nationally recognised as a crucial mechanism for achieving Net-Zero goals. Programs are being developed to train young people in renewable energy roles, such as high-voltage cable technicians and offshore wind technicians. These apprenticeships provide hands-on experience and education, preparing the workforce for careers in the green economy and supporting the scaling of renewable energy infrastructure.

Apprenticeships have an important role to play in preparing the workforce needed for the Net zero target set by 2050, but a lack of flexibility in the Apprenticeship Levy may be hindering their effectiveness in meeting the demands of Net Zero.

Below is the list of some Apprenticeships available across the UK to prepare the next generation for the workforce that will support the UK transition to green energy:

**Level 2:**

- Solar Panel Installer

**Level 3:**

- Wind Turbine Technician
- Heat network maintenance technician
- Low Carbon heating technician
- Science Manufacturing technician
- Battery Manufacturing technician

- Power Industry substation fitter
- Power industry distribution cable jointer
- Power industry overhead linesperson.
- Energy Efficiency Technician
- Electrical Engineering Technician

**Level 4:**

- Community Energy specialist
- Renewable Energy Engineering
- Electrical Engineering Technician

It is important to highlight that all involved stakeholders in education, from schools to universities, in the UK are playing huge role from their place in developing all needed resources to achieve the UK ambitious plan of Net Zero target by 2050.

**Schools:** Across the four nations of the UK, there is already an emphasis on embedding climate and sustainability learning in school curricula. Work now needs further coordination and support from government, including additional investment in staff development and the embedding of Net Zero in careers guidance.

**Further education colleges:** While many colleges are already providing some form of Net Zero training, current investment in Further Education in the UK appears to be badly out of step with that demanded by the magnitude and pace of the transition to Net Zero; funding should be reviewed.

**Universities** have a major role to play in providing the high-level education and training the workforce of the UK to accelerate the transition to Net Zero. Although most universities have committed to reducing emissions from their estates and activities, few have fully embedded Net Zero into their learning provision.

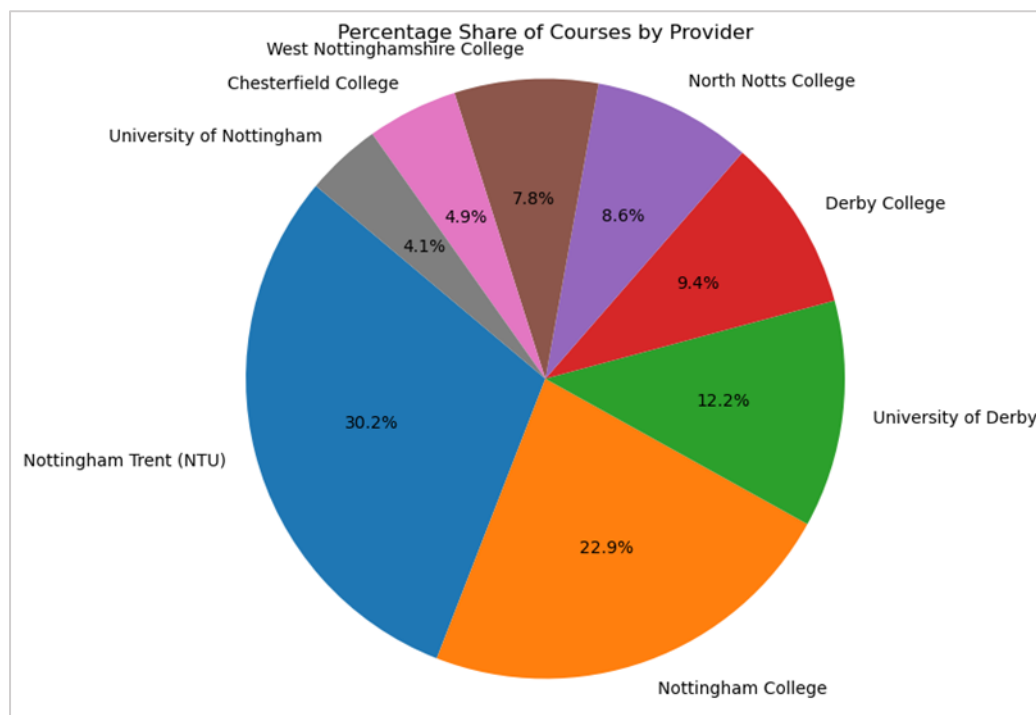
## Green Construction

The gap analysis of the current skills pathways in green construction first maps and examines the current provision of skills training across the EMCCA region, set within the context of the green skills gap in this sector. Alongside a quantitative analysis of the course provision, local case studies of best practice are interspersed throughout.

An analysis of the collective course provision in construction across the EMCCA region, based on available provider course listings, is presented in Figure 4.6. This analysis indicates that Nottingham Trent University and Nottingham College are the largest providers, jointly offering approximately 50 percent of the estimated 250 construction-

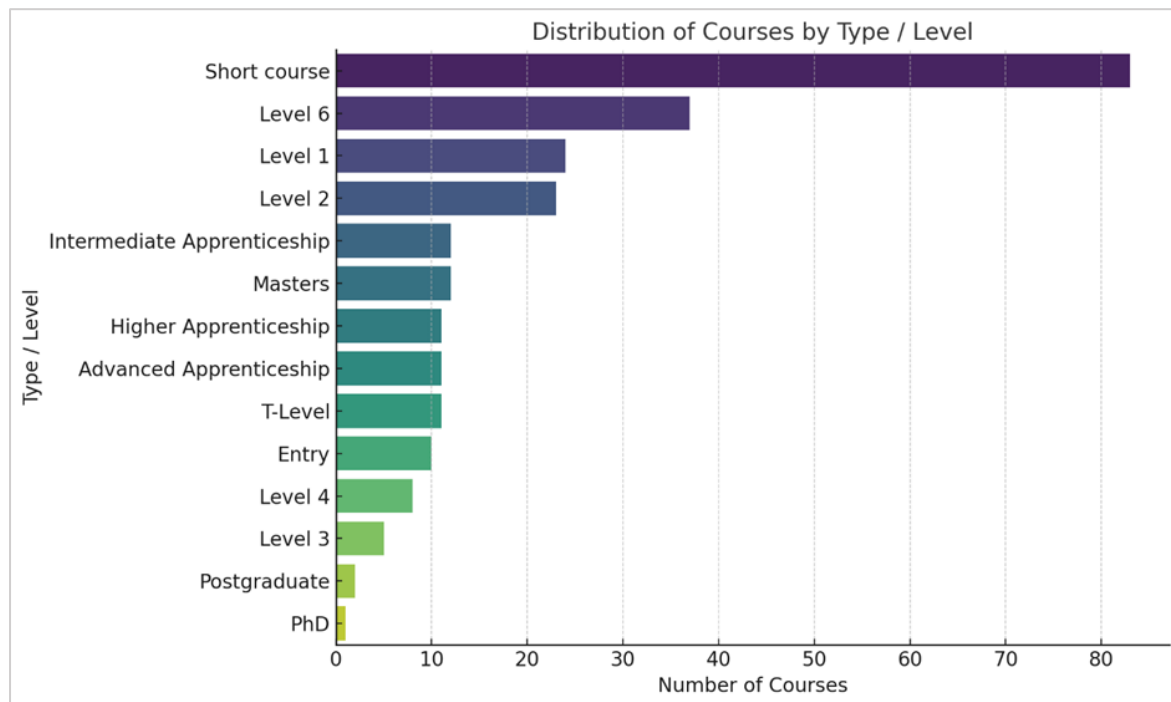
related courses available across the region. While this analysis cannot be considered fully definitive given the potential for new courses to be introduced or removal of ones, it nonetheless provides a useful indication of the current strength and breadth of construction-related provision among regional providers.

Figure 4.6: Distribution of Construction Courses



Further analysis, as depicted in Figure 4.7, indicates that skills gaps are most pronounced between Levels 3 and 7. This finding is particularly significant as it broadly corroborates the Skills England (2024) report, which identifies a misalignment between existing training provision and the actual skills demanded within the sector, especially at the mid-skill levels (Levels 3–7). Notably, there are substantial gaps in roles associated with the green transition, such as energy efficiency retrofits and sustainable building practices, with these deficits most evident at Levels 3–5.

Figure 4.7: Distribution of Construction Courses by Type / Level



Although a wide range of short courses is available, many of these entail financial costs for employers. While several of these programmes are specifically designed to support the development of green construction skills, a significant proportion are either not currently being delivered or are experiencing enrolment rates below expectations. This suggests a disconnect between the availability of training and employers' capacity or willingness to engage with it.

These findings further support the conclusions of Skills England (2024), which highlight issues such as limited employer investment in training, particular challenges faced by SMEs in accessing provision, and the need for more flexible and accessible training models. More broadly, this stresses systemic barriers including cost, limited awareness, and workforce constraints that inhibit SMEs from fully engaging with existing upskilling opportunities.

Despite the challenges, within the EMCCA region, there is clear potential to address the growing demand for skills to support the construction sector. With appropriate levels of investment, FE and HE providers are well placed to adapt to, and effectively respond to, the evolving needs of the industry.

### Chesterfield College: Pioneering a live construction site skills hub

In November 2024, Chesterfield College, in collaboration with Chesterfield Borough Council, Devonshire Group and the University of Derby, officially opened the Construction Skills Hub in Staveley. This innovative facility offers training in various construction disciplines all of which have embedded green literacy, including site and bench joinery, brickwork, groundworks, and electrical installation. The hub provides students with hands-on experience on a live construction site. Chesterfield College offers fully funded green skills courses including the fitting of wall insulation, solar panels, heat pumps, hybrid vehicle awareness, and a qualification in retrofit. The initiative received £200k from the UK Shared Prosperity Fund, to assist businesses in complying with upcoming regulations and contributing to environmental goals. The initiative aims to provide career insights, training, and work experience for over 5,000 students over a ten-year period. The green skills courses have enabled local businesses to upskill their workforce in preparation for the Future Homes Standard and the UK's 2050 net-zero target. These courses have been instrumental in promoting sustainable practices within the local construction industry.

Alongside the emphasis of embedding sustainability into the curriculum, there is also a strong focus on ensuring students are employer ready. The site being situated on a live construction site, owned by the Devonshire Group, offers daily opportunities for learners to gain work experience with new homebuilders Harron Homes and Vistry Group. Both companies partner with the tutors to build upon the curriculum that is taught on site with valuable time working with experienced trades people at each stage of the site's development. Collaboration with both CITB and NHBC is underway to ensure that we benchmark our provision amongst the best in the UK. Planning is underway to build both apprenticeships and higher education into the provision delivered on site.

Bull et al. (2024) highlighted recommendations and emphasised the necessity of embedding green skills within every role, process, and training programme in the construction sector. The report identified significant skills gaps within the construction industry in the D2N2 (at the time) region, as summarised in Table 4.5.

Table 4.5: Green Skills and Careers in Construction and Retrofit for Nottingham College

| Highest Level Skill Gaps                                                       | Other Notable Skill Gaps                                 |
|--------------------------------------------------------------------------------|----------------------------------------------------------|
| Upskilling in traditional trades with green skills                             | Drone technology for surveying                           |
| Expertise in green building materials                                          | Lack of qualified assessors and trainers in green skills |
| Expertise in sustainable technologies, such as heat pumps and solar PV systems | PAS 2030 certification                                   |
| Installation specialists                                                       | Facilities management professionals                      |

|                                                              |                                                          |
|--------------------------------------------------------------|----------------------------------------------------------|
| Retrofit training (PAS 2035 certification)                   | Digital skills professionals for green construction      |
| Rainwater harvesting specialists                             | Regulatory compliance and environmental management       |
| Surveying specialists                                        | Carbon calculations for building projects                |
| Asbestos and waste removal professionals                     | General environmental awareness and messaging techniques |
| Construction and project management (sustainability-focused) | Understanding industry standards                         |
|                                                              | Fire door installation and inspection                    |
|                                                              | EV charging point engineers                              |

Source: Bull et al. (2024)

Bull et al. (2024) highlight the necessity of increasing awareness of low-carbon construction techniques by incorporating climate literacy into conventional construction-focused programmes, such as bricklaying. Considering this and given the pressing need to enhance the skills of the existing construction workforce, an additional funding stream should be introduced. This would allow Training Providers, Further Education Colleges, and Universities to offer courses that are not currently publicly funded to their affiliated employer partners. The aim is to ensure that the construction workforce is sufficiently equipped with the requisite skills to meet the demands of sustainable building practices and comply with regulatory requirements, with the following objectives:

1. To integrate climate literacy into existing courses by embedding smaller awards and learner engagement opportunities, ensuring low-carbon awareness is incorporated across all construction programmes,
2. To provide institutionally self-certified and smaller awards in areas that are not currently available through Ofqual and Office for Students regulated qualifications at Levels 2–7. These areas include but are not limited to: Installation and Maintenance of Heat Pump Systems (Non-Refrigerant Circuits), Small-Scale Photovoltaic Systems, BS 7671:2018 Level 3 Award in the Requirements for Electrical Installations (including Amendment 2), PAS 2035 Certification, PAS 2030:2019 Certification, and Rainwater Harvesting

### T-Levels, HTQs, and Apprenticeships in Green Construction

According to the Institute for Apprenticeships and Technical Education (IfATE), two T Level pathways are currently available: *Building Services Engineering for Construction* and

*Design, Surveying and Planning for Construction*. Both are being delivered by FE providers within the EMCCA region. In addition, five occupational standards have been mapped to Higher Technical Qualifications (HTQs). These include *Construction Design and Build Technician*, *Construction Site Supervisor*, *Construction Quantity Surveying Technician*, *Building Services Engineering Senior Technician*, and *Civil Engineering Senior Technician*; collectively these are being delivered by NTU, Derby College, Chesterfield College, North Notts College, and Nottingham College. Furthermore, there are approximately 135 apprenticeship standards available across levels 2 to 7. As illustrated in Figure 4.8, these pathways span a range of qualification levels aligned to the green construction sector. The varying shades of green within the figure indicate the extent to which low-carbon practices and sustainability principles have been embedded into each course, with the darkest shades representing a significant incorporation of climate literacy.

Figure 4.8: Green Classification by Level

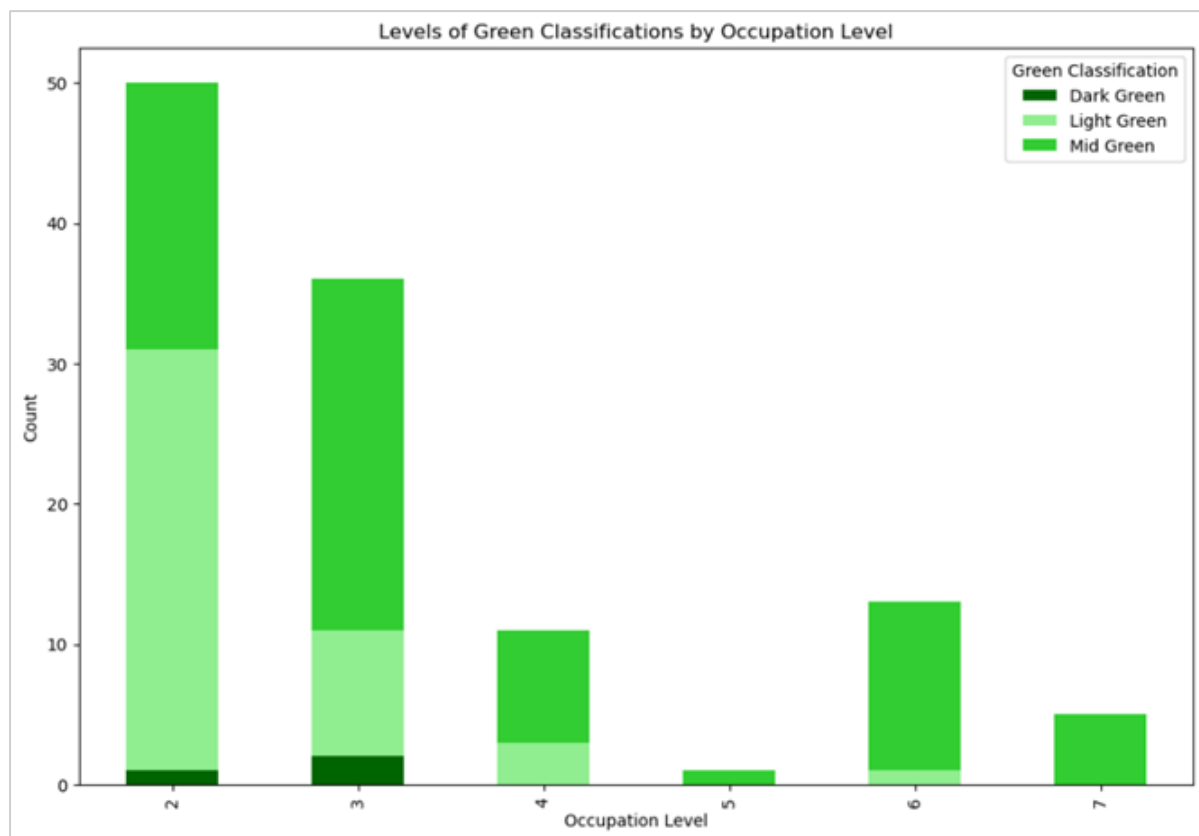


Figure 4.8 illustrates that, while a considerable number of occupational standards incorporate elements of climate literacy, there is limited evidence of its significant integration (dark green) across all qualification levels particularly at Levels 4 and above. Furthermore, the figure reveals a significant shortfall in the provision of green construction-related skills at Levels 4 to 7, indicating a pressing need to enhance advanced training and curriculum development in sustainable construction practices.

### University of Derby Case Study

The University of Derby offers a diverse range of courses and initiatives in the built environment that integrate green literacy. Examples include the MSc Sustainable Architecture and Healthy Buildings, which focuses on climate-responsive design and energy efficiency, and the MSc Civil Engineering and Construction Management, which includes modules such as Environmental Risk and Responsibility to address sustainability in construction. Undergraduate programmes in architectural technology, interior architecture, quantity surveying, civil engineering, and construction management provide a mixture of standard and apprenticeship courses that incorporate future-focused skills, offering hands-on experience with advanced equipment to support sustainable building practices. Central to this narrative is the CIAT Centre of Excellence, one of only three in the UK and abroad, which emphasizes issues of sustainability in the built environment within the context of climate change.

The immediate research environment is provided by the Built Environment Research Group (BERG), incorporated into the broader Environmental Sustainability Research Centre (ESRC) to benefit from multidisciplinary opportunities. Furthermore, zero carbon is one of the University's six key research themes. Research in this area has both a strategic purpose—informing international, national, and regional policy—and a tactical one: influencing business support projects as well as urban and environmental sustainability initiatives. Innovation and business links are supported by three Zero Carbon Research Centres and the Institute for Innovation in Sustainable Engineering.

