Jobs and Skills in Green Tech

July 2024



Sustainability first

Foreword

Sustainability First is an independent think tank and charity with over twenty years' experience and expertise in applying sustainability principles in the energy and water sectors, helping businesses, regulators, and policymakers. We also conduct impactful community engagement to foster informed dialogue on social equity and the climate crisis.

The energy and water sectors are undergoing huge transformation as they upgrade infrastructure, to ensure secure, fair, affordable services, and address the climate emergency. Technology plays a vital role in reaching these goals, whilst offering new jobs and demand for new skills. Engaging with professionals in both sectors provides insights about the scale and nature of these opportunities.

There are many reports on green jobs and skills, but few focus on green tech or examine what these roles might be. Green tech jobs and skills address the climate emergency through innovative technologies and practices. This report focuses on digital opportunities, ranging from using technology that will make the energy grid more efficient, to automating water treatment plants, requiring skills such as data analysis, machine-learning and cybersecurity. By creating a list of roles, we define where the gaps are and what should happen. We are grateful to the Hg Foundation for funding this research project.

"Embracing the potential of green technology and leveraging the opportunities presented by diversifying talent are vital for employers in the utilities sector, including energy and water firms. We need to understand the required skills in green technology and job prospects to attract and retain talent. We hope this report helps industries, while raising awareness among young people and underrepresented groups about potential career paths. It also highlights opportunities for both sectors to contribute to the UK government's goal of two million green jobs by 2030, as outlined in the Green Jobs Taskforce report[1]."

David Murray
Executive Director, Sustainability First

With thanks to the Hg Foundation for its funding support, enabling Sustainability First to undertake this work. Special thanks to James Turner, the Foundation's CEO, and to Christopher Fielding a Senior Partner at Hg for their guidance and input. The Hg Foundation helps under-represented groups to access high quality jobs in tech by supporting education and employment programmes across the UK, Europe and North America. www.thehgfoundation.com

The Hg Foundation

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Executive summary

Climate change necessitates a fundamental shift away from fossil fuels across society and the economy. Using technology intelligently is crucial for facilitating these changes; the stakeholders we engaged acknowledged the profound opportunities afforded by digital innovation. However, addressing the looming skills gap is imperative to meet the demand for these essential roles.

This Sustainability First report explores green tech jobs and skills in the energy and water sectors in Great Britain. It anticipates future trends, opportunities, and challenges, and offers approaches to engage young people and underrepresented groups in these sectors.

The research has been funded by the Hg Foundation which helps underrepresented groups to access high quality jobs in tech by supporting education and employment-based programmes across the UK. Our report focuses specifically on digital green tech, differentiating it from broader reports on the green economy, jobs, and skills.

Context

The way we work has changed; Covid revealed that the traditional 9 to 5 office routine was more habitual than necessary. Young people do not expect to stay in one job for life, and working flexibly and remotely is now the norm. While job insecurity is common, employers must make their roles appealing to attract and retain talent. Stakeholders emphasised that jobs using technology to cut emissions and address climate change give employees a sense of purpose.

As digital technology advances and offers significant benefits in efficiency and insights, many people still lack the necessary skills to use it effectively. This growing gap, known as the digital divide, is becoming more pronounced. A recent report by the House of Lords emphasised the need to tackle this issue. It pointed out that reducing digital exclusion is crucial for meeting important government goals addressing regional inequalities, enhancing public health, and achieving net zero emissions[2]. Improving access to digital skills is more important than ever.

We have conducted a separate literature review to contextualise our research, looking at green jobs and within that green tech roles. Information on how digital tech can advance green jobs and what green tech roles might look like is limited. We have conducted interviews with thirty five organisations, spanning energy, water, and technology companies, government departments, regulators, environmental groups, and educational/vocational organisations. We also hosted an online roundtable discussion.

Definition of green tech jobs and skills

This report defines green tech jobs as those involving technology aimed at addressing climate change, reducing emissions, and advancing environmental objectives. Green tech skills can be acquired through training, practice, or experience. The term ‘green’ has been criticised by some participants for its vagueness and overuse.