These findings align with the insights presented in the Skills England (2024) report, which highlights the substantial workforce challenges currently faced by the construction sector. A critical issue is the acute shortage of skilled workers, particularly in occupations vital to achieving green transition objectives, such as energy efficiency retrofits and sustainable building techniques. This shortage is further compounded by a persistent misalignment between the training available and the skills demanded by industry, especially at mid-skill levels (Levels 3–7).

These issues collectively highlight the urgent need to encourage a more collaborative environment between industry and training providers. Additionally, there is a clear imperative for providers to coordinate more effectively with one another, reducing competition that often hinders course viability due to insufficient enrolment. Such collaborative approaches are essential to ensuring that training provision is both responsive to industry needs and sustainable in delivery.

## Nottingham Trent University: A Centre for Sustainable Construction and Retrofit

As part of its University, Reimagined Strategy, Nottingham Trent University (NTU) has ensured that sustainability is one of its six strategic themes. In 2023 NTU invested £1.5 million to establish the Centre for Sustainable Construction and Retrofit (CSCR), driving skills, research, and training to support the construction sector's transition to net zero and tackle the skills gap in this sector. Fundamental to this was launching L4 courses such as Higher Technical Qualifications (HTQs) and apprenticeships to equip students and businesses with the expertise needed to meet low-carbon regulations. This was alongside short courses in sustainable and digital construction skills, notably a L5 Retrofit Co-ordinator course. In 2025 a new Construction and Engineering Lab was opened in NTU Mansfield's Teaching and Learning building, the lab will support the learning and teaching of construction and engineering courses. Students now have access to cutting-edge facilities, including robotics, 3D printing, CNC machining, automation equipment, and sustainable construction and retrofit equipment, such as Spot the robot dog.

The establishment of the CSCR has furthered NTU's sustainable construction research and training, encouraging collaborations and knowledge exchange with industry partners, national and local government, and contributing to the development of a skilled workforce adept in green construction practices. The development of compelling new partnerships — alongside our unique relationship with Vison West Notts College has enabled us to work closely with strategic partners such as Morgan Sindall and Volker Fitzpatrick, as well as local stakeholders like Focus Consultants, the Coal Authority, and Bolsover and Ashfield district councils (through SME consultancy work, supported by Levelling Up funding).

## Advanced Manufacturing

Following the completion of the Sustainable Advanced Manufacturing interim report and the subsequent workshop held on 2<sup>nd</sup> April 2025 with key stakeholders including prominent industry representatives, such as MAKE UK, employers, and leading educationalists in the field of Sustainable Advanced Manufacturing the findings presented in Part 3 of this report were reviewed, validated, and revised. This process aimed to accurately identify both current and future skills requirements within the manufacturing sector in the EMCCA region. Table 4.6 shows the very high or high priority skills highlighted by the participants of the workshop.

Table 4.6: Workshop Findings - Priority Skills

| Very High Priority Skills                                                                                                                                                                                                                                                                          | High Priority Skills                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Circular product design and practices</li> <li>• Machine tools operators</li> <li>• Mechanical electrical fitters</li> <li>• Welding</li> <li>• AI-driven robot route planning and manipulation</li> <li>• Regulatory and standards compliance</li> </ul> | <ul style="list-style-type: none"> <li>• Sustainable materials</li> <li>• Recycle and remanufacturing</li> <li>• Tool maker</li> <li>• Continuous improvement (Lean &amp; Six Sigma)</li> <li>• PLC programming and troubleshooting</li> <li>• Precision manufacturing (less waste)</li> </ul> |

|                                                                                                                                                                                                                                                                                              |                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Artificial intelligence / machine learning</li> <li>• Advanced machine vision</li> <li>• Lean / Smart manufacturing (reduce waste)</li> <li>• Additive Manufacturing</li> <li>• Robotics, Industrial robots, cobots, and mobile robotics</li> </ul> | <ul style="list-style-type: none"> <li>• Programming / software development</li> <li>• CAD</li> <li>• Electrical and electronics engineering</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|

In addition, the following challenges were identified from the participants, these are used to inform the recommendations:

### **Manufacturing and Technology**

1. Enhanced and advanced manufacturing capabilities in both physical processes and the digital domain.
2. Increased use of composites.
3. Smarter, reconfigurable precision manufacturing with less waste.
4. Increased automation and robotics throughout manufacturing.
5. Flexible layouts, tooling, and fixtures.
6. AI and Machine Learning to inform further process integration and optimisation.
7. Development of new advanced materials for challenging environments.

### **Energy and Environment**

1. Increasing energy demands and the need for energy security.
2. Decarbonisation efforts.

### **Data and Security**

1. Data security, integrity, collection, storage, and analysis.

### **Education and Skills Development**

1. Ensure education is more aligned with regional industry and business needs.
2. Research and develop vocational courses, placements, and apprenticeships aligned to business needs.
3. Universities to work collaboratively across teaching and research and show leadership.
4. Mid-career conversions to grow workforce.
5. Promote education and awareness to remove bias of working in Manufacturing.
6. Address the Level 3 / 4 demand.
7. Develop a pipeline of opportunities and certainty in skills and people management.
8. More university expertise is required to support industry in materials, manufacturing technologies, and digital domains, including PhDs and Eng Docs.

### **Business and Economic Growth**

1. Global exporting opportunities for UK technologies and companies.

2. New business models focused on agile and shorter cycle times.
3. Increasing productivity to offset compliance and regulatory burdens.
4. Focus on public awareness of jobs in manufacturing.
5. Encourage engagement with SMEs to collaborate collectively with educational partners.
6. Create a one-stop shop for employers to centralise contact with FE and HE providers within EMCCA.
7. Knowing who are the SMEs in the area.

### Workforce and Resources

1. Lack of resources and aging workforce retiring, leading to loss of knowledge.
2. Need for UK testing capability for verification and validation of products and materials.

In the continued absence of detailed information regarding the Growth and Skills Levy, the cumulative evidence highlights several key imperatives for the region's economic and industrial development. These include the need to stimulate growth in the availability and adaptability of skills, promoting a more flexible approach to how skills are both developed and delivered. It is also necessary to reduce competition and instead encourage greater collaboration among training providers. A pressing concern is the requirement to engage and attract younger generations to careers in manufacturing and engineering, while simultaneously upskilling the existing workforce. Moreover, stronger collaboration between SME and larger industrial players with the education sector is essential to ensure that the skills pipeline is aligned with industry needs and that more young people are prepared to enter the workforce; incentivising this collaboration will be crucial.

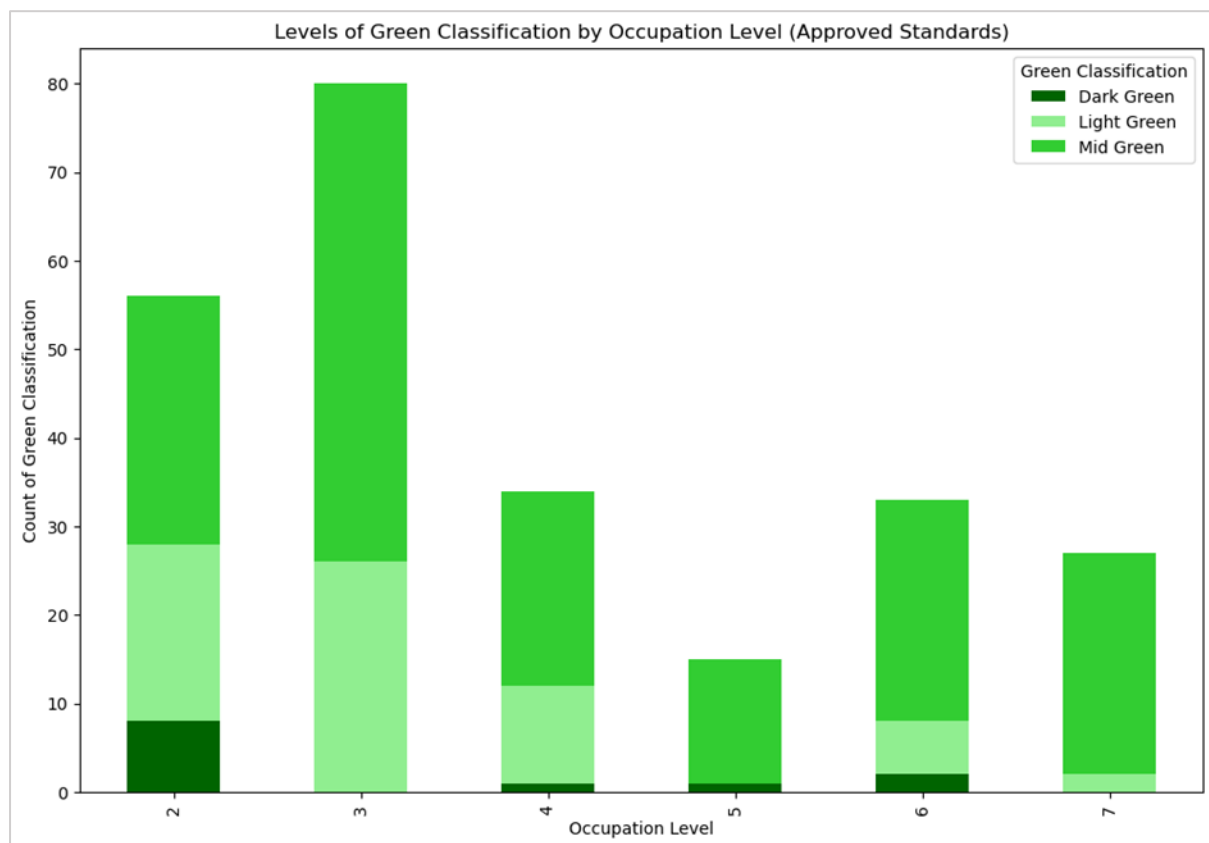
Furthermore, funding decisions must be careful not to become overly prescriptive or restrictive. While efforts are made to identify current skills shortages, some anomalies are inevitable, particularly in sectors that produce highly specialised or bespoke products. Moreover, skills requirements can change in response to innovation and the emergence of local projects. For instance, the decommissioning and redevelopment of the Ratcliffe-on-Soar Power Station, alongside the relocation of Garnalex, an aluminium firm based in Derbyshire to a 7.28-hectare manufacturing site near Junction 27 of the M1, exemplify such developments. Similarly, the £30 million Automated Distribution and Manufacturing Centre (ADMC) aims to position the district as a leading hub for innovation and technology. In addition, the construction of a major manufacturing facility near the A617 and A6075 Abbott Road is projected to generate up to 500 jobs by autumn 2025. Finally, Explore Park, which is situated just west of Worksop within the East Midlands Investment Zone (EMIZ), already hosts Laing O'Rourke and Europe's largest and most advanced pre-

assembly manufacturing facility. Further examples include the West Burton site and the STEP fusion energy project, both of which highlight the role of local innovation and infrastructure in driving demand for new and highly specialised skills.

## T-Levels, HTQs and Apprenticeships in Sustainable Manufacturing

According to the Institute for Apprenticeships and Technical Education's (IfATE) occupational map for Engineering and Manufacturing, there are approximately 332 approved apprenticeships spanning Levels 2 to 7. In addition, three T Level routes are available in this sector: *Design and Development for Engineering and Manufacturing*, *Maintenance, Installation and Repair for Engineering and Manufacturing*, and *Engineering, Manufacturing, Processing and Control*. Furthermore, five occupational standards are currently linked to around 27 Higher Technical Qualifications (HTQs). The distribution of qualifications across Levels 2 to 7 is illustrated in Figure 4.9.

Figure 4.9: Occupational Standards – Green Classifications



The current data suggests that, despite the wide availability of apprenticeships, employer engagement remains limited. This indicates a clear disparity between the supply of opportunities and actual uptake. Furthermore, although an increasing number of occupational standards now incorporate green and sustainable skills, relatively few embed these elements in a meaningful or comprehensive way. Where sustainability is more deeply

integrated, this is indicated by darker green shading in the accompanying data visualisation.

At the local level, the ASF administered by the EMCCA presents a strategic opportunity to support the development of skills, particularly at Level 2. To a more limited extent, this support can extend to Level 3 provision through the Free Courses for Jobs initiative. However, the evidence suggests that the most significant skills shortages are emerging between Levels 3 and 5 more widely within the sector. This issue is further compounded by low enrolment numbers in T Levels, which remain less popular compared to Applied General Qualifications.

While local Skills Bootcamps are available and can play a partial role in addressing these gaps, they are not without limitations. Like the ASF, access to Bootcamps is governed by eligibility criteria, and there are ongoing concerns regarding bureaucracy and the degree to which these programmes are responsive to employer needs. These observations are consistent with the findings of Skills England, which also identifies Levels 3 to 5 as the area of greatest skills shortage within the manufacturing sector.

## Sector Relevant Skills

### SMEs Analysis

A recent report highlighted that within Midlands SMEs there is a lack of leadership and management skills and capabilities (Yoruk & Gilman, 2022). The region has more than 80,000 businesses employing more than 930,000 people, and yet only 985 have been on the governments Help To Grow Management programme. Many owner managers struggle with leadership and areas such as management, strategy, innovation, performance measurement and management, digitalisation, CSR and development, to name a few, which are crucial to growing companies.

However, it was found that a lack of managerial skills and strategic planning, low levels of investment in employee recruitment and training were major growth barriers, not to mention the difficulty in finding suitably qualified staff. Human resources issues (including high employee turnover, lack of employee skills) are the top future growth barriers. SMEs essentially view their staff as less competent than desired and due to deficiencies in their human resource management, they miss the opportunity to nurture their future growth through using their employees as a competitive advantage.

A comprehensive business strategy is key to driving organisational growth. Yet only 39% of SMEs have a written business strategy, 36% say they have an unwritten strategy and 25% have no strategy at all. When asked to produce their written strategy, at best they

have a specific business plan which may have been targeted for obtaining a bank overdraft or loan, and at worst they could not produce or explain what the wider strategy was. Where a strategy is present, High Growth Firms (HGFs) are more likely to cover product/service development and innovation (77%), finance (70%), managing and developing human resources (65%), process improvement and innovation (63%), and quality of product or service (63%). All areas that require a high level of skill and the development of dynamic capabilities. HGFs are particularly distinguished from other firms by their coverage of managing the development of human resources and CSR issues in the strategic plan.

49% of SMEs have no spend when it comes to training and development. Even though 39% of the firms committed expenditure to staff training and development on an ad hoc basis, only 12% of firms have a dedicated budget.

Innovation and the use of technology are also important factors, but most companies see a lack of adequately qualified staff as a barrier. 55% of the firms believe there is a positive effect on their growth from pursuing an environmentally friendly approach to business. However, when it comes to the implementation of CSR initiatives in particular contexts, it is either mostly 'considered' or 'not implemented' at all (61%).

Growing firms are also strongly associated with good staff recruitment for CSR purposes, ensuring future business profitability within CSR strategies, supporting their local community, and to some extent with using resources more efficiently.

## Labour Force Analysis

According to the OECD (2024), 19.4% of the UK labour force is employed in green-driven occupations, only just under the OECD average of 20%. Across the OECD, these green-driven occupations are made up of green-enhanced skills occupations (46%, existing occupations for which the skill set has changed as a result of focus on green growth), green increased demand occupations (40%, existing occupations in demand for green growth) and new/emerging green occupations (14%).

As Table 4.7 shows, the EMCCA economic activity (measured by size of employment) is concentrated in four sectors: manufacturing (13%), wholesale and retail trade (15%), health (13%) and education (9%). This region stands out as distinct from England by the prominence of Manufacturing, which not only brings challenges to sustainable development, but also provides specific opportunities in terms of green technologies, green jobs and skills. Most of the East Midlands local authorities (LAs) have proportions of employment in manufacturing that are 2-3 times the English average. Apart from advanced manufacturing, regional employment remains subdued in the higher value-

added sectors such as finance and insurance (1.3%), information and communication services (2.7%) and professional, scientific and technical services (7.5%). The under-representation of such sectors negatively impacts on the region's productivity and potentially reduces its potential to take advantage of the shift to green economy and clean technologies.

Table 4.7: Regional employment breakdown by sector

| Area         | Agric.,<br>forestry &<br>fishing (A) | Mining,<br>quarrying &<br>utilities (B,D<br>and E) | Manuf.<br>(C) | Constr. (F) | Motor<br>trades<br>(Part G) | Wholesale<br>(Part G) | Retail<br>(Part G) | Transport &<br>storage (inc<br>postal) (H) | Accomm.<br>& food<br>services (I) | Inform. &<br>comm. (J) | Fin. &<br>ins. (K) | Property<br>(L) | Prof.,<br>sci. &<br>techn. (M) | Bus.<br>admin. &<br>support<br>serv. (N) | Public<br>admin. &<br>defence<br>(O) | Educ.<br>(P) | Health<br>(Q) | Arts, entmt.,<br>recr. & oth.<br>serv. (R,S,T,U) |
|--------------|--------------------------------------|----------------------------------------------------|---------------|-------------|-----------------------------|-----------------------|--------------------|--------------------------------------------|-----------------------------------|------------------------|--------------------|-----------------|--------------------------------|------------------------------------------|--------------------------------------|--------------|---------------|--------------------------------------------------|
| England      | 1%                                   | 1%                                                 | 8%            | 5%          | 2%                          | 4%                    | 9%                 | 5%                                         | 7%                                | 4%                     | 3%                 | 2%              | 9%                             | 9%                                       | 4%                                   | 8%           | 12%           | 5%                                               |
| <b>EMCCA</b> | <b>1%</b>                            | <b>2%</b>                                          | <b>13%</b>    | <b>5%</b>   | <b>2%</b>                   | <b>5%</b>             | <b>10%</b>         | <b>5%</b>                                  | <b>7%</b>                         | <b>3%</b>              | <b>1%</b>          | <b>2%</b>       | <b>8%</b>                      | <b>8%</b>                                | <b>4%</b>                            | <b>9%</b>    | <b>13%</b>    | <b>4%</b>                                        |
| Derby        | 0%                                   | 1%                                                 | 19%           | 3%          | 2%                          | 3%                    | 8%                 | 4%                                         | 6%                                | 2%                     | 1%                 | 2%              | 10%                            | 10%                                      | 3%                                   | 8%           | 15%           | 3%                                               |
| Nottingham   | 0%                                   | 2%                                                 | 5%            | 3%          | 1%                          | 4%                    | 12%                | 4%                                         | 6%                                | 5%                     | 3%                 | 2%              | 8%                             | 10%                                      | 6%                                   | 12%          | 15%           | 4%                                               |
| Amber Valley | 2%                                   | 1%                                                 | 21%           | 9%          | 2%                          | 6%                    | 8%                 | 7%                                         | 7%                                | 1%                     | 1%                 | 2%              | 6%                             | 5%                                       | 6%                                   | 7%           | 9%            | 4%                                               |
| Bolsover     | 1%                                   | 1%                                                 | 14%           | 6%          | 2%                          | 6%                    | 8%                 | 10%                                        | 7%                                | 3%                     | 1%                 | 2%              | 12%                            | 4%                                       | 2%                                   | 8%           | 8%            | 6%                                               |
| Chesterfield | 0%                                   | 1%                                                 | 8%            | 4%          | 4%                          | 8%                    | 10%                | 7%                                         | 6%                                | 2%                     | 2%                 | 1%              | 6%                             | 9%                                       | 3%                                   | 8%           | 19%           | 3%                                               |
| Derbyshire   |                                      |                                                    |               |             |                             |                       |                    |                                            |                                   |                        |                    |                 |                                |                                          |                                      |              |               |                                                  |
| Dales        | 7%                                   | 2%                                                 | 14%           | 4%          | 2%                          | 3%                    | 10%                | 3%                                         | 14%                               | 1%                     | 0%                 | 2%              | 6%                             | 4%                                       | 8%                                   | 5%           | 7%            | 7%                                               |
| Erewash      | 1%                                   | 2%                                                 | 18%           | 6%          | 2%                          | 5%                    | 10%                | 5%                                         | 9%                                | 2%                     | 1%                 | 2%              | 6%                             | 6%                                       | 2%                                   | 10%          | 10%           | 4%                                               |
| High Peak    | 3%                                   | 3%                                                 | 18%           | 4%          | 2%                          | 4%                    | 10%                | 5%                                         | 9%                                | 1%                     | 1%                 | 1%              | 7%                             | 6%                                       | 2%                                   | 7%           | 10%           | 5%                                               |
| North East   |                                      |                                                    |               |             |                             |                       |                    |                                            |                                   |                        |                    |                 |                                |                                          |                                      |              |               |                                                  |
| Derbyshire   | 3%                                   | 1%                                                 | 22%           | 7%          | 2%                          | 6%                    | 7%                 | 3%                                         | 7%                                | 2%                     | 1%                 | 2%              | 6%                             | 5%                                       | 1%                                   | 8%           | 11%           | 4%                                               |
| South        |                                      |                                                    |               |             |                             |                       |                    |                                            |                                   |                        |                    |                 |                                |                                          |                                      |              |               |                                                  |
| Derbyshire   | 3%                                   | 1%                                                 | 20%           | 5%          | 2%                          | 4%                    | 7%                 | 6%                                         | 7%                                | 2%                     | 1%                 | 2%              | 7%                             | 9%                                       | 2%                                   | 10%          | 7%            | 4%                                               |
| Ashfield     | 0%                                   | 2%                                                 | 18%           | 11%         | 4%                          | 6%                    | 7%                 | 5%                                         | 4%                                | 1%                     | 1%                 | 1%              | 4%                             | 5%                                       | 2%                                   | 6%           | 20%           | 3%                                               |
| Bassetlaw    | 2%                                   | 2%                                                 | 18%           | 5%          | 2%                          | 4%                    | 10%                | 7%                                         | 6%                                | 2%                     | 1%                 | 1%              | 7%                             | 6%                                       | 4%                                   | 7%           | 14%           | 4%                                               |
| Braxtowe     | 0%                                   | 2%                                                 | 13%           | 8%          | 2%                          | 6%                    | 12%                | 5%                                         | 7%                                | 3%                     | 2%                 | 1%              | 12%                            | 6%                                       | 2%                                   | 8%           | 8%            | 5%                                               |
| Gedling      | 1%                                   | 2%                                                 | 11%           | 8%          | 2%                          | 6%                    | 11%                | 3%                                         | 7%                                | 1%                     | 1%                 | 1%              | 5%                             | 8%                                       | 3%                                   | 10%          | 13%           | 5%                                               |
| Mansfield    | 0%                                   | 1%                                                 | 11%           | 6%          | 2%                          | 5%                    | 14%                | 2%                                         | 5%                                | 1%                     | 1%                 | 1%              | 5%                             | 14%                                      | 4%                                   | 9%           | 12%           | 5%                                               |
| Newark and   |                                      |                                                    |               |             |                             |                       |                    |                                            |                                   |                        |                    |                 |                                |                                          |                                      |              |               |                                                  |
| Sherwood     | 3%                                   | 2%                                                 | 12%           | 6%          | 2%                          | 3%                    | 8%                 | 12%                                        | 12%                               | 3%                     | 1%                 | 2%              | 6%                             | 7%                                       | 3%                                   | 6%           | 10%           | 6%                                               |
| Rushcliffe   | 2%                                   | 1%                                                 | 6%            | 4%          | 1%                          | 5%                    | 8%                 | 2%                                         | 7%                                | 6%                     | 1%                 | 2%              | 13%                            | 6%                                       | 6%                                   | 13%          | 10%           | 8%                                               |

Sources: Annual Population Survey (2020). Conditional formatting reflects difference from England averages. Greenness Indicator calculated as proportion of Green Tasks in overall tasks based on O\*NET data and descriptors.

For the EMCCA region, the high level of employment in manufacturing is reflected in the occupational profile of the region (see Table 4.8), with Professional and Associated Professional occupations (major groups 2 and 3) and Skilled Trades occupation (major group 5) featuring more prominently than others. The extent to which these occupational groups are classified as green gives an indication of the degree to which there is potential for green growth in the region. The green-ness indicator developed by Dierdorff et al. (2011) is based on O\*NET occupational greening evaluations and reflects the proportion of tasks in each occupation associated with the green economy in the total tasks undertaken. They include existing green skills, green enhanced skills as well as new/emerging green skills (National Center for O\*NET Development, 2010).

*Table 4.8: Regional employment breakdown by occupation - Distribution of within the region*

| Green-ness Indicator  | 51%                                      | 35%                      | 35%                               | 58%                               | 21%                        | 39%                                           | 58%                                    | 22%                                   | 35%                    |       |
|-----------------------|------------------------------------------|--------------------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------------------------------|----------------------------------------|---------------------------------------|------------------------|-------|
| Area                  | Managers, Directors and Senior Officials | Professional Occupations | Associate Prof & Tech Occupations | Admin and Secretarial Occupations | Skilled Trades Occupations | Caring, Leisure and Other Service Occupations | Sales and Customer Service Occupations | Process, Plant and Machine Operatives | Elementary occupations | Total |
| England               | 12%                                      | 23%                      | 15%                               | 10%                               | 9%                         | 9%                                            | 7%                                     | 6%                                    | 10%                    | 100%  |
| <b>EMCCA</b>          | <b>11%</b>                               | <b>20%</b>               | <b>14%</b>                        | <b>9%</b>                         | <b>11%</b>                 | <b>10%</b>                                    | <b>8%</b>                              | <b>8%</b>                             | <b>10%</b>             | 100%  |
| Derby                 | 9%                                       | 22%                      | 13%                               | 7%                                | 11%                        | 8%                                            | 10%                                    | 6%                                    | 13%                    | 100%  |
| Nottingham            | 7%                                       | 21%                      | 12%                               | 10%                               | 10%                        | 12%                                           | 7%                                     | 6%                                    | 15%                    | 100%  |
| Amber Valley          | 11%                                      | 25%                      | 16%                               | 6%                                | 9%                         | 5%                                            | 8%                                     | 9%                                    | 9%                     | 100%  |
| Bolsover              | 6%                                       | 13%                      | 17%                               | 0%                                | 16%                        | 27%                                           | 6%                                     | 14%                                   | 0%                     | 100%  |
| Chesterfield          | 12%                                      | 21%                      | 13%                               | 10%                               | 8%                         | 13%                                           | 9%                                     | 6%                                    | 8%                     | 100%  |
| Derbyshire Dales      | 19%                                      | 29%                      | 9%                                | 8%                                | 17%                        | 4%                                            | 0%                                     | 5%                                    | 9%                     | 100%  |
| Erewash               | 15%                                      | 14%                      | 15%                               | 9%                                | 10%                        | 12%                                           | 7%                                     | 11%                                   | 6%                     | 100%  |
| High Peak             | 8%                                       | 21%                      | 17%                               | 11%                               | 10%                        | 8%                                            | 7%                                     | 5%                                    | 12%                    | 100%  |
| North East Derbyshire | 13%                                      | 11%                      | 16%                               | 15%                               | 17%                        | 5%                                            | 7%                                     | 7%                                    | 8%                     | 100%  |
| South Derbyshire      | 11%                                      | 23%                      | 17%                               | 9%                                | 10%                        | 7%                                            | 4%                                     | 12%                                   | 7%                     | 100%  |
| Ashfield              | 7%                                       | 12%                      | 10%                               | 7%                                | 24%                        | 8%                                            | 11%                                    | 11%                                   | 11%                    | 100%  |
| Bassetlaw             | 10%                                      | 14%                      | 17%                               | 5%                                | 17%                        | 13%                                           | 8%                                     | 5%                                    | 11%                    | 100%  |
| Broxtowe              | 5%                                       | 23%                      | 17%                               | 13%                               | 12%                        | 7%                                            | 6%                                     | 10%                                   | 7%                     | 100%  |
| Gedling               | 15%                                      | 20%                      | 9%                                | 13%                               | 8%                         | 8%                                            | 9%                                     | 11%                                   | 9%                     | 100%  |
| Mansfield             | 11%                                      | 20%                      | 8%                                | 6%                                | 14%                        | 15%                                           | 9%                                     | 8%                                    | 10%                    | 100%  |
| Newark and Sherwood   | 15%                                      | 11%                      | 9%                                | 12%                               | 8%                         | 13%                                           | 10%                                    | 8%                                    | 14%                    | 100%  |
| Rushcliffe            | 15%                                      | 36%                      | 19%                               | 11%                               | 5%                         | 5%                                            | 3%                                     | 4%                                    | 2%                     | 100%  |

Sources: Annual Population Survey (2020), National Center for O\*NET Development (2010). Conditional formatting reflects difference from England averages. Greenness Indicator calculated as proportion of Green Tasks in overall tasks based on O\*NET data and descriptors.

As Table 4.8 and Table 4.9 show, there is scope for targeting the provision for the development of skills attached to specific occupations and in specific locations – e.g. green skills development in Professional occupations (Group 2) in Rushcliffe and Derbyshire Dales, Admin and Secretarial occupations (Group 4) in North East Derbyshire, Sales and Customer Service occupations (Group 7) in Nottingham, Ashfield and Newark and Sherwood etc.

Table 4.9: Regional employment breakdown by occupation - Distribution of across the region

| Green-ness Indicator  | 51%                                      | 35%                      | 35%                               | 58%                                        | 21%                        | 39%                                           | 58%                                    | 22%                                   | 35%                    |
|-----------------------|------------------------------------------|--------------------------|-----------------------------------|--------------------------------------------|----------------------------|-----------------------------------------------|----------------------------------------|---------------------------------------|------------------------|
| Area                  | Managers, Directors and Senior Officials | Professional Occupations | Associate Prof & Tech Occupations | Administrative and Secretarial Occupations | Skilled Trades Occupations | Caring, Leisure and Other Service Occupations | Sales and Customer Service Occupations | Process, Plant and Machine Operatives | Elementary occupations |
| Derby                 | 10%                                      | 13%                      | 12%                               | 9%                                         | 11%                        | 10%                                           | 16%                                    | 10%                                   | 16%                    |
| Nottingham            | 10%                                      | 15%                      | 13%                               | 16%                                        | 13%                        | 17%                                           | 13%                                    | 11%                                   | 22%                    |
| Amber Valley          | 7%                                       | 8%                       | 7%                                | 4%                                         | 5%                         | 3%                                            | 7%                                     | 7%                                    | 6%                     |
| Bolsover              | 2%                                       | 2%                       | 4%                                | 0%                                         | 4%                         | 8%                                            | 2%                                     | 5%                                    | 0%                     |
| Chesterfield          | 5%                                       | 5%                       | 5%                                | 5%                                         | 3%                         | 6%                                            | 6%                                     | 4%                                    | 4%                     |
| Derbyshire            |                                          |                          |                                   |                                            |                            |                                               |                                        |                                       |                        |
| Dales                 | 5%                                       | 4%                       | 2%                                | 3%                                         | 4%                         | 1%                                            | 0%                                     | 2%                                    | 3%                     |
| Erewash               | 8%                                       | 4%                       | 7%                                | 6%                                         | 5%                         | 8%                                            | 6%                                     | 8%                                    | 4%                     |
| High Peak             | 3%                                       | 5%                       | 6%                                | 5%                                         | 4%                         | 4%                                            | 4%                                     | 3%                                    | 5%                     |
| North East Derbyshire | 6%                                       | 3%                       | 5%                                | 7%                                         | 7%                         | 2%                                            | 5%                                     | 4%                                    | 4%                     |
| South Derbyshire      | 5%                                       | 6%                       | 7%                                | 5%                                         | 4%                         | 4%                                            | 3%                                     | 8%                                    | 4%                     |
| Ashfield              | 4%                                       | 4%                       | 4%                                | 4%                                         | 12%                        | 5%                                            | 9%                                     | 8%                                    | 6%                     |
| Bassetlaw             | 5%                                       | 4%                       | 6%                                | 3%                                         | 7%                         | 7%                                            | 5%                                     | 3%                                    | 5%                     |
| Broxtowe              | 2%                                       | 6%                       | 6%                                | 8%                                         | 5%                         | 3%                                            | 4%                                     | 7%                                    | 3%                     |
| Gedling               | 7%                                       | 5%                       | 3%                                | 7%                                         | 3%                         | 4%                                            | 6%                                     | 7%                                    | 5%                     |
| Mansfield             | 5%                                       | 5%                       | 3%                                | 3%                                         | 6%                         | 7%                                            | 6%                                     | 5%                                    | 5%                     |
| Newark and Sherwood   | 8%                                       | 3%                       | 4%                                | 7%                                         | 4%                         | 7%                                            | 8%                                     | 5%                                    | 8%                     |
| Rushcliffe            | 7%                                       | 9%                       | 7%                                | 6%                                         | 2%                         | 3%                                            | 2%                                     | 3%                                    | 1%                     |
| Total                 | 100.0%                                   | 100.0%                   | 100.0%                            | 100.0%                                     | 100.0%                     | 100.0%                                        | 100.0%                                 | 100.0%                                | 100.0%                 |

Sources: Annual Population Survey, 2020; National Center for O\*NET Development, 2010. Greenness Indicator calculated as proportion of Green Tasks in overall tasks based on O\*NET data and descriptors.

In a recent study of the D2N2 LEP (Derby Derbyshire Nottingham Nottinghamshire Local Enterprise Partnership) region, it was found that different stakeholders are seeing awareness raising/education of employees on sustainable as very important, especially with younger employees, because higher level managers (especially large or medium firms) is are normally more aware and more committed in sustainable development measures than lower level managers and front line staff (He and Baranova, 2025).

This study found that transition to Net Zero needs better technological infrastructure as well legal infrastructure and technical staff to support. Hence, properly educated, trained and skilled workforce is very important (He and Baranova, 2025). Although there are increasing knowledge offerings from Higher Education and Universities on sustainability and green skills, but those are largely missing at from primary and secondary education providers, suggesting limited foundational education on sustainability skills (He and Baranova, 2025).

This study also found that transition to Net Zero needs effective collaboration which requires better educated/trained individuals with shared understanding, open-mindedness, better communication skills as well as carbon literate knowledge and skills (He and Baranova, 2025).

## Education

Arguably, by and large, greening skills education is or will be fed through the existing provision network of institutions and facilities. Table 4.10 shows a list of undergraduate and postgraduate courses with a specific focus on sustainability, available at the University of Derby, University of Nottingham and Nottingham Trent University for the upcoming academic year.

The table shows there are only four undergraduate courses available that have a specific focus on sustainability across all three institutions, whereas there are sixteen postgraduate courses available, either as taught degrees or research degrees.

This shows that there is a gap in the provision of sustainability-focused degrees in the region, especially at undergraduate level, but it is promising to see that two of the undergraduate courses and three of the postgraduate courses are focused on sustainable practices within business management.

However, it should be pointed out that the list of courses in Table 4.10 is not exhaustive, as there is the possibility that courses that do not explicitly state “sustainability” in the title may include modules that do focus on sustainable practices. A comprehensive review of all modules within all courses would be required to fully evaluate the provision of sustainability education provided by East Midlands universities, but this was unachievable for this report due to resource and timing constraints.

*Table 4.10: Sustainability focused degrees at three East Midlands universities*

| University                  | Undergraduate                                             | Postgraduate                                                                 |
|-----------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------|
| University of Derby         | Business Management and Sustainable Practice BA (Hons)    | Strategic Sustainability Management MSc (online)                             |
|                             | Environmental Science and Sustainability BSc (Hons)       | Sustainability and Environmental Management MSc (online)                     |
|                             | Nuclear Academy - Chartered Manager Degree Apprenticeship | Sustainable and Ethical Business Management MSc                              |
|                             |                                                           | Sustainable Architecture and Healthy Buildings MSc                           |
| University of Nottingham    |                                                           | Architecture and Sustainable Design MArch                                    |
|                             |                                                           | Electrical Engineering for Sustainable and Renewable Energy MSc              |
|                             |                                                           | Environmental Sciences PhD/MPhil/MRes                                        |
|                             |                                                           | Food Production Management MSc                                               |
|                             |                                                           | Global Environmental Sustainability MSc                                      |
|                             |                                                           | Sustainable Building Technology MSc                                          |
|                             |                                                           | Sustainable Energy and Entrepreneurship MSc                                  |
|                             |                                                           | Sustainable Energy Engineering MSc                                           |
|                             |                                                           | Sustainable Energy Technology PhD                                            |
|                             |                                                           | Sustainable Transportation and Electrical Power Systems (Erasmus Mundus) MSc |
|                             |                                                           | Sustainable Urban Design MArch                                               |
| Nottingham Trent University | Business Management and Sustainability                    | Management (Sustainable Leadership) MSc                                      |

Source: University of Derby, 2025; University of Nottingham, 2025 and Nottingham Trent University, 2025a, 2025b

A recently established Nuclear Skills Academy is the first of its kind and aims to sustain nuclear capability within the UK's submarines programme by creating a dedicated pipeline of talent at the start of their careers. Based in Derby at the iHub, the Nuclear Skills Academy is a partnership between the University of Derby and Rolls-Royce supported by industry and education experts, including the Nuclear Advanced Manufacturing Research Centre, the National College for Nuclear and Derby City Council. This ensures that new apprentices have access to the best courses and mentors throughout their apprenticeship.