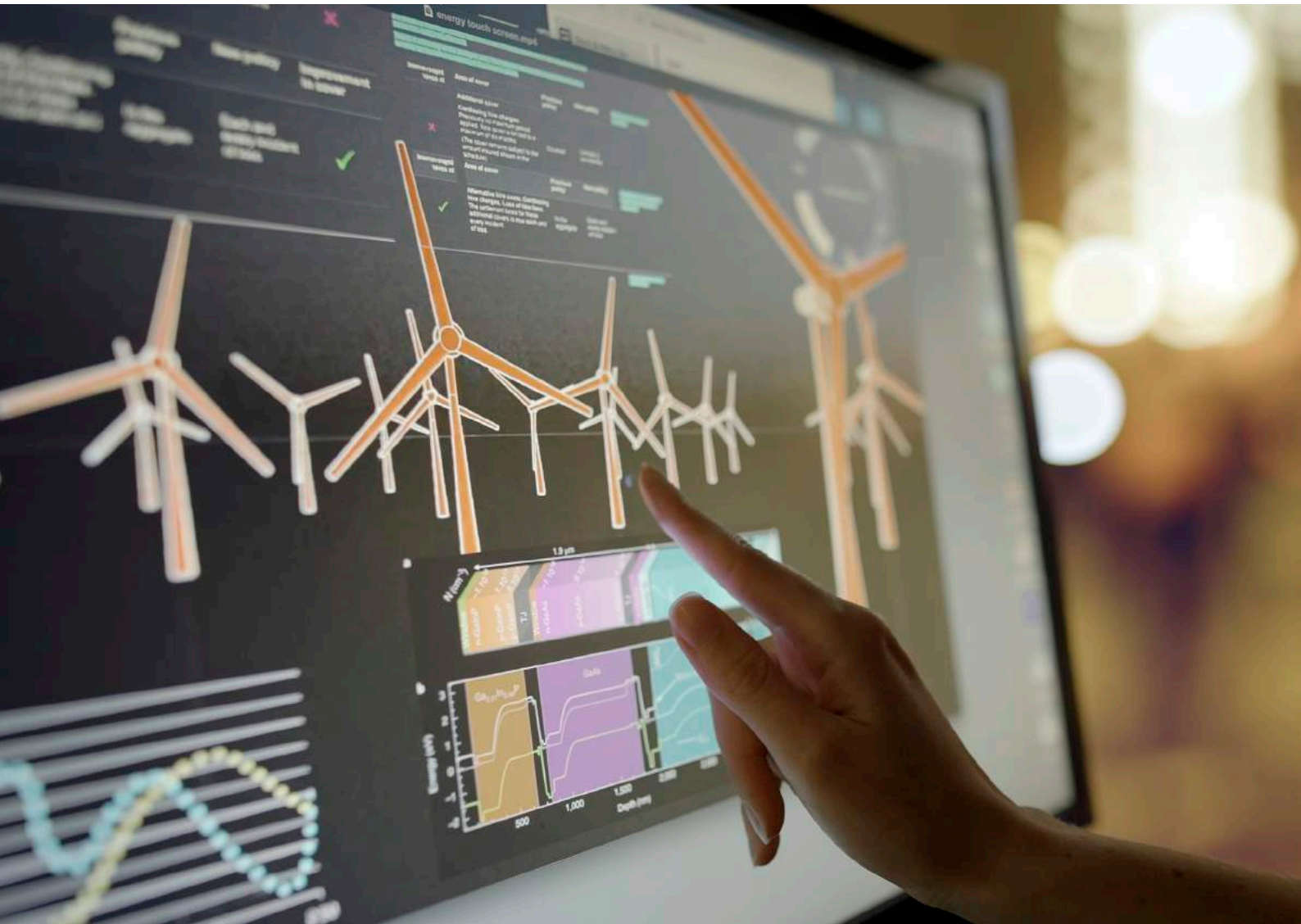
Green tech roles

Many roles incorporate digital aspects, across organisations and departments. Senior leaders are grappling with how to integrate digital transformation into their structures and develop workforce plans to consider future need and potential innovations. Some are ensuring that green tech is represented at the board level and among top executives.