The distribution of qualifications, subjects and training achievements and the relative standing of the EMCCA geographies must be considered in any strategy of intervention. Relative to the England averages, Table 4.11 highlights the particularities of EMCCA. Most LAs have lower proportions of residents qualified at NVQ level 4 and above. Conversely, the vast majority of LAs have higher proportions qualified at NVQ3. Within the EMCCA, a higher proportion of young people than the national average enrol on apprenticeships rather than sustained education – places such as Bassetlaw, Bolsover and Gedling have proportions of qualifications in apprenticeships that are two to three times higher than the national average.

Table 4.11: Qualifications of population aged 16-64 by NVQ level

|                          | No<br>quals. | Level 1    | Level 2    | Level 3    | Level 4+   | Trade<br>appr. | Other<br>quals. |
|--------------------------|--------------|------------|------------|------------|------------|----------------|-----------------|
| England                  | 7%           | 10%        | 16%        | 17%        | 40%        | 3%             | 7%              |
| <b>EMCCA</b>             | <b>7%</b>    | <b>11%</b> | <b>16%</b> | <b>21%</b> | <b>34%</b> | <b>4%</b>      | <b>7%</b>       |
| Derby                    | 9%           | 10%        | 16%        | 18%        | 33%        | 4%             | 9%              |
| Nottingham               | 10%          | 11%        | 12%        | 20%        | 36%        | 2%             | 9%              |
| Amber Valley             | 3%           | 13%        | 15%        | 29%        | 33%        | 3%             | 5%              |
| Bolsover                 | 9%           | 10%        | 22%        | 24%        | 19%        | 8%             | 8%              |
| Chesterfield             | 6%           | 11%        | 19%        | 26%        | 28%        | 6%             | 4%              |
| Derbyshire Dales         | 8%           | 12%        | 23%        | 12%        | 42%        | 3%             | 0%              |
| Erewash                  | 2%           | 14%        | 21%        | 21%        | 33%        | 3%             | 6%              |
| High Peak                | 7%           | 4%         | 11%        | 26%        | 45%        | 0%             | 5%              |
| North East<br>Derbyshire | 8%           | 13%        | 18%        | 21%        | 35%        | 0%             | 5%              |
| South Derbyshire         | 2%           | 10%        | 13%        | 26%        | 38%        | 5%             | 5%              |
| Ashfield                 | 10%          | 13%        | 22%        | 23%        | 21%        | 6%             | 5%              |
| Bassetlaw                | 10%          | 17%        | 20%        | 19%        | 16%        | 7%             | 10%             |
| Broxtowe                 | 6%           | 11%        | 13%        | 23%        | 42%        | 4%             | 0%              |
| Gedling                  | 6%           | 10%        | 18%        | 16%        | 36%        | 8%             | 6%              |
| Mansfield                | 8%           | 15%        | 18%        | 21%        | 22%        | 4%             | 12%             |
| Newark and<br>Sherwood   | 11%          | 11%        | 13%        | 22%        | 33%        | 0%             | 9%              |
| Rushcliffe               | 2%           | 5%         | 9%         | 14%        | 65%        | 2%             | 3%              |

Source: Annual Population Survey (2020). Conditional formatting reflects difference from England averages

In Table 4.12, EMCCA LAs have significantly higher proportions of achievement than England in Health, Public Services and Care (most LAs), Business, Administration and Law (all LAs), and Engineering and Manufacturing Technology (most LAs, especially Derby). Chesterfield and Derbyshire Dales stand out in Retail and Commercial Enterprise, while Mansfield, Rushcliffe and Broxtowe stand out in Arts, Media and Publishing.

*Table 4.12: Distribution of adult Further Education and Training achievements by sector subject area*

|                       | Prep. for Life & Work | Health, Public Services & Care | Bus., Admin. & Law | Retail & Comm. Enterp. | Eng. & Manuf. Tech. | Constr., Planning, the Built Env. | Info. and Comm. Tech. | Arts, Media, Publ. | Sci. & Maths | Langs., Lit. & Culture | Educ. & Training | Leisure, Travel, Tourism | Agr., Hort. & Animal Care | History, Philo. & Theology | Social Sciences |
|-----------------------|-----------------------|--------------------------------|--------------------|------------------------|---------------------|-----------------------------------|-----------------------|--------------------|--------------|------------------------|------------------|--------------------------|---------------------------|----------------------------|-----------------|
| England               | 47.6%                 | 16.2%                          | 7.3%               | 5.9%                   | 2.4%                | 2.8%                              | 4.1%                  | 2.7%               | 2.9%         | 2.7%                   | 2.2%             | 1.5%                     | 1.0%                      | 0.1%                       | 0.4%            |
| EMCCA                 | 46.3%                 | 15.1%                          | 9.7%               | 4.9%                   | 4.2%                | 2.4%                              | 3.4%                  | 3.2%               | 2.6%         | 2.3%                   | 1.9%             | 1.7%                     | 1.0%                      | 0.1%                       | 0.3%            |
| Derby                 | 49.9%                 | 11.1%                          | 9.7%               | 3.7%                   | 10.7%               | 1.4%                              | 3.4%                  | 0.8%               | 2.8%         | 2.6%                   | 1.3%             | 2.1%                     | 0.4%                      | 0.0%                       | 0.2%            |
| Nottingham            | 63.4%                 | 8.0%                           | 7.8%               | 3.1%                   | 1.4%                | 2.9%                              | 3.4%                  | 3.2%               | 2.4%         | 2.0%                   | 0.5%             | 1.1%                     | 0.3%                      | 0.2%                       | 0.3%            |
| Amber Valley          | 32.9%                 | 19.9%                          | 13.4%              | 6.6%                   | 4.9%                | 2.0%                              | 3.6%                  | 2.5%               | 2.5%         | 2.3%                   | 4.0%             | 3.1%                     | 2.0%                      | 0.0%                       | 0.3%            |
| Bolsover              | 39.3%                 | 20.7%                          | 11.8%              | 7.4%                   | 2.2%                | 2.4%                              | 2.2%                  | 4.7%               | 2.9%         | 1.6%                   | 2.0%             | 1.5%                     | 1.0%                      | 0.1%                       | 0.3%            |
| Chesterfield          | 36.3%                 | 18.7%                          | 12.7%              | 11.6%                  | 3.2%                | 3.9%                              | 2.3%                  | 0.9%               | 2.8%         | 2.6%                   | 3.2%             | 0.7%                     | 0.4%                      | 0.1%                       | 0.3%            |
| Derbyshire Dales      | 28.1%                 | 23.5%                          | 13.8%              | 11.3%                  | 4.3%                | 2.3%                              | 1.8%                  | 2.2%               | 2.2%         | 3.2%                   | 3.3%             | 1.7%                     | 1.7%                      | 0.2%                       | 0.5%            |
| Erewash               | 38.1%                 | 21.2%                          | 11.2%              | 5.0%                   | 5.8%                | 1.8%                              | 4.3%                  | 1.3%               | 2.4%         | 2.2%                   | 3.0%             | 1.6%                     | 1.5%                      | 0.1%                       | 0.4%            |
| High Peak             | 27.4%                 | 29.3%                          | 7.5%               | 6.4%                   | 2.3%                | 3.0%                              | 2.7%                  | 1.3%               | 3.4%         | 2.0%                   | 6.4%             | 7.1%                     | 0.5%                      | 0.2%                       | 0.1%            |
| North East Derbyshire | 32.8%                 | 22.2%                          | 14.3%              | 7.7%                   | 4.3%                | 2.6%                              | 3.2%                  | 1.7%               | 2.8%         | 2.1%                   | 3.4%             | 1.7%                     | 0.6%                      | 0.2%                       | 0.2%            |
| Derbyshire South      | 25.5%                 | 29.4%                          | 11.9%              | 5.5%                   | 5.6%                | 1.9%                              | 3.7%                  | 1.5%               | 4.2%         | 2.7%                   | 3.2%             | 3.4%                     | 1.0%                      | 0.1%                       | 0.4%            |
| Ashfield              | 39.4%                 | 17.7%                          | 9.7%               | 4.6%                   | 4.9%                | 2.7%                              | 3.4%                  | 4.0%               | 2.5%         | 2.1%                   | 2.6%             | 2.5%                     | 3.5%                      | 0.4%                       | 0.1%            |
| Bassetlaw             | 42.1%                 | 21.1%                          | 10.6%              | 5.3%                   | 3.3%                | 2.9%                              | 4.7%                  | 0.9%               | 2.4%         | 1.6%                   | 2.0%             | 0.7%                     | 1.6%                      | 0.1%                       | 0.3%            |
| Broxtowe              | 41.7%                 | 18.0%                          | 10.7%              | 4.8%                   | 4.1%                | 2.6%                              | 2.2%                  | 6.4%               | 2.0%         | 2.3%                   | 1.9%             | 1.7%                     | 1.3%                      | 0.3%                       | 0.1%            |
| Gedling               | 46.3%                 | 16.3%                          | 9.5%               | 4.3%                   | 2.2%                | 2.7%                              | 3.9%                  | 4.6%               | 3.1%         | 2.6%                   | 1.5%             | 1.2%                     | 1.0%                      | 0.3%                       | 0.3%            |
| Mansfield             | 44.0%                 | 15.7%                          | 7.5%               | 5.5%                   | 2.5%                | 1.9%                              | 3.2%                  | 9.7%               | 2.4%         | 2.3%                   | 2.3%             | 1.5%                     | 1.4%                      | 0.1%                       | 0.2%            |
| Newark and Sherwood   | 42.0%                 | 18.8%                          | 11.0%              | 4.8%                   | 4.1%                | 1.4%                              | 4.1%                  | 4.0%               | 1.9%         | 2.9%                   | 2.3%             | 1.2%                     | 1.2%                      | 0.1%                       | 0.2%            |
| Rushcliffe            | 39.5%                 | 16.0%                          | 8.3%               | 5.8%                   | 3.8%                | 2.5%                              | 4.2%                  | 5.9%               | 2.7%         | 2.8%                   | 2.3%             | 2.1%                     | 3.6%                      | 0.3%                       | 0.3%            |

Source: Department for Education (2020). Conditional formatting reflects difference from England averages

In terms of apprenticeships, Table 4.13 shows that EMCCA LAs have significantly higher proportions of achievement than England in Business, Administration and Law (most LAs), and Engineering and Manufacturing Technology (most LAs, especially South Derbyshire). The LAs of Nottingham, Derbyshire Dales and Rushcliffe stand out in Retail and Commercial Enterprise. While most LAs have lower proportions of apprenticeship achievement in Health, Public Services and Care than England as a whole, Nottingham, Derby, and Bassetlaw have larger proportions (associated with the location of major NHS teaching hospitals).

Table 4.13: Distribution of apprenticeships achievements by sector subject area

|                          | Bus.,<br>Admin. &<br>Law | Health,<br>Public<br>Services &<br>Care | Eng. &<br>Manuf.<br>Tech. | Retail &<br>Comm.<br>Enterp. | Constr.,<br>Planning,<br>the Built<br>Env. | Info. and<br>Comm.<br>Tech. | Educ. &<br>Training | Leisure,<br>Travel,<br>Tourism | Agr., Hort.<br>& Animal<br>Care | Arts,<br>Media,<br>Publ. | Sci. &<br>Maths |
|--------------------------|--------------------------|-----------------------------------------|---------------------------|------------------------------|--------------------------------------------|-----------------------------|---------------------|--------------------------------|---------------------------------|--------------------------|-----------------|
| England                  | 29%                      | 23%                                     | 18%                       | 11%                          | 6%                                         | 6%                          | 3%                  | 2%                             | 2%                              | 0.3%                     | 0.0%            |
| EMCCA                    | 30%                      | 22%                                     | 20%                       | 11%                          | 6%                                         | 4%                          | 3%                  | 2%                             | 2%                              | 0.2%                     | 0.0%            |
| Derby                    | 29%                      | 26%                                     | 20%                       | 10%                          | 5%                                         | 3%                          | 4%                  | 2%                             | 1%                              | 0.0%                     | 0.0%            |
| Nottingham               | 28%                      | 28%                                     | 12%                       | 14%                          | 6%                                         | 5%                          | 3%                  | 3%                             | 1%                              | 0.3%                     | 0.0%            |
| Amber Valley             | 31%                      | 19%                                     | 23%                       | 10%                          | 8%                                         | 3%                          | 2%                  | 1%                             | 2%                              | 0.2%                     | 0.0%            |
| Bolsover                 | 32%                      | 22%                                     | 20%                       | 11%                          | 5%                                         | 3%                          | 3%                  | 4%                             | 1%                              | 0.0%                     | 0.0%            |
| Chesterfield             | 31%                      | 22%                                     | 24%                       | 9%                           | 5%                                         | 6%                          | 2%                  | 1%                             | 1%                              | 0.0%                     | 0.0%            |
| Derbyshire Dales         | 27%                      | 10%                                     | 23%                       | 14%                          | 11%                                        | 3%                          | 3%                  | 3%                             | 5%                              | 0.0%                     | 1.1%            |
| Erewash                  | 31%                      | 22%                                     | 23%                       | 8%                           | 6%                                         | 6%                          | 2%                  | 1%                             | 1%                              | 0.0%                     | 0.0%            |
| High Peak                | 28%                      | 17%                                     | 21%                       | 12%                          | 11%                                        | 5%                          | 0%                  | 4%                             | 2%                              | 0.4%                     | 0.0%            |
| North East<br>Derbyshire | 31%                      | 16%                                     | 23%                       | 11%                          | 8%                                         | 5%                          | 3%                  | 2%                             | 1%                              | 0.0%                     | 0.0%            |
| South Derbyshire         | 32%                      | 20%                                     | 27%                       | 8%                           | 3%                                         | 3%                          | 1%                  | 2%                             | 3%                              | 0.2%                     | 0.0%            |
| Ashfield                 | 35%                      | 22%                                     | 23%                       | 8%                           | 3%                                         | 3%                          | 3%                  | 1%                             | 1%                              | 0.4%                     | 0.0%            |
| Bassetlaw                | 25%                      | 26%                                     | 20%                       | 11%                          | 7%                                         | 3%                          | 4%                  | 1%                             | 3%                              | 0.0%                     | 0.0%            |
| Broxtowe                 | 31%                      | 20%                                     | 19%                       | 12%                          | 6%                                         | 6%                          | 3%                  | 2%                             | 1%                              | 0.0%                     | 0.0%            |
| Gedling                  | 32%                      | 21%                                     | 13%                       | 11%                          | 10%                                        | 5%                          | 3%                  | 4%                             | 1%                              | 0.3%                     | 0.0%            |
| Mansfield                | 33%                      | 22%                                     | 23%                       | 11%                          | 4%                                         | 3%                          | 2%                  | 1%                             | 1%                              | 0.3%                     | 0.0%            |
| Newark and<br>Sherwood   | 34%                      | 21%                                     | 16%                       | 13%                          | 4%                                         | 3%                          | 3%                  | 3%                             | 3%                              | 0.3%                     | 0.0%            |
| Rushcliffe               | 33%                      | 20%                                     | 14%                       | 13%                          | 6%                                         | 4%                          | 2%                  | 6%                             | 2%                              | 0.4%                     | 0.0%            |

Source: Department for Education (2020). Conditional formatting reflects difference from England averages

## Discussion from stakeholder workshop

The sector relevant skills workshop was held on 29<sup>th</sup> April 2025 with key stakeholders from industry bodies, local authorities, local businesses and other educational institutions. The findings presented above in the gap analysis were reviewed, validated, and revised. This process aimed to accurately identify both current and future skills requirements within green skills, leadership and management in the EMCCA region. The workshop discussion focused on four key questions, the answers of which are displayed below.

### What are the skills, knowledge, capabilities and leadership requirements to address sustainability, innovation and growth?

This area garnered a lot of attention and input from the attendees. Participants questioned whether there might be a need to move away from the terminology green skills and call them "skills for sustainability"?

The workshop identified several key requirements as follows:

- The need to address a lack of technical skills and capabilities that enable green transition and development of green industries was highlighted. Even where the skills are present there is a technical knowledge/information gap between managers, technicians, engineers and practitioners.

- There is need for digital skills (i.e. skills supporting technical), skills for innovation and continuous improvement (not just entrepreneurial, but on the job – in the vein of kaizen) at firm level.
- There is a lack of skills, knowledge and capabilities to support greening activities of SMEs – e.g. understanding technical issues in energy transition, understanding carbon footprint of SME activity, etc.
- A need for planning skills and planner capacity for the future.
- Development of green skills for 'inactive' communities (those unemployed and not in education). The Green skills offer should include these communities due to high potential to tackle socio-economic issues and unemployment.
- Understanding where the areas of economic deprivation in the city and region are to stimulate green job creation and green skills development.

To address the shortage in these skills, there needs to be education from schools and training in businesses (perhaps including sustainability/green skills into mandatory training). Carbon literacy was identified as a foundational knowledge requirement. Awareness raising on green skills for public and businesses should be increased and misalignment between college funding and green skills provision needs to be tackled at local and national levels.

Focusing particularly on leadership and management, it was felt that there is a requirement to place much more emphasis on strategic frameworks. Different strategic approaches are needed for GREEN / INNOVATION / GROWTH initiatives, and once again clarity of terminology is needed.

We need management systems that integrate green issues from the start, at a strategic level, and to do so requires leadership capabilities for driving sustainability transformation. Board level green competences need to be looked at separately to develop sustainable and responsible businesses. Also, business support provision needs to integrate green growth, and green skills development offers.

Participants identified several barriers to achieving the above including:

- Carbon/sustainability certifications are very complex / contradicting - lack of clear understanding and communication around carbon issues
- Skills gaps in both broad/general capabilities and specialized technical skills
- Leadership awareness deficiencies
- Cost implications of green business initiatives
- Cost of training
- Government not serving as exemplars in sustainability practices

- Insufficient training frameworks
- Broad policy demands lacking specificity
- Lack of demand from suppliers in small businesses

College provision (levels 1-3) on green skills needs to be included in the analysis. This must include an overview of the FE colleges provision across the EMCCA region.