> "The biggest risk is doing nothing. The companies slow to act or who aren't trying to think what 2030 looks like, will be left behind. This is a bigger risk than the threat of cyber security and crime"
>
> **Baroness Martha Lane-Fox, President, British Chambers of Commerce**

There is a strong emphasis on analysing vast data sets to better understand how we use energy and water and how to make infrastructure that provides those services, more efficient and lower carbon.

This report builds on earlier work by Sustainability First, including on Smart Meter Energy Data and the Public Interest Advisory Group (PIAG) [3] in 2021, which explored public interest opportunities from access to smart meter data and showed how this information could improve energy demand accuracy. Greater awareness of how much energy and water we use, as well as when and where we use them, could significantly improve management and efficiency in both sectors [4].



Overcoming challenges and gaps

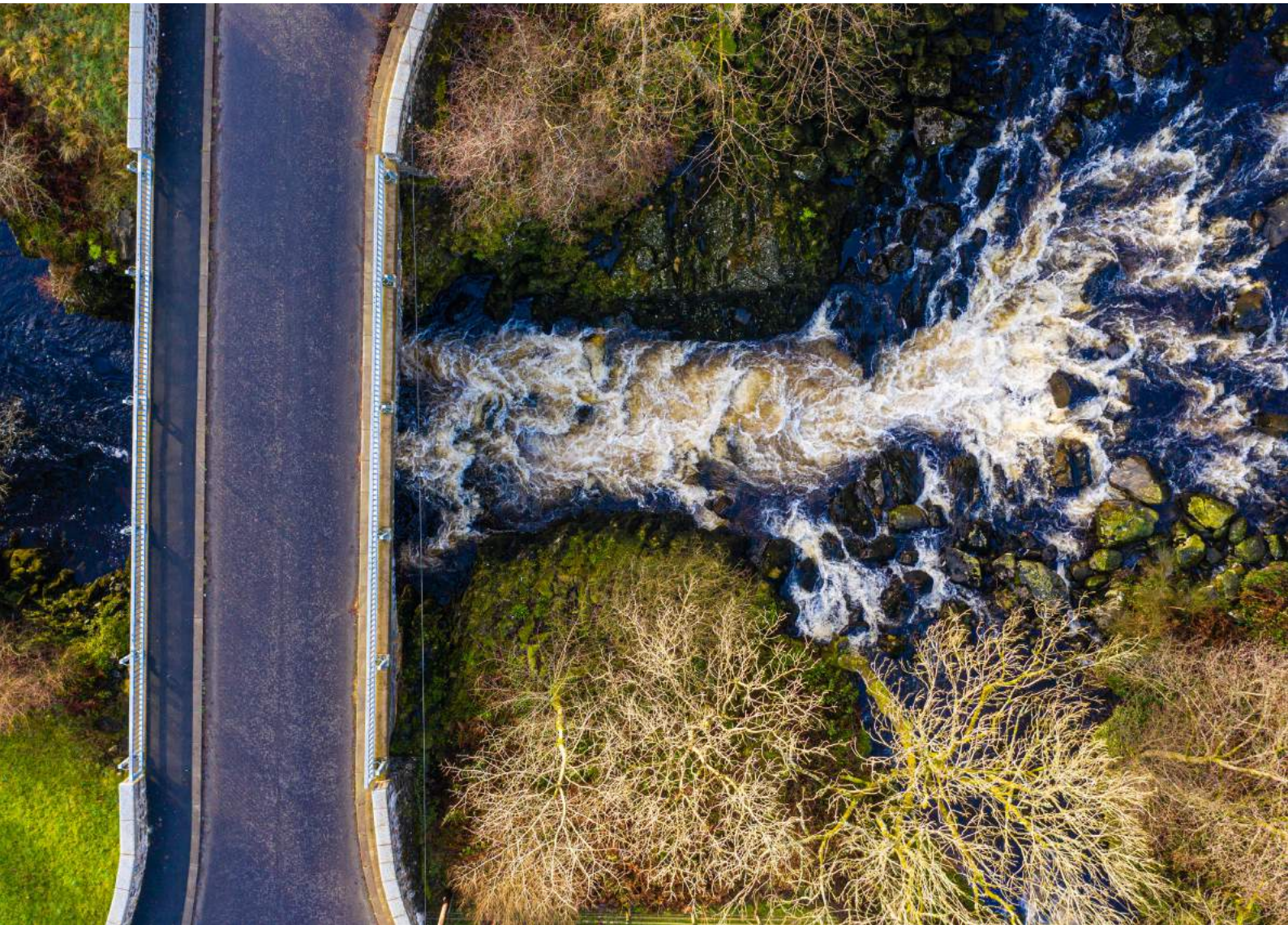
The energy and water sector face challenges such as negative public perception, unclear messaging on climate change, uncertainty caused by the absence of strong political leadership, shortages in skilled workers – including engineers, data scientists and hydrologists, intense competition for talent, ageing workforces, and insufficient diversity. There is a need for cultural shifts within companies, increased entry-level opportunities and practical skills development. Separately, there are concerns about data security and the uncertain impact of AI on employment.