**Identify the skills base already in the EMCCA region, which is relevant to green skills, leadership and management**

It was felt that getting a feel for existing skills (i.e. deployed in businesses) is difficult. However, the following was discussed at a sectoral level:

- Construction, manufacturing and engineering are more advanced in green skills development due to sector policy and regulations.
- Education, retail, hospitality are lagging.
- Farming, landowners and land managers are often missing from the conversations on green skills and net zero.
- Transportation and infrastructure (HS2, Zero Emission initiatives), standardisation efforts of skills required are underway
- Finance networks developing to support transition.
- SMEs showing cultural adaptability - smaller organizations demonstrating nimbleness
- Skills gap and awareness issues need to be better identified
- Career mobility requiring future-focused skills development
- Funding to stimulate the demand for green skills development from businesses and public organisations.

It was expressed that support must be given to organisations such as the Institute of Technology that coordinate series of providers and work to standardise and lead curriculum development in construction, engineering, advanced manufacturing and leadership.

There is a need to tap into funding sources to provide incentives (subsidies) that encourage greening activities (e.g. retro-fitting) and governance improvement. "Quality" leadership should include sustainability.

A specific mention was made of developing waste heating recovery systems as a part of the greening activities.

At a regional level it was felt that innovative ideas are emerging on how to improve training for green skills, but several areas require further development such as:

- Employability skills with identified practice gaps in green skills
- Learning programs and e-skills development
- Training needs assessment would be required to improve

As with the above the high costs of certification was noted as a barrier.

### **What are the green skills, and leadership and management skills required in the future to meet the ambitions of the EMIZ programme?**

It was felt that in general companies have difficulty dealing with and identifying high-level, industry specific training which is not already available regionally or nationally. Areas mentioned for further development include:

- Comprehensive management skills for sustainability integration
- Human roles in AI-augmented environments
- Middle management control capabilities which are transferable skills
- "Green champions" to drive organizational change
- Skill development across spectrum from basic foundational skills (such as carbon literacy) to specialized expertise such as data analytics
- Learning pathways that demonstrate practical application ("show me, don't just tell me")

In terms of how to develop new learning approaches, it was considered key to:

- Shift from "tell me" to "show me" in skills development
- Create a balance between broad awareness and specialized expertise
- Provide recognition of different learning preferences

It was felt also that green skills and leadership skills need to be included in education early on and career guidance needs to be informed by specifics of the region. Teachers/schools need to be aware of businesses in the region and understand what careers are available, relevant for the future. So, teachers/schools need be upskilled and supported to engage with businesses. This creates real issues with capacity as councils are already struggling to find school staff for career and business engagement even with additional funding. Further means of addressing the gaps could include:

- Encouraging curiosity from the businesses and public to learn about green industries of the future and green industrial transition. Opening conversations with businesses about future green growth options.
- Businesses need to have time and space to think beyond day-to-day operational pressures and to start strategizing for green growth where green competences are necessary part of the green industrial transition.

- Sector and firm size are important parameters in designing the green skills offer and providing support for green skills development
- Young Trend blazer programme for DWT (currently in design). – collaborative project to support young talents. Green skills development could be one of the specific areas for development as part of the programme.
- Partnership working in developing green skills development offer for:
  - Strategic sector for green industrial transition – nuclear, hydrogen, etc
  - Generic business support that targets green growth and green entrepreneurship

### **What are the potential shortfalls in green skills, leadership and management skills areas?**

There is an acute need for regional strategy and planning support to lead, direct and coordinate business activities and encourage collaboration. There needs to be a leadership mindset change from seeing training and upskilling as a cost to seeing it as an investment. E.g. success in attracting inward investment into the zone means previous, existing businesses will face a worsening shortage of skilled labour. Newcomers will Hoover up and poach available skills and existing businesses will struggle to retain their staff. This is also seen as a barrier to training and developing their staff, only to see them leave for other companies.

Technical skills once again came to the fore, particularly level 5. High skill technicians are required to both implement and support decarbonisation.

Companies need to be supported with information and retraining where affected by the shift to green economy (e.g. ICE parts suppliers losing business from shift to EVs). This is particularly relevant as lots of older workers are employed in high carbon emitting industries. There is a shortage of reskilling provision, bite-sized learning. Attendees are looking forward to the Lifelong Learning Entitlement (LLE) from the government from 2026.

There needs to be programmes that raise awareness, knowledge and understanding about green skills and their potential for sustainable regional development. The language and terminology used needs to be simplified for businesses and public to increase uptake of the green skills training programmes. EMMCA could also consider development of Green Awards for regional businesses to showcase the work of regional businesses, recognising green champions and celebrating their successes.

However, it was felt that there are some Key Issues to address:

- 30% of Gen Z/Gen Alpha NOT INTERESTED in basic green skills
- Limited foundational provision for "green skills" (particularly carbon literacy)
- Need for STANDARDIZED management systems which integrate green issues
- Supply chain challenges (SMEs): requiring additional support to get up to speed with supply chain requirements, but this is a good driver for SMEs
- BAME representation issues requiring focus

Business networks, universities and the Chambers of Commerce, etc., could play a key role in creating and building awareness about accreditation requirements. Stakeholders could also look more at the role of AI in bridging the skills gaps. Examples of successful application (e.g., NTU event: AI in lifecycle assessment). Attendees mentioned here that humans would be required as gatekeepers to the further use of AI. They argued that quality assurance and critical thinking are still needed alongside AI. Yet, it could help close the gap around carbon literacy fundamentals. Other regional considerations on Net Zero Transition:

- 2050 target facilitation requires socio-economic approach
- East Midlands has significant opportunities in energy sector (needs highlighting)

Implementation of standardized management systems must integrate green issues.

## Part 5: Recommendations from the stakeholder workshops

Following the stakeholder workshops of all six Work Packages, recommendations have been made as how to address the skills gaps within the EMCCA region. The list of recommendations are split between the relevant sectors, whilst where some recommendations from multiple sectors are aligned, these are shown together.

### Nuclear

The recommendations proposed below are based on the analysis of data received from the desk-based research, stakeholder workshop and schools and colleges engagement.

#### **1. Supporting Young People to understand the exciting career opportunities available in Nuclear by engaging with schools and colleges operating in the EMCCA region**

If we are to increase young people's interest in careers in the nuclear industry and its career opportunities, we need to address misconceptions and safety concerns and inspire students through a range of activities, both through careers education and outreach work by the industry itself.

Explore a range of interventions such as interactive workshops and visits, more projects about nuclear power within STEM groups, frame nuclear careers as part of the **climate solution**, emphasizing low-carbon energy and sustainability and link this with the global challenge for energy security and decarbonisation.

Young people would benefit from clarifying career pathways, providing clear information about qualifications, apprenticeships and university routes and showing the diverse roles within the industry, with more placement opportunities.

Consideration of further work with some focus groups from survey to explore how best to engage young people in the debate.

Increase the number of local candidates involved in 'young apprenticeship schemes' or bootcamps to provide young people with a better understanding of the nuclear sector, and even complete some knowledge, skills and behaviours that could be mapped to an apprenticeship standard. Rolls-Royce run a very successful 'young apprenticeship scheme' that is oversubscribed with applicants every year.

## **2. Invest in existing workforce – developing short modular learning to accelerate skills capability**

According to the Nuclear Skills Delivery Group (NSDG), 35% of the workforce are 50 years and over. There seems to be a general saying now in engineering and advanced manufacturing “*where are the 30- and 40-year-olds*”. We need to develop a mentoring approach for the 50 years plus, to pass on knowledge and expertise to the sparse 30- and 40-year-olds but also spend time nurturing the future talent that will join the sector. The skills challenges may not surface in the short-term (circa 5 years), but the medium-term onwards will see challenges in the sector.

We also need to build on a sense of community and offering more opportunities for career growth and development within the sector by creating mechanisms to motivate, excite and retain talent for the long-term.

Developing technical skills support around data analytics, data visualisation, understanding the basics of coding, robotics and automation, AI adoption and machine learning, Non-destructive Examination (NDE), pipe welding, electron beam welding, hot isostatic processing (HIP) are areas that would be recommended.

For non-technical skills support, developing courses in leadership development, strategic thinking, harnessing innovation, emotional intelligence, coaching and mentoring for knowledge transfer, commercial awareness, bid writing, health and safety regulations for nuclear compliance, exporting, sustainability and decarbonising.

Whilst accrediting forms of training are important i.e., gaining a recognised qualification, the embedded learning was the key impact from any skills-based intervention.

## **3. Nuclear Specific Conversion Courses**

The sector needs to develop a strong and competitive supply chain and developing a nuclear specific conversion course to support employers who wish to transition into nuclear is key. According to the International Atomic Energy Authority (IAEA) - “*Nuclear operators depend on chains of suppliers of both products and services to be able to produce nuclear energy. These suppliers provide products and services in all phases of a reactor’s life cycle: design, construction, commissioning, operation and decommissioning*”.

The Fit for Nuclear government funded scheme was formed in 2017 to support the nuclear supply chain and provide them with a seal of approval to convert or transition.

Targeting employers who were Small to Medium Enterprises (SME's) with 10 plus employees and circa £1.6m plus turnover. Example of the programme is presented in Table 5.1.

Table 5.1: The Fit for Nuclear Programme overview

| Area                             | Support                                                                                                                                                                                                                                            |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UK Nuclear Industry Knowledge    | Learn about the UK nuclear industry. Gain the knowledge you need to be entirely up to speed with the sector you are looking to join. We have provided links to industry bodies, places to upskill and where to find career advice                  |
| How does a nuclear reactor work? | Learn the basics of the technology. You certainly don't need a PhD to understand that a nuclear power plant is basically a large kettle. We provide explainer videos and links to further information if you want to delve deeper into the details |
| Is Nuclear Energy Clean?         | Nuclear energy is often depicted as hazardous, dirty and unsafe. This could not be further from the truth. Find out how nuclear power has the lowest lifecycle carbon footprint of any electricity source and requires a small amount of land      |
| Future of Nuclear Power          | New reactor designs mean nuclear can do more to cut carbon and fight climate change. New small reactors, large reactors, advanced reactors, and fusion technology are all on the way. It is an exciting time for the nuclear industry              |
| The Uses of Nuclear Energy       | From an energy production perspective, nuclear energy is pretty good at what it does. It uses the least land, produces the lowest carbon, and creates the most power. Find out how else we can use Nuclear Energy                                  |
| Types of Nuclear Jobs            | The nuclear industry is not only for people wearing lab coats and holding test tubes. There is a vast                                                                                                                                              |

|  |                                                                             |
|--|-----------------------------------------------------------------------------|
|  | number of roles available, requiring a wide range of skills and experience. |
|--|-----------------------------------------------------------------------------|

Source: Department for Business and Trade (2017)

#### 4. Deepen the Nuclear workforce pool in the EMCCA region

Increasing employment opportunities through upskilling programmes to attract and develop mid-career entrants, double the number of new entrants through apprenticeships and graduate schemes in the short-term, plus increase the number of subject matter experts, and provide experienced instructor resources to Further Education. This theme also encompasses supporting nuclear bursary and sponsorship schemes to increase STEM careers and social mobility opportunities.

Another recent suggestion in the Midlands Nuclear Skills Hub was to create an Apprenticeship Training Agency (ATA) model that recruits apprentices, and they complete 'On-the-Job' activity across a variety of different employers in the nuclear sector, to provide a richer experience to gain the knowledge, skills and behaviours required to complete the relevant apprenticeship standard. Could this be a model that EMCCA support introducing?

The introduction of specific bootcamps for green energy would be a strong proposal. They could last for circa 10 weeks and provide candidates with a thorough understanding of the sector, plus gain an interview with an employer on-completion.

#### 5. Collaborate across the sector and EMCCA region

Creating forums for employers of all shapes and sizes consistently is a good model to explore. The East Midlands Chamber has an East Midlands Manufacturing Network that is a good example of a forum that attracts manufacturers to attend. The 'rules of engagement' is that you're invited to the Network if you can 'add value' and ensure each forum is focussed on progression.

Midlands Nuclear Skills Hub is another example of a membership group that is shaping the future skills needs of the nuclear sector.

Creating a digital portal is another example to share vacancies and link candidates up with employers.

#### 6. Introduce a Mathematics Development Hub

The Adult Skills Fund (ASF) delivers numeracy courses in devolved regions like EMCCA. How can the ASF be developed to create numeracy courses geared for nuclear specific problem solving? Mathematics support is required for levels 1-3 to accommodate advancement onto apprenticeships and degree programmes.

Introducing a Mathematics Development Hub for those young people interested in green energy and advanced manufacturing is key to the success of the region.

## Zero Emission Propulsion

Based on conclusions drawn from the gap analysis of the zero emission propulsion sector, and the main themes discussed during the workshop, the following recommendations have been made for this sector:

### Revenue Investment

- **EMCCA to identify and manage regional priorities and incentives for transport propulsion skills provision which considers the ambition and desired positioning of regional strategies and needs in relation to national strategies** – The intensity of skills demand and scale of skills gaps will require initial regional focus on a selection of gaps rather than tackling all at once. EMCCA need to clarify regional priorities and where this fits and aligns with national strategies to provide this clarity of focus for initial investment and incentivise integrated delivery of courses across providers to efficiently fill these gaps. Such considerations are expected to consider alignment with the regional policy for energy production, associated transport use cases and regional supply chain needs and the core underpinning capabilities across sectors and propulsion types such as a strengthening of power electronics and electric propulsion underpin all. The resulting plan should include periodic review to ensure anticipation and flexibility to adapt to changing priorities. It should also ensure integration and alignment of skills provision across suppliers to provide clarity of pathway and provision overseen by regional governance and co-ordination with the transport sector to ensure value and demand alignment. Although the EMCCA propulsion cluster is well established, current skills supply is segregated, insufficient and there are established centres in adjacent regions focussed on meeting some skills demands, particularly in automotive, rail and underpinning battery technologies. It is recommended that the region complements the national centres by enhancing core engineering courses, selecting priorities from the skills gaps identified in part 4.

- **Develop Skills Pathways Mapped to Careers and Raise Awareness of Career Progression and Opportunity** - Incentivise and support the education sector to develop and deliver collaborative education pathways through the levels focussed on propulsion life-cycle roles (maintenance, operations, systems: hydrogen, electric & fuel cell, licencing and regulation etc). Bring the transport sector together to map out the career pathways and education requirements and to ensure a steady pipeline of learners and development of careers to incentivise regional retention of capability. Ensure learners in SMEs are able to gain experience within system integrator and operation environments to build capability and ensure the revenue supports industry to provide these placements.
- **Ensure Curriculum Readiness** - Review coverage of the specific skills needs identified and fund development of modules through the levels to address gaps. Delivery should relate to the regional priorities and ensure collaboration between regional skills providers.
- **Co-ordinate the contribution of propulsion-related research and development activities among the centres at regional and national levels into research-informed teaching.** - The research centres in EMCAA that focus on cutting-edge low carbon technologies should coordinate their activities together with a unified and well-defined strategy towards a Net-Zero vision. At a broader scale, this coordination should be expanded to the other research centres across the UK. Such coordination shall include contribution of the research centres to the delivery of lectures, case studies and course modules related to new propulsion technologies, delivered through the EMCCA skills providers. To ensure teaching skills are current, mobility between skills providers and research centres should be facilitated.

## Capital Investment

- **Capital and maintenance support for Technical Demonstrators for practical training and system development** - Provide funding, supported by the transport sector, for demonstrators to enable supply chain clusters to both develop and demonstrate technologies and provide the practical training and development opportunities to underpin 'classroom' theory. Depending on business case, linked to skills pathways, this could include:
  - Aerospace demonstrators (via Rolls Royce)
  - Rail demonstrator (for example via the shunting locomotive sprint project with Clayton Equipment)

- Road demonstrator (lorries and cars) via Toyota and neighbouring Horiba Mira.
- **Visual Software and Hardware in the Loop Simulation Tools for Training** – These can be used for understanding systems interfaces and exploring safety-critical processes including appropriate response to faults in a safe environment. The virtual tools can provide classroom based skills development before learners encounter practical environments. They can be located within centres providing applied learning.
- **Growth in Digitalisation and Automation:** to scale up the production line, the propulsion industry requires reinforcement of its automation and digitalisation infrastructure. This boosts up the manufacturing and production of components in the aerospace, automotive and railway industries.

## Renewable Energy

The Renewable Energy Skills Workshop convened stakeholders from industry, FE/HE, local authorities and community energy groups. Table 5.2 below shows the workshop exercises that the participants worked through (column 1), the common themes across the tables at the workshop and typical comments from participants. The fourth column in Table 5.2 shows the recommendations from the participants as to what it meant for EMIZ skills planning.

*Table 5.2: Workshop findings and their meaning for the EMIZ*

| Workshop exercise                                       | Most frequent themes across the tables                                                                                                                                                                                                                                                          | Typical comments & examples                                                                                                                                                                                          | What this means for EMIZ skills planning                                                                                                                                             |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Future skills needed for renewable energy growth</b> | <p>Specialist technical roles (battery manufacture &amp; recycling), hydrogen storage engineers, retrofit specialists, PV/solar cell production technicians, system (integration &amp; network-management technicians).</p> <p>Digital &amp; soft skills – data-driven diagnostics, ability</p> | <p>“Battery manufacturing &amp; end-of-life recycling” – Table 4.</p> <p>“Hydrogen material specialists, retrofit specialists” – Table 5.</p> <p>“Technicians (integration, services, network mgmt.)” – Table 3.</p> | <p>EMIZ must embed battery/ hydrogen/ retrofit pathways in FE &amp; HE curricula and wrap soft-skills modules into technical courses so graduates can support customer adoption.</p> |

|                                                      |                                                                                                                                                                         |                                                                                                                                                                           |                                                                                                                                       |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
|                                                      | to explain complex tech to customers.                                                                                                                                   |                                                                                                                                                                           |                                                                                                                                       |
| <b>"One thing" to make EMCCA a UK leader</b>         | Apprenticeship & CPD expansion and centre-of-excellence concepts (National Solar-cell & Battery Centre; regional recycling hub).                                        | "Apprenticeship" & Midland's battery-recycling advantage – Table 5.<br>"National production solar-cell/battery centre" – Table 4.                                         | Prioritise a flagship regional facility plus an apprenticeship levy-match scheme to brand the region and funnel talent quickly.       |
| <b>Where to direct capital &amp; revenue funding</b> | Upgrade college workshops & flexible CPD labs. University-industry hubs for prototype manufacture. Green-SME finance (placements, reverse placements, equipment funds). | "Capital fund FE for maintenance/upgrading equipment... flexible evening/weekend provision" – Table 1.<br>"More university hubs with manufacturing facilities" – Table 4. | Split EMIZ skills budget 3-way: (i) college kit; (ii) university pilot-lines; (iii) SME training vouchers/placements.                 |
| <b>Barriers highlighted</b>                          | Funding complexity & fragmentation; shortage of trainers; lack of coordinated regional vision; competition vs collaboration between local actors.                       | "Funding management expertise/mis-management of funding" – Table 4.<br>"Need regional strategy before mapping skills plan" – Table 2.                                     | EMIZ should create a single regional skills coordination office to streamline grants and broker partnerships, minimising duplication. |
| <b>Cross cutting enablers</b>                        | Early-years/STEM outreach; bring industry experts into classrooms; marketing to make roles attractive; continuous skills mapping.                                       | "Engage employees in teaching, start in schools" – Table 3 & Table 2.<br>"Marketing plan to make roles attractive" – Table 2.                                             | Build a schools-to-skills pipeline and a regional green-careers campaign, refreshed annually using live skills-map data.              |

## Green construction and Advanced Manufacturing

Stakeholder workshops for these two sectors were convened on the 1<sup>st</sup> and 2<sup>nd</sup> April 2025, which brought together key stakeholders, including prominent industry representatives and leading educational experts. During the sessions, the findings of the Work Packages'

interim reports, which provided insights into both current and emerging skills gaps, drew upon findings from the Sprint B Innovation and Skills Roadmaps, and included a comprehensive analysis of international, national, and regional policies and strategies, was reviewed, validated, and refined.

This process aimed to ensure the accurate identification of both current and future skills requirements, along with the development of targeted recommendations for the EMCCA region. These recommendations are intended to stimulate interest among younger individuals in pursuing careers in construction, support the existing workforce in upskilling to meet regulatory compliance, and enable the sector to progress towards net zero targets. Furthermore, the process sought to embed climate literacy across all areas of construction and to encourage stronger collaboration between education and training providers and industry, with particular emphasis on the SME sector.

The completion of the research and consultation activities has resulted in a series of recommended key interventions aimed at addressing the identified gaps. These recommendations are categorised into those requiring revenue investment and those necessitating capital investment. The authors have categorised the recommendations into revenue – which are referring to as the 'East Midlands Skills Injection Fund (EMSIF) and capital – the East Midlands Capital Injection Fund (EMCIF).

## Revenue Investment

The East Midlands Skills Injection Fund (EMSIF) is proposed to support three key priority areas aligned with regional and national skills strategies: **Curriculum Readiness, Skills Development, and Raising Awareness.**

### 1. Curriculum Readiness

To ensure the post-16 skills system is equipped to deliver high quality, future-facing provision, this strand of the fund would support:

- **Upskilling of existing teaching staff** in FE and HE to enable delivery of priority skills, with a focus on those aligned to green construction, retrofit needs and to emerging sustainable advanced manufacturing needs.
- **Industry and Provider Exchange funding** to facilitate the temporary recruitment of qualified industry professionals into teaching roles, and to enable current educators to re-engage with industry, ensuring up-to-date technical knowledge and pedagogical relevance.
- **Integration of climate literacy** across all levels and types of provision, including technical, vocational, and academic pathways. This may be achieved through

enrichment activities, guest lectures, smaller complementary qualifications, and other relevant interventions to embed low-carbon principles within curricula.

## 2. Skills Development

To address identified green construction and sustainable advanced manufacturing skills gaps and support labour market progression, EMSIF would also fund:

- **Short courses and modular provision**, primarily at Levels 3 to 5, maximum of 120 hours per intervention, tailored to meet employer needs. Where alternative public funding is unavailable, provision at Level 2 may also be considered.
- **Funding allocations should be determined based on guided learning hours, qualification level, and minimum cohort sizes** to ensure cost-effectiveness and alignment with identified workforce demand.
- To maximise value for public investment and strengthen employer engagement, **co-investment from industry partners should be encouraged** as standard practice. Where direct financial contributions are not feasible, providers must demonstrate a clear commitment from employers to offer meaningful in-kind support. This may include, but is not limited to:
  - Contribution to curriculum delivery (e.g. guest lecturing, co-teaching, mentoring)
  - Provision of high-quality work placements or site-based learning experiences
  - Facilitation of apprenticeship opportunities
  - Participation in careers events, sector insight sessions, or professional development activities for staff
  - This approach will help ensure the sustainability of provision, enhance the relevance of learning, and strengthen the link between technical education and local labour market needs.
- **Complementarity with existing provision**, supporting progression to programmes already funded by government, including Skills Bootcamps, Apprenticeships, and Higher Technical Qualifications.
- **Alignment with existing strategic frameworks**, enhancing outcomes under the Adult Skills Fund, Local Skills Improvement Plans (LSIPs), the Inclusive Growth Strategy, and the National Industrial Strategy.

## 3. Raising Awareness

This strand of the EMSIF aims to raise awareness of low-carbon construction methods and sustainable advanced manufacturing. It aims to promote careers in these sectors through coordinated outreach and engagement activities. Key priorities include:

- **Promoting awareness and adoption of low-carbon construction techniques** across the construction and manufacturing sectors, supporting the transition to greener practices in line with national net zero ambitions.
- **Disseminating the EMSIF offer** to ensure employers, providers, and learners are informed of available opportunities within the programme portfolio.
- **Strengthening engagement with local schools, academies, and communities**, to raise the profile of construction and manufacturing careers—particularly those aligned with sustainable and green skills pathways.
- **Targeted outreach** to underrepresented groups, including women, ethnic minorities, and individuals with disabilities, to improve diversity in the sector.
- **Focused engagement** with young people not in education, employment, or training (NEET), providing accessible entry routes into training and employment in construction and manufacturing.
- EMCCA should lead **Sector Engagement Forums** to convene industry panels with a particular focus on engaging SMEs in the construction and manufacturing sectors. These forums will:
  - Facilitate direct engagement with EMIZ opportunities.
  - Working alongside other sector bodies e.g. MAKE UK, to function as a centralised coordination point to reduce duplication and mitigate ‘provider fatigue’ among employers.
  - Encourage collaborative working between providers involved in the EMIZ programme, helping to minimise unnecessary competition and promote shared outcomes.
  - Support the simplification of the education and skills landscape through a more coherent, employer-facing approach.
- An EMCCA-led **online platform** should be developed to serve as a one-stop-shop for employers to explore the full portfolio of courses, policy updates and a referral portal for consultancy.
- Collaborating with providers, EMCCA should implement a **standardised Organisational Needs Analysis (ONA)** to assess employer-specific skills requirements. Key features include:
  - A consistent approach to identifying local and sector-specific skills gaps.
  - ONAs used by providers to inform curriculum development and course design.
  - Aggregated data from ONAs inputted into a **centralised dashboard**, providing EMCCA with real-time labour market intelligence to inform strategic planning and funding decisions.

- The potential for this model to be **extended across other devolved funding streams**, such as the Adult Skills Fund, to ensure that local skills need remain current and accurately reflected.
- Enhanced transparency for SMEs, enabling them to better understand sector-wide skills gaps and align their workforce planning accordingly.

## Capital Investment

The East Midlands Capital Injection Fund (EMCIF) is proposed to support the delivery of strategic skills priorities through targeted investment in physical infrastructure through two strands, the **Infrastructure Capacity Fund** and **Maintenance Fund**. The fund will underpin the objectives of the EMIZ programme and align with wider regional and national skills strategies.

### 1. Infrastructure Capacity Fund (ICF):

The ICF will provide capital funding to education and training providers to purchase industry-standard equipment and resources that reflect current and emerging sector needs—particularly those identified through robust local labour market intelligence and skills gap analysis.

Funding allocations will be prioritised for bids that clearly demonstrate:

- Alignment of capital investment with the delivery of high-quality provision that meets employer demand and supports priority skills, i.e. green construction, sustainable advanced manufacturing, zero-emission propulsion etc.
- How the investment will enhance both teaching and learning within the classroom and wider engagement with industry, including opportunities for learners to develop applied, work-ready skills using industry-relevant technologies and facilities.
- Evidence of collaborative arrangements with local SMEs, outlining how employers will benefit from shared access to capital resources. Bids will be particularly strengthened by proposals that include:
  - Employer contributions to the sustainability of capital assets (e.g. through maintenance funding or in-kind support)
  - SME involvement in curriculum delivery (e.g. guest lecturing, mentorship, or co-delivery of technical content)
  - Employer-supported learner progression routes, including work placements, apprenticeships, and other real-world learning opportunities.

### 2. Maintenance Fund:

The Maintenance Fund, as part of the EMCIF, is intended to ensure that existing capital assets held by providers remain fit-for-purpose and aligned with the region's evolving skills

needs—particularly those related to the green construction and sustainable advanced manufacturing sectors.

This fund acknowledges that while many providers already possess relevant equipment and facilities, a significant proportion may be outdated, underutilised, or non-operational due to a lack of routine maintenance, technical upgrades, or modernisation. The Maintenance Fund will:

- Support providers in restoring and upgrading existing equipment to industry standards, ensuring it can be used effectively to deliver high-quality training aligned to local skills priorities.
- Enable the continued use of previously funded capital assets, representing good value for money and reducing the need for unnecessary reinvestment in new equipment.
- Focus investment on assets that directly support training in priority areas—particularly those identified through ONAs and local labour market intelligence as critical for the green construction, retrofit and sustainable advanced manufacturing sectors.
- Strengthen the capacity of providers to deliver technical education in real-world, industry-standard environments, thereby improving learner outcomes and employer confidence in the skills system.

## Sector Relevant Skills

The main recommendations for EMCCA from the Sector Relevant Skills workshop are presented below. The recommendations have been grouped under four headings of “Revenue funding and funding mechanisms to support the future skills within the EMCCA Region”, “Capital funding and investments required to enable the providers to deliver to the future skills”, “Delivery mechanisms for future skills” and “Future skills”.

### Revenue funding and funding mechanisms to support the future skills within the EMCCA Region

- Increase funding to SMEs to support green skills development which will include capability development interventions that address gaps in technical as well as business growth and development skills including green growth strategy, green procurement, sustainable supply chains, etc.
- Introduce a wider range of grant categories, such as seed funding, scale-up grants, and small and demonstrator/innovation grants, to cater to different stages of green businesses and projects.

- Target “inactive” communities with upskilling of green skills
- Raise understanding of carbon/sustainability certificates throughout regional businesses
- Commission a report to fully understand the green skills provision at levels 1-3 across all colleges in the EMCCA region, which can in turn guide changes to the content of future courses
- Set up a mechanism to inform careers guidance of the specifics of the region. This will allow guidance counsellors to inform students of the requirements of businesses in the region
- Provide additional funding to upskill teachers to better engage with businesses
- Work with regional bodies to develop Green Awards to showcase the work of businesses, recognising green champions and celebrating their successes
- Address foundational provision for "green skills" by expanding education of carbon literacy

### Capital funding and investments required to enable the providers to deliver to the future skills

- Investment in areas to support net zero and broader sustainability transitions
- Identify centres of excellence for the training providers, for example the Nuclear Academy, in the region and provide funding to wider access from individuals and businesses

### Delivery mechanisms for future skills

- Digital platforms
- Flexible patterns of delivery
- Problem-based training solutions

### Future skills

Overall, in terms of leadership and management there was a strong sense that skills and capabilities around strategy and planning are key for businesses and the region. Without the ability to think and plan strategically many of the required skill development would be ineffective.

At a regional level, support and coordinating organisation could help to map, standardise and lead on curriculum development. Key stakeholders could also play an important role in creating and building awareness. Further, for long-term impact, it was recommended that skills/capability building should begin at an early age within school education in order to embed into our future leaders and workforce.

Particular skills that were mentioned as important include:

- Technical skills
- Digital skills, including AI, etc.
- Skills for supporting SME transitions
- Strategic & Planning skills
- Leadership and management skills and capabilities
- Board level skills
- Skills for the 'inactive'

## Priority area of recommendations

### EMIZ Cross cutting Priorities

The report has provided specific priorities put forward by stakeholders for each sector assigned a Work Package. This section identifies the areas that have been made throughout the recommendations, highlighting where stakeholders from more than one sector have mentioned this type of recommendation to rectify the skills gap in the EMCCA region.

- 1. Raise awareness and address public perceptions of green skills/industries across the region.** Informational campaigns are needed to promote these sectors to the current and future workforce.
- 2. Collaboration across the region** between businesses, universities, colleges, schools and local authorities. To ensure adequate skills provision is provided across the region, skills providers need to be working together under a regional strategy rather than competing against one another or duplicating efforts. A stakeholder advisory board could be included in decision making on EMCCA priority areas and the allocation of funding to strengthen the collaborative process.
- 3. Accurate identification and mapping of skills for careers pathways.** This will allow future workers in the region to plan their career pathway into a green industry by understanding the qualifications and skills needed.
- 4. Starting the skills education at an early age, such as at primary school level.** This will ensure that the region is generating a future workforce pipeline equipped with the skills and knowledge to take on roles necessary in the growing

industries. EMCCA may want to consider whether this is driven by the EMIZ initiative and includes specific career guidance.

5. **Investment in teacher's development to focus on green skills and to embed Net Zero in careers guidance labelled.** Teachers and careers guidance counsellors need to understand the requirements of the region in terms of green skills, if they are to successfully educate the future workforce.
6. **Future skills requirements include new skills/jobs and upskilling existing workforce.** The current workforce of the EMCCA region may have transferrable skills that can allow them to transition to one of the green sectors identified in this report, but upskilling will be necessary to allow this transition. Also, many of the WP reports identified that there is a requirement for shorter skill interventions and CPD to ease the training burden on SMEs.
7. A strategy that combines **Revenue investments** and **Capital investments** has been recommended by multiple Work Package reports.
8. **Removing barriers to access the provisions of green skills.**
9. **Soft skills such as leadership, management and digital skills** need to be included in any strategy alongside the targeted provision of technical skills.

## EMIZ Skills Funding Recommendations

Based on the identified priority areas, the recommendation is for the EMIZ Skills Funding to be focussed on supporting three areas of activity: 1) building a connected FE/HE skills ecosystem; 2) building a pipeline of future talent and skills; 3) investing into specific skills programmes to meet cross-cutting or sector specific skills needs. The specific recommendations are to:

1. **Build an integrated and connected skills ecosystem across all FE and HE providers in EMCCA region to ensure efficiency, clear skills progression and alignment with EMCCA skills priorities.**
  - A. A collaborate forum should be funded to focus providers on:
    - I. How we work collaboratively as an FE/HE system to ensure adequate skills provision is provided across the region. These include the need to:
      - work together under a regional strategy rather than competing against one another or duplicating efforts.
      - regional strategy and planning support to lead, direct and coordinate business activities and encourage collaboration
      - stimulate growth in the availability and adaptability of skills,
      - promote a more flexible approach to how skills are both developed and delivered.

- engage and attract younger generations to careers in manufacturing and engineering, while simultaneously upskilling the existing workforce.
- stronger collaboration between SME and larger industrial players with the education sector to ensure that the skills pipeline is aligned with industry needs.
- better educated/trained individuals with shared understanding, open-mindedness, better communication skills as well as carbon literate knowledge and skills (He and Baranova, 2025).
- Ensure Curriculum Readiness - Review coverage of the specific skills needs identified and fund development of modules through the levels to address gaps.
- embed climate literacy via collaboration between education and training providers and industry, with particular emphasis on the SME sector.

B. EMCCA should implement a **standardised Organisational Needs Analysis (ONA)** to assess employer-specific skills requirements across the FE/HE network. Key features include:

- A consistent approach to identifying local and sector-specific skills gaps.
- ONAs used by providers to inform curriculum development and course design.
- Aggregated data from ONAs inputted into a **centralised dashboard**, providing EMCCA with real-time labour market intelligence to inform strategic planning and funding decisions.
- The potential for this model to be **extended across other devolved funding streams**, such as the Adult Skills Fund, to ensure that local skills need remain current and accurately reflected.
- Enhanced transparency for SMEs, enabling them to better understand sector-wide skills gaps and align their workforce planning accordingly.

Develop Skills Pathways Mapped to Careers and Raise Awareness of Career Progression and Opportunity - Incentivise and support the education sector to develop and deliver collaborative education pathways through the levels

The intensity of skills demand and scale of skills gaps will require initial regional focus on a selection of gaps rather than tackling all at once. EMCCA

need to clarify regional priorities and where this fits and aligns with national strategies to provide this clarity of focus for initial investment and incentivise integrated delivery of courses across providers to efficiently fill these gaps.

**C. Invest into a building the future pipeline of skills and talent to grow a local diverse and inclusive workforce with the skills EMIZ businesses will need in the future.** This should include programmes to:

- i. Raise awareness and address public perceptions of green skills/green industries across the region.** Informational campaigns are needed to promote these sectors to the current and future workforce. The campaign will include specific interventions to drive up interest in employers in engaging in green skills across a range of programmes
- ii. Address skills education at an early age, such as at primary school level and continuing through to Further and Higher Education.** This will ensure that the region is generating a future workforce pipeline equipped with the skills and knowledge to take on roles necessary in the growing industries.
- iii. Invest in teacher's development to focus on green skills and to embed Net Zero in careers guidance.** Teachers, and careers guidance counsellors (both within educational establishments and local delivery partners) need to understand the requirements of the region in terms of green skills, if they are to successfully educate the future workforce.
- iv. Explore how we build the inclusive pipeline through IAG, promo of sectors etc**
  - Key to this is *"growing a diverse and inclusive workforce that is motivated, recognised and inspired – filling 40,000 new jobs by 2030, doubling our current rate of recruitment, in order to deliver the UK's priorities for national security and energy resilience."* (NSDG, 2024)
  - **SDGs:**
    - Goal 8 aims to promote sustained and inclusive economic growth and decent work for all. It emphasises the need for higher productivity, innovation, and entrepreneurship while

ensuring fair wages, safe working conditions, and equal opportunities.

- Goal 9, which focuses on industry, innovation, and infrastructure, encourages the development of resilient infrastructure and the promotion of inclusive and sustainable industrialisation (United Nations, 2015).
- Goal 11, which aims to make cities inclusive, safe, resilient, and sustainable, necessitates the adoption of environmentally responsible construction methodologies.
- **Social equity** remains a challenge. Lower-income populations face disproportionate difficulties in accessing green jobs and reskilling programmes, necessitating stronger just transition measures (Marelli et al., 2025). Strengthening investment in training, streamlining regulatory frameworks, and advancing public-private partnerships will be crucial in advancing Europe's green transition while maintaining economic resilience (European Commission, 2025a).
- **Gender diversity**
  - Lack of diversity, e.g. around 20% women in nuclear and offshore wind and ethnic minorities only 7% of offshore wind.
  - Looking at example occupations critical to clean energy sectors, it is estimated that only 26% of the total STEM workforce is female; for engineering roles, this falls to just 15.7%. 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.
- **Ageing and retiring workforce**
  - The UK has an ageing workforce, with 1 in 3 workers aged over 50. This is also true across many clean energy sectors such as engineering construction where 38% of the workforce is aged over 50, and heat pumps with two-thirds of the installer base aged over 45. 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. The Office for National Statistics (2020) published its UK population projections. The data (see Figure 4.5 below) predicts an increase in the number of 18-year-olds until 2040 before returning to 2020 levels. This is important as it suggests that the labour pool for new clean energy jobs is likely to hold or increase from 2020 levels.