Routes into Green Tech

Different routes into green tech include graduate programmes, apprenticeship schemes, STEM (Science, Technology, Engineering, and Mathematics) pathways and T Levels. Employers are becoming more open to candidates without degrees, prioritising practical experience and the ability to learn. However, routes into these sectors are often unclear. Clarity on the roles available, entry routes, and necessary skills are needed.

Desired skills and competencies

Employers in the energy sector, and to some extent water, focus on recruiting engineers. There is growing demand for people with expertise in computer science, data analysis, AI, coding, and software engineering. With emphasis on skills such as systems thinking, carbon accounting, and social and environmental metrics. As well as practical skills, employers seek candidates who are proactive and curious.



Attracting and retaining talent

Strategies to attract and retain talent vary, including collaborating with partner organisations to reach wider networks, targeted advertising, and flexible working arrangements. Young people increasingly seek companies with strong values and a positive environmental and social impact. Benefits, career progression, flexibility, and remote working are important, as well as salaries.

Equity, Diversity, and Inclusion (EDI)

The energy, water and environmental sectors lack diversity; historically older, white males from middle-class backgrounds have dominated the workforce. Recruiting diverse candidates, including women and ethnically diverse individuals, can be challenging, but some organisations are making this a priority.

The lack of diversity may deter underrepresented groups from entering the sectors. Organisations need to gather data to better understand the true picture of their workforce and understand multiple layers of exclusion. Actions include reviewing job roles for gender-neutral language, implementing anonymous CVs and unconscious bias training. Engaging young people and fostering an inclusive culture are also crucial.

> "Take a long-term view with a 3-5 year roadmap for equity, diversity and inclusion. Be honest and transparent about the journey you are on and where you are on that journey. This shouldn't just be quantitative. Talk about what it will look and feel like. It's not just about numbers, it is about the experiences people have."
>
> **Mac Alonge, Founder and Chief Executive Officer, The Equal Group**

Stakeholder recommendations

To fully embrace the potential of green tech, a collaborative effort is needed from employers, policymakers and educational institutions.

- Employers need to identify skills gaps, communicate the opportunities and improve energy and water literacy. They can help promote green tech careers through engagement with schools, Further Education and Higher Education institutions, sharing case studies, offering site visits, providing practical experience, and building partnerships. Cross-sector training, apprenticeships, and graduate programmes could offer exposure to various industries while reducing the emphasis solely on degrees.

- Policymakers and regulators need to maintain policy