- **Targeted outreach** to underrepresented groups, including women, ethnic minorities, and individuals with disabilities, to improve diversity in the sector.
- **Focused engagement** with young people not in education, employment, or training (NEET), providing accessible entry routes into training and employment in construction and manufacturing.

**2. Invest into sector specific and cross cutting skills programmes (both capital and revenue where appropriate, and aligned with other regional and national skills funding.** This should address both cross-cutting and sector specific skills, and address challenges within current skills funding mechanisms (with the need of upfront capital investment or curriculum development recourse, or where current skills funding mechanisms do not deliver in a way that meets employers needs and constraints.

A. Investment into **cross-cutting skills** programmes would include funding for:

It was felt that in general companies have difficulty dealing with and identifying high-level, industry specific training which is not already available regionally or nationally. Areas mentioned for further development include:

- Comprehensive management skills for sustainability integration
- Human roles in AI-augmented environments
- Middle management control capabilities which are transferable skills
- "Green champions" to drive organizational change
- Skill development across spectrum from basic foundational skills (such as carbon literacy) to specialized expertise such as data analytics
- Learning pathways that demonstrate practical application ("show me, don't just tell me")

Companies need to be supported with information and retraining where affected by the shift to green economy (e.g. ICE parts suppliers losing business from shift to EVs).

There needs to be programmes that raise awareness, knowledge and understanding about green skills and their potential for sustainable regional development.

Technical skills:

Once again came to the fore, particularly level 5. High skill technicians are required to both implement and support decarbonisation:

- General engineering
- Welding and mechanical trades
- Electrical trades including instrumentation control systems
- Digital, automation and AI
- Introduce a Mathematics Development Hub - skills needed in applied mathematics and computational skills for modelling and simulations, including opportunities for XR (mixed-reality) applications.

Non-technical skills:

- Planning, programme and project management
- Managerial roles and other occupations (see Sector specific section below)

## **B. Specific sector-based interventions to meet skills gaps:**

### **Nuclear:**

- Deepen the Nuclear workforce pool in the EMCCA region
- Supporting Young People to understand the exciting career opportunities available in Nuclear by engaging with schools and colleges operating in the EMCCA region
- Invest in existing workforce – developing short modular learning to accelerate skills capability and Nuclear Specific Conversion Courses

### **Technical skills.**

- With regards the technical skills, new technologies, approaches and methodologies in areas of welding, fitting, machining and material science, safety and nuclear physics were highlighted as core areas for new capabilities.
- Advancements in data science, artificial intelligence, automation and data visualisation were seen as emerging skills required within the future nuclear workforce.

- As new, smaller, more 'local' nuclear energy production emerges through small modular reactors and novel nuclear technologies, skill required in civil engineering, novel construction (e.g. off-site production, on-site construction) and low-carbon construction (e.g. technologies to decarbonise concrete production whilst retaining structural integrity).
- In delivering such skills, delegates proposed enquiry-based, problem-based, applied learning approaches.

### Non-technical skills

- To advance the nuclear sector ecosystem new capabilities in Strategic leadership, supply chain management and leadership will be required alongside project management skills, contract management and procurement skills.
- In this, delegates acknowledged the geo-political environment in which nuclear energy production resides and therefore skills in diplomacy, policy and political intelligence are/will be required.
- new 'corporate' technologies will need to be embraced in, for example, AI and automation of processes.
- Based on the security aspects associated with the nuclear sector, capabilities in cyber security and data protection, along with legal capabilities in intellectual property, protection of commercial expertise and commercial law were seen as key requirements both now and for the future.
- Delegates also acknowledged there is a need to 'market' the nuclear sector in new ways, particularly in the civil nuclear sector, to engage constructive public discourse in the acceptance of new approaches to nuclear as part of the future energy production landscape.

Apprenticeships - There are six nuclear related standards at levels 2 to 6 (excluding medical nuclear), with a further potential standard at level 7 (going through approval). Of the six approved standards, four have apprentices enrolled on them.

### Zero Emission Propulsion

- **Hydrogen skills gaps.** five key areas where training was required: Policy and Regulation, System Integration, Energy Modelling Tools, Climate Change and Sustainability and Future Industry Growth, with hybrid delivery CPD concluded as a favoured approach to learning (HyDEX, 2023).
- **Aerospace skills gaps,** a diverse range of advanced skills across the aerospace sector, particularly in the East Midlands, which plays a central role in the UK's net zero ambitions. Key skill areas include electric and hybrid-electric propulsion systems,

hydrogen fuel cell technology, sustainable aviation fuel (SAF) development, emissions measurement and management, and sustainable materials engineering.

- The transition also requires skills in digital simulation, systems integration, and regulatory compliance, as well as cross-sector collaboration to adapt innovations from adjacent industries. As greenhouse gas emissions become a core performance metric, supply chain specialists and sustainability professionals will be critical in aligning operations with emerging environmental standards.
- Education provision in propulsion within the EMCCA region specifically is focussed on core STEM skills. The specifications for the courses would need to be assessed to determine the specific degree to which they cover new and emerging propulsion technologies to address the identified skills needs.

### Renewable Energy

- There will be increasing demand in the clean energy jobs market for a range of roles, but skilled workers in these roles will also be in demand from other competing sectors.
  - 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 transition to a low-carbon economy will require skilled workers in areas such as renewable energy, energy efficiency, green transport, sustainable agriculture, and carbon capture. Required Workforce to support the Net Zero Transition
- Specialist technical roles (battery manufacture & recycling), hydrogen storage engineers, retrofit specialists, PV/solar cell production technicians, system (integration & network-management technicians).
- Digital & soft skills – data-driven diagnostics, ability to explain complex tech to customers.
- There are a few key occupations that are expected to be in higher demand across all clean energy sectors at the national level and therefore in the East Midlands area as well. Some examples of these occupations include:
  - b. **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.
  - c. **Welding and mechanical trades:** Welders will be required in several 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.

- d. **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.
- e. **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, while Natural England have said the same for over 80% of the time they need to extend a deadline for a planning application. 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.
- f. **Managerial roles and other occupations:** There will be demand for managerial roles across all clean energy sectors ranging from levels 3 to 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.

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.

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.

Skills range from basic functional skills through to skills at the level of a doctorate or equivalent.

- **Vocational and Technical Training (Levels 2-4):** For roles such as technicians, installers, and maintenance workers in renewable energy, energy efficiency, and electric vehicles.

- **Undergraduate Degrees (Levels 5-6):** For engineers, system designers, and energy analysts in sectors like renewable energy, hydrogen, and carbon capture.
- **Postgraduate Education (Levels 7-8):** For R&D roles, policy analysts, and senior management roles focused on green technologies, sustainability, and carbon reduction strategies.
- **The apprenticeship programs:** The apprenticeships programs have been nationally recognised as a crucial mechanism for achieving Net-Zero goals. Programs are being developed to train young people in renewable energy roles, such as high-voltage cable technicians and offshore wind technicians. These apprenticeships provide hands-on experience and education, preparing the workforce for careers in the green economy and supporting the scaling of renewable energy infrastructure.

### Green Construction

Skills gaps are most pronounced between Levels 3 and 7.

Necessity of embedding green skills within every role, process, and training programme in the construction sector. A report identified significant skills gaps within the construction industry in the D2N2 (at the time) region, as summarised in Table 4.5.

Table 4.5: Green Skills and Careers in Construction and Retrofit for Nottingham College

| Highest Level Skill Gaps                                                       | Other Notable Skill Gaps                                 |
|--------------------------------------------------------------------------------|----------------------------------------------------------|
| Upskilling in traditional trades with green skills                             | Drone technology for surveying                           |
| Expertise in green building materials                                          | Lack of qualified assessors and trainers in green skills |
| Expertise in sustainable technologies, such as heat pumps and solar PV systems | PAS 2030 certification                                   |
| Installation specialists                                                       | Facilities management professionals                      |
| Retrofit training (PAS 2035 certification)                                     | Digital skills professionals for green construction      |

|                                                              |                                                          |
|--------------------------------------------------------------|----------------------------------------------------------|
| Rainwater harvesting specialists                             | Regulatory compliance and environmental management       |
| Surveying specialists                                        | Carbon calculations for building projects                |
| Asbestos and waste removal professionals                     | General environmental awareness and messaging techniques |
| Construction and project management (sustainability-focused) | Understanding industry standards                         |
|                                                              | Fire door installation and inspection                    |
|                                                              | EV charging point engineers                              |

Source: Bull et al. (2024)

- Bull et al. (2024) highlight the necessity of increasing awareness of low-carbon construction techniques by incorporating climate literacy into conventional construction-focused programmes, such as bricklaying.
- The aim is to ensure that the construction workforce is sufficiently equipped with the requisite skills to meet the demands of sustainable building practices and comply with regulatory requirements, with the following objectives:
  3. To integrate climate literacy into existing courses by embedding smaller awards and learner engagement opportunities, ensuring low-carbon awareness is incorporated across all construction programmes,
  4. To provide institutionally self-certified and smaller awards in areas that are not currently available through Ofqual and Office for Students regulated qualifications at Levels 2–7. These areas include but are not limited to: Installation and Maintenance of Heat Pump Systems (Non-Refrigerant Circuits), Small-Scale Photovoltaic Systems, BS 7671:2018 Level 3 Award in the Requirements for Electrical Installations (including Amendment 2), PAS 2035 Certification, PAS 2030:2019 Certification, and Rainwater Harvesting

### Advanced Manufacturing

Table 4.6 shows the very high or high priority skills highlighted by the participants of the workshop.

Table 4.6: Workshop Findings - Priority Skills

| Very High Priority Skills                                                                                                    | High Priority Skills                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Circular product design and practices</li> <li>• Machine tools operators</li> </ul> | <ul style="list-style-type: none"> <li>• Sustainable materials</li> <li>• Recycle and remanufacturing</li> <li>• Tool maker</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Mechanical electrical fitters</li> <li>• Welding</li> <li>• AI-driven robot route planning and manipulation</li> <li>• Regulatory and standards compliance</li> <li>• Artificial intelligence / machine learning</li> <li>• Advanced machine vision</li> <li>• Lean / Smart manufacturing (reduce waste)</li> <li>• Additive Manufacturing</li> <li>• Robotics, Industrial robots, cobots, and mobile robotics</li> </ul> | <ul style="list-style-type: none"> <li>• Continuous improvement (Lean &amp; Six Sigma)</li> <li>• PLC programming and troubleshooting</li> <li>• Precision manufacturing (less waste)</li> <li>• Programming / software development</li> <li>• CAD</li> <li>• Electrical and electronics engineering</li> </ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

In addition, the following challenges were identified from the participants, these are used to inform the recommendations:

- **Manufacturing and Technology**

8. Enhanced and advanced manufacturing capabilities in both physical processes and the digital domain.
9. Increased use of composites.
10. Smarter, reconfigurable precision manufacturing with less waste.
11. Increased automation and robotics throughout manufacturing.
12. Flexible layouts, tooling, and fixtures.
13. AI and Machine Learning to inform further process integration and optimisation.
14. Development of new advanced materials for challenging environments.

- **Energy and Environment**

3. Increasing energy demands and the need for energy security.
4. Decarbonisation efforts.

- **Data and Security**

2. Data security, integrity, collection, storage, and analysis.

- **Education and Skills Development**

9. Ensure education is more aligned with regional industry and business needs.
10. Research and develop vocational courses, placements, and apprenticeships aligned to business needs.
11. Universities to work collaboratively across teaching and research and show leadership.
12. Mid-career conversions to grow workforce.
13. Promote education and awareness to remove bias of working in Manufacturing.
14. Address the Level 3 / 4 demand.

15. Develop a pipeline of opportunities and certainty in skills and people management.
16. More university expertise is required to support industry in materials, manufacturing technologies, and digital domains, including PhDs and Eng Docs.

### Sector Relevant Skills

A recent report highlighted that within Midlands SMEs there is a lack of leadership and management skills and capabilities (Yoruk & Gilman, 2022). The region has more than 80,000 businesses employing more than 930,000 people, and yet only 985 have been on the governments Help To Grow Management programme.

As Table 4.8 and Table 4.9 (see main report) show, there is scope for targeting the provision for the development of skills attached to specific occupations and in specific locations – e.g. green skills development in Professional occupations (Group 2) in Rushcliffe and Derbyshire Dales, Admin and Secretarial occupations (Group 4) in North East Derbyshire, Sales and Customer Service occupations (Group 7) in Nottingham, Ashfield and Newark and Sherwood etc.

This study also found that transition to Net Zero needs effective collaboration which requires better educated/trained individuals with shared understanding, open-mindedness, better communication skills as well as carbon literate knowledge and skills (He and Baranova, 2025).

#### Future skills

Overall, in terms of leadership and management there was a strong sense that skills and capabilities around strategy and planning are key for businesses and the region. Without the ability to think and plan strategically many of the required skill development would be ineffective.

There needs to be a leadership mindset change from seeing training and upskilling as a cost to seeing it as an investment

At a regional level, support and coordinating organisation could help to map, standardise and lead on curriculum development. Key stakeholders could also play an important role in creating and building awareness. Further, for long-term impact, it was recommended that skills/capability building should begin at an early age within school education in order to embed into our future leaders and workforce.

Particular skills that were mentioned as important include:

- Technical skills
- Digital skills, including AI, etc.
- Skills for supporting SME transitions

- Strategic & Planning skills
- Leadership and management skills and capabilities
- Board level skills
- Skills for the 'inactive'

## References

Aerospace Technology Institute (2022). 'Workforce to Deliver Liquid Hydrogen Powered Aircraft'. Available at: <https://www.ati.org.uk/wp-content/uploads/2022/03/FZO-IST-PPL-0053-Workforce-to-Deliver-Liquid-Hydrogen-Powered-Aircraft.pdf>

Automated Distribution & Manufacturing Centre (2025) 'Welcome to the ADMC'. Available at: <https://www.theadmc.co.uk/>

Bruegel. (2025) 'How to finance the European Union's building decarbonisation plan', Bruegel, 26 February. Available at: <https://www.bruegel.org/policy-brief/how-finance-european-unions-building-decarbonisation-plan>

Bull, R. & Domingues, A.R. (2021) 'Levelling Up and Greening Out: A Just and Holistic Transition to Low Carbon Jobs - An Analysis of Challenges and Opportunities for the UK, the Midlands and Bolsover.' Nottingham: Nottingham Trent University.

Bull, R., Coulson, B. & Simpson, K. (2024) 'Green Skills and Careers in Construction and Retrofit for Nottingham College.'

Castañeda-Navarrete, J., Roupakia, Z., Döme, V. and Anzolin, G. (2024) 'Women in UK Manufacturing 2024: Addressing labour shortages and bridging the gender gap'.

Cambridge: University of Cambridge. Available at:

<https://engage.ifm.eng.cam.ac.uk/wp-content/uploads/Women-in-Manufacturing-report-2024.pdf>

Calza, E., Soguero Escuer, J., Fabiani, J. and De Prato, G. (2024). 'Advanced Manufacturing Study. Preliminary findings on EU's Advanced Manufacturing industry in the global landscape'. Luxembourg: Publications Office of the European Union. DOI: 10.2760/798090, JRC137761

Center for Policy and Stability (2025) 'The Resurgence of Nuclear Energy: A Global Perspective'. Available at: <https://policystability.com/post/2025-02/nuclear-energy-global-perspective/>

Climate Action Tracker. (2025) 'EU', Climate Action Tracker, 7 February. Available at: <https://climateactiontracker.org/countries/eu/>

Climate Change Committee (2023). 'A Net Zero Workforce'. Available at: <https://www.theccc.org.uk/wp-content/uploads/2023/05/CCC-A-Net-Zero-Workforce-Web.pdf> (Accessed: 15 March 2025)

Cogent Skills (2025) '2024 Nuclear Workforce Assessment'. Available at:  
<https://cogentskills.com/publications/nuclear-workforce-assessment-2024/>

Construction Leadership Council. (2017) 'Industry Skills Plan'. London: Construction Leadership Council.

Construction Leadership Council. (2021). 'Industry Skills Plan for the UK Construction Sector 2021-2025'. London: Construction Leadership Council. Available at:  
[https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2021/03/B06322\\_CLC\\_SkillsPlan\\_v27.pdf](https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2021/03/B06322_CLC_SkillsPlan_v27.pdf)

Consoli, D., Marin, G., Marzucchi, A. and Vona, F. (2016) 'Do green jobs differ from non-green jobs in terms of skills and human capital?', *Research Policy*, 45(5), pp. 1046-1060.

D2N2 LSIP. (2023) 'Local Skills Improvement Plan.' Available at: <https://d2n2lep.org/wp-content/uploads/2023/04/230328LSIPreport.pdf>

Deloitte (2020), 'Women at the wheel: Key findings from the 2020 Diversity, Equity, and Inclusion in Automotive Study'. Available at:  
<https://www2.deloitte.com/content/dam/Deloitte/us/Documents/manufacturing/us-women-at-the-wheel-2020-executive-summary-final.pdf>

Department for Business and Trade (2017) 'Fit For Nuclear business support – England'. Available at: <https://www.gov.uk/business-finance-support/fit-for-nuclear-business-support-england>

Department for Education (2020). 'Further Education and Skills'. Available at:  
<https://explore-education-statistics.service.gov.uk/data-catalogue/data-set/8d416d95-e125-466c-8e96-61e6c20b48d5/csv> (Accessed 17 March 2025)

Department for Energy Security & Net Zero (2024). 'Assessment of the clean energy skills challenge' Available at: <https://www.gov.uk/government/publications/clean-power-2030-action-plan-assessment-of-the-clean-energy-skills-challenge/assessment-of-the-clean-energy-skills-challenge>

Department for Transport (2021). 'Decarbonising Transport. Retrieved from A Better, Greener Britain'. Available at:  
<https://assets.publishing.service.gov.uk/media/610d63ffe90e0706d92fa282/decarbonising-transport-a-better-greener-britain.pdf>

Dierdorff, E. C., Norton, J. J., Gregory, C. M., Rivkin, D. and Lewis, P. (2011) 'Greening of the World of Work: Revisiting Occupational Consequences'. Raleigh, NC: National Center for O\*NET Development. Available at: [https://www.onetcenter.org/dl\\_files/Green2.pdf](https://www.onetcenter.org/dl_files/Green2.pdf)

Ecuity. (2020) 'Local green jobs – accelerating a sustainable economic recovery'. London: Ecuity Consulting.

European Climate Foundation. (2025) 'A socially-just EU Renovation Wave', European Climate Foundation. Available at: <https://europeanclimate.org/wp-content/uploads/2022/05/ieecp-socially-just-homes-summary-report-may-2022.pdf>

European Commission. (2025a) 'Delivering the European Green Deal: JRC study finds mixed progress so far', Joint Research Centre News, 5 February. Available at: [https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/delivering-european-green-deal-jrc-study-finds-mixed-progress-so-far-2025-02-05\\_en](https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/delivering-european-green-deal-jrc-study-finds-mixed-progress-so-far-2025-02-05_en)

European Commission. (2025b) '2025 Competitiveness Progress Report: Opportunities to boost EU clean tech', Energy News, 26 February. Available at: [https://energy.ec.europa.eu/news/2025-competitiveness-progress-report-opportunities-boost-eu-clean-tech-2025-02-26\\_en](https://energy.ec.europa.eu/news/2025-competitiveness-progress-report-opportunities-boost-eu-clean-tech-2025-02-26_en)

European Commission. (2025c) 'European Skills Agenda', Employment, Social Affairs, and Inclusion. Available at: [https://employment-social-affairs.ec.europa.eu/policies-and-activities/skills-and-qualifications/european-skills-agenda\\_en](https://employment-social-affairs.ec.europa.eu/policies-and-activities/skills-and-qualifications/european-skills-agenda_en)

European Commission. (2025d) 'Energy Performance of Buildings Directive', Energy - European Commission. Available at: [https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive\\_en](https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en)

European Commission. (2025e) 'Renovation Wave', Energy - European Commission. Available at: [https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave\\_en](https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en)

European Commission. (2025f) 'Nearly-zero energy and zero-emission buildings', Energy - European Commission. Available at: [https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/nearly-zero-energy-and-zero-emission-buildings\\_en](https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/nearly-zero-energy-and-zero-emission-buildings_en)

European Commission. (2025g) 'Financing for building renovations', Energy - European Commission. Available at: [https://energy.ec.europa.eu/topics/energy-efficiency/financing/financing-building-renovations\\_en](https://energy.ec.europa.eu/topics/energy-efficiency/financing/financing-building-renovations_en)

Financial Times (2025a) 'EU to keep climate goals but loosen rules for companies, says green chief', Financial Times, 26 February. Available at: <https://www.ft.com/content/53f3886b-b90b-41e5-81a7-2432977c9bca>

Financial Times (2025b). 'Industrial strategy turns from green to battleship grey', Financial Times, 13 March. Available at: <https://www.ft.com/content/e40a6309-9691-456c-bb57-d9774dd7c336>

Green Jobs Taskforce. (2021) 'Report on the Future of Green Jobs in the UK.' Available at: <https://www.gov.uk/government/publications/green-jobs-taskforce-report>

He, Q., & Baranova, P. (2025) 'Working Paper: Engaging with Net Zero through Multi-stakeholder Collaborations in Firms' Ecosystems: Evidence from the UK'. University of Derby. Accessed on 10/03/2025

HVM Catapult. (2020). 'Manufacturing the Future Workforce'. Available at: <https://hvm.catapult.org.uk/wp-content/uploads/2022/06/Manufacturing-the-Future-Workforce-Full-Report.pdf>

HVM Catapult. (2021). 'The Electrification Skills Framework'. Available at: <https://hvm.catapult.org.uk/wp-content/uploads/2021/11/National-Electrification-Skills-Forum-Brochure-FINAL.pdf>

HyDEX (2023). 'Evaluating the skills gap in the hydrogen economy'. Available at: <https://hydex.ac.uk/wp-content/uploads/2023/03/Skills-Survey-Written-Report-Feb-2023.pdf>

HyDEX. (2025). 'Fuel Cell and Hydrogen Technologies CPD Programme'. Available at: <https://hydex.ac.uk/hydrogen-fuel-cell-cpd-programme/>

IEA. (2024) 'Mapping green and digital energy jobs'. Paris: IEA. Available at: <https://iea.blob.core.windows.net/assets/16986de9-b1f9-4243-8411-a2a12f00413c/MappingGreenandDigitalEnergyJobs.pdf>

International Labour Organisation. (2019) 'Green Jobs Programme.' Available at: <https://www.ilo.org/global/topics/green-jobs/lang--en/index.htm>

Jagger, N., Foxon, T. and Gouldson, A. (2013) 'Skills constraints and the low carbon transition', *Climate Policy*, 13(1), pp. 43–57.

Killip, G. (2020) 'Skills for a low-carbon construction industry', *Buildings and Cities*, 1(1), pp. 525–537.

Labour Party. (2024) 'Housing Plan: 1.5 million New Homes.' Available at: <https://labour.org.uk/updates/stories/just-announced-labour-will-build-1-5-million-homes-to-save-the-dream-of-homeownership>

Lewis, P. A. (2020) 'The Missing Middle: Technicians, Innovation and Advanced Manufacturing', in Goodhart, D. (ed.) *The Training We Need Now: Essays on Technical Training, Life-long Learning and Apprenticeships*. London: Policy Exchange, pp. 1835-1850. DOI: 10.2139/ssrn.3622019

Loughborough University (2025). 'Hydrogen for Net Zero'. Available at:  
<https://www.lboro.ac.uk/hydrogen-net-zero/hydrogen-works/>

Madonsela, N. S. (2022), 'Aligning Education and Workforce Training with Industry Needs: A Perspective on Human Capital Development', *Proceedings of the First Australian International Conference on Industrial Engineering and Operations Management*

MakeUK (2022a). '2030 Skills: Closing The Gap'. Available at:  
<https://www.makeuk.org/docs/skills-2030-closing-gap-report-web/download?attachment>

MakeUK (2022b). 'Leadership and Management Skills'

Marelli, L., Trane, M., Barbero Vignola, G. et al. (2025) *Delivering the EU Green Deal: progress towards targets*. Publications Office of the European Union. Available at: <https://data.europa.eu/doi/10.2760/3105205>

Midlands Aerospace Alliance (2022) 'Jet Zero Midlands conference'. Available at:  
<https://www.midlandsaerospace.org.uk/events/Midlands-net-zero-aerospace-aviation>

Midlands Net-Zero Hub. (2024) 'Midlands Net-Zero Workforce Strategy.'

Midlands Engine (2021) 'Ten Point Plan For Green Growth In The Midlands Engine'. Available at: [https://www.midlandsengine.org/wp-content/uploads/2021/11/Ten-Point-Plan-for-Green-Growth-in-the-Midlands-Engine\\_V1-1.pdf](https://www.midlandsengine.org/wp-content/uploads/2021/11/Ten-Point-Plan-for-Green-Growth-in-the-Midlands-Engine_V1-1.pdf)

Midlands Engine (2025) 'The Nuclear Industry In The Midlands: A major economic growth opportunity'. Available at: [https://midlandsengine.org/wp-content/uploads/2025/02/ME\\_The-Nuclear-Industry-in-the-Midlands\\_a-major-economic-growth-opportunity\\_January-2025.pdf](https://midlandsengine.org/wp-content/uploads/2025/02/ME_The-Nuclear-Industry-in-the-Midlands_a-major-economic-growth-opportunity_January-2025.pdf)

National Center for O\*NET Development (2010). O\*NET Green Task Development Project. *O\*NET Resource Center*. Available at  
<https://www.onetcenter.org/reports/GreenTask.html>

Nelles, J. K. (2023). 'Energy/Propulsion in the East Midlands - Understanding Cluster Growth Potential Case Study'. Available at:  
<https://innovationcaucus.co.uk/app/uploads/2023/07/Energy-Propulsion-in-the-East-Midlands.pdf>

Nottingham Trent University (2025a). 'A-Z of undergraduate courses'. Available at: <https://www.ntu.ac.uk/study-and-courses/undergraduate/course-a-z> (Accessed: 14 March 2025)

Nottingham Trent University (2025b). 'Postgraduate subjects'. Available at: <https://www.ntu.ac.uk/study-and-courses/postgraduate/subject-areas> (Accessed: 14 March 2025)

Nuclear Skills Delivery Group (2024) 'National Nuclear Strategic Plan for Skills'. Available at: <https://nuclearskillsdeliverygroup.com/wp-content/uploads/2024/05/NSDG-National-Nuclear-Strategic-Plan-For-Skills.pdf>

OECD (2024) 'OECD Employment Outlook 2024: The Net-Zero Transition and the Labour Market'. OECD Publishing, Paris. Available at: <https://doi.org/10.1787/ac8b3538-en>.

Office for National Statistics (2020). 'Annual Population Survey'. Available at: <https://www.nomisweb.co.uk/datasets/apsnew> (Accessed 10 March 2025)

Office for National Statistics (2021a) 'Employment in the UK by industry: Manufacturing and construction'. London: ONS.

Office for National Statistics (2021b) 'Low Carbon and Renewable Energy Economy (LCREE) estimates'. London: ONS.

Office for National Statistics (2021c) 'Output in the construction industry, Table 7.' London: ONS. Available at: <https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/datasets/outputintheconstructionindustry>

Office for National Statistics (2022) 'National population projections: 2020-based interim'. London: ONS. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2020basedinterim>

Office for National Statistics (2024a). 'Experimental estimates of green jobs, UK: 2024'. Available at: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/experimentalestimatesofgreenjobsuk/2024#jobs-in-green-industries> (Accessed 18 March 2025)

Office for National Statistics (2024b). 'Low Carbon and renewable energy economy, UK:2022'. London: ONS. Available at: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2022>

Office for National Statistics (2024c) 'Workforce jobs by industry (SIC 2007) and sex.' London: ONS.

PBC Today (2024) 'What does the Labour manifesto promise for UK construction?'. Available at: <https://www.pbctoday.co.uk/news/planning-construction-news/what-labour-have-promised-for-uk-construction/140527/>

PCAN. (2019) 'Tracking local employment in the green economy: PCAN Just Transition Jobs Tracker'. Available at: <https://pcancities.org.uk/tracking-local-employment-green-economy-pcan-just-transition-jobs-tracker>

Relly, S. J., Killip, G., Robson, J., Emms, K., Klassen, M., and Laczik, A. (2022) 'Greening construction: A complex challenge for jobs, skills, and training'. Edge Foundation. Available at: <https://www.edge.co.uk/research/projects/research-reports/greening-construction-a-complex-challenge-for-jobs-skills-and-training/>

Reuters. (2025b) 'Climate policy requires a more realistic approach', Reuters, 28 February. Available at: <https://www.reuters.com/breakingviews/climate-policy-requires-more-realistic-approach-2025-02-28/>

RICS. (2024) 'RICS Sustainability Report (2024)'. Available at: <https://www.rics.org/news-insights/current-topics-campaigns/sustainability/sustainability-report-2024>

Ritchie, H. (2020) 'Sector by sector: where do global greenhouse gas emissions come from?' Published online at OurWorldinData.org. Available at: <https://ourworldindata.org/ghg-emissions-by-sector>

Rowley, J. and Walker, H. (2020) 'The green economy and employment transformation', *Environmental Policy Review*, 22(3), pp. 221–239.

Sharp, N. (2020). 'Tackling the UK's Manufacturing Skills Gap: Why We Must Act Now'. Available at: <https://www.escatec.com/blog/uk-manufacturing-skills-gap>

Skills England. (2024). *Driving growth and widening opportunities*. London: Department for Education. Available at: [https://assets.publishing.service.gov.uk/media/66ffd4fce84ae1fd8592ee37/Skills\\_England\\_Report.pdf](https://assets.publishing.service.gov.uk/media/66ffd4fce84ae1fd8592ee37/Skills_England_Report.pdf) [Accessed 14 Apr. 2025]

The Guardian. (2024) 'Cop29's new carbon market rules offer hope after scandal and deadlock', The Guardian, 24 November. Available at: <https://www.theguardian.com/environment/2024/nov/24/cop29s-new-carbon-market-rules-offer-hope-after-scandal-and-deadlock>

The Guardian. (2025b) 'Oslo Leads in Quiet, Low-Emission Electric Construction.' Available at: <https://www.theguardian.com/world/2025/jan/10/oslo-leads-quiet-low-emission-electric-vehicles-building-sites>

The Guardian. (2025c) 'US officials have been absent from global climate forums during Trump 2.0', The Guardian, 25 February. Available at: <https://www.theguardian.com/us-news/2025/feb/25/officials-absent-international-climate-meetings>

The Guardian. (2025d) 'EU reveals plan to hit climate goals by helping dirty industries clean up', The Guardian, 26 February. Available at: <https://www.theguardian.com/world/2025/feb/26/eu-climate-goals-dirty-industries-clean-industrial-deal>

The Manufacturer (2024) 'Now hiring: Understanding and tackling the skills shortage in UK manufacturing'. Available at: <https://www.themanufacturer.com/reports-whitepapers/now-hiring-understanding-and-tackling-the-skills-shortage-in-uk-manufacturing/>

Time. (2025a) 'Sweden is Building the World's Largest City Made Entirely from Timber.' Available at: <https://time.com/7207873/sweden-stockholm-wood-city-sustainability/>

Time. (2025b) 'The Rise of Carbon-Neutral Neighbourhoods.' Available at: <https://time.com/7200318/the-rise-of-carbon-neutral-neighborhoods/>

UK Construction Week (2024) 'UKCW MANIFESTO ROUNDUP: WHAT EACH VICTORY COULD MEAN TO THE CONSTRUCTION SKILLS SHORTAGE'. Available at: <https://www.ukconstructionweek.com/blogs/ukcw-manifesto-roundup-each-victory-mean-construction-skills-shortage>

UK Government. (2020a) 'Powering our Net Zero future'. Available at: [https://assets.publishing.service.gov.uk/media/5fdc61e2d3bf7f3a3bdc8cbf/201216\\_BEIS\\_EWP\\_Command\\_Paper\\_Accessible.pdf](https://assets.publishing.service.gov.uk/media/5fdc61e2d3bf7f3a3bdc8cbf/201216_BEIS_EWP_Command_Paper_Accessible.pdf)

UK Government (2020b). 'The Ten Point Plan for a Green Industrial Revolution'. Available at: [https://assets.publishing.service.gov.uk/media/5fb5513de90e0720978b1a6f/10\\_POINT\\_PLAN\\_BOOKLET.pdf](https://assets.publishing.service.gov.uk/media/5fb5513de90e0720978b1a6f/10_POINT_PLAN_BOOKLET.pdf)

UK Government. (2021) 'Net-Zero Strategy: Build Back Greener.' Available at: <https://www.gov.uk/government/publications/net-zero-strategy>

UK Government (2022) 'Levelling Up the United Kingdom'. Available at:  
[https://assets.publishing.service.gov.uk/media/61fd3ca28fa8f5388e9781c6/Levelling\\_up\\_the\\_UK\\_white\\_paper.pdf](https://assets.publishing.service.gov.uk/media/61fd3ca28fa8f5388e9781c6/Levelling_up_the_UK_white_paper.pdf)

UK Government (2023a). 'Advanced manufacturing plan'. Available at:  
<https://assets.publishing.service.gov.uk/media/65788f51095987000d95df34/advanced-manufacturing-plan.pdf>

UK Government (2023b) 'Employer Skills Survey 2022'. Available at: <https://explore-education-statistics.service.gov.uk/find-statistics/employer-skills-survey>.

UK Government (2023c) 'National Infrastructure and Construction Pipeline.'

UK Government (2024a) 'Clean Power 2030 Action Plan: A new era of clean electricity. Assessment of the clean energy skills challenge - Evidence annex'. Available at:  
<https://assets.publishing.service.gov.uk/media/675b3171348e10a16975a422/clean-power-2030-clean-energy-skills-assessment-annex.pdf>

UK Government (2024b) 'Invest 2035: The UK's Modern Industrial Strategy'. Available at:  
<https://assets.publishing.service.gov.uk/media/6711176c386bf0964853d747/industrial-strategy-green-paper.pdf>

UNFCCC: United Nations Framework Convention on Climate Change, n.d., *The Paris Agreement*, UNFCCC

United Nations. (2015) 'Sustainable Development Goals Framework.' Available at:  
<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

University of Derby (2025). 'A-Z of courses'. Available at:  
<https://www.derby.ac.uk/courses/a-z/> (Accessed: 14 March 2025)

University of Nottingham (2025). 'Postgraduate course search'. Available at:  
<https://www.nottingham.ac.uk/pgstudy/courses/courses.aspx> (Accessed: 14 March 2025)

Van Der Ree, K. (2019) 'Promoting green jobs: Decent work in the transition to a green economy', *International Labour Review*, 158(4), pp. 519–544.

Weir, I., Beinarovica, J., Nelson, K., Fagura, J. and Morrison, M. (2023). *Mapping the current and forecasted hydrogen skills landscape*. Available at:

<https://www.climateexchange.org.uk/wp-content/uploads/2023/09/cxc-mapping-the-current-and-forecasted-hydrogen-skills-landscape-jun-2023.pdf>. DOI: 10.7488/era/3369

World Economic Forum (2021). 'These are the sectors where green jobs are growing in demand'. Available at: [https://www.weforum.org/stories/2021/09/sectors-where-green-jobs-are-growing-in-demand/#:~:text=While%20green%20talent%20development%20is,%2C%20transportation%2C%20construction%20and%20manufacturing](https://www.weforum.org/stories/2021/09/sectors-where-green-jobs-are-growing-in-demand/#:~:text=While%20green%20talent%20development%20is,%2C%20transportation%2C%20construction%20and%20manufacturing.). (Accessed: 18 March 2025)

World Employment Confederation-Europe. (2025) 'Skills and Quality Jobs: The Building Blocks for a More Competitive and Resilient Europe', News, 12 February. Available at: <https://wecglobal.org/news-post/skills-and-quality-jobs-the-building-blocks-for-a-more-competitive-and-resilient-europe/>

WorldSkills UK (2023). 'Manufacturing Excellence Report 2023'. Available at: [https://www.worldskillsuk.org/wp-content/uploads/2023/05/Manufacturing-excellence-report\\_v4a.pdf](https://www.worldskillsuk.org/wp-content/uploads/2023/05/Manufacturing-excellence-report_v4a.pdf)

Yoruk, D.E. and Gilman, M. (2022), 'Understanding the SME Drag Effect in the West Midlands Economy – Findings of PSP Growth Diagnostic (Survey)'. Available at: <https://bcuassets.blob.core.windows.net/docs/ceigsme-report-2-132828473450467757.pdf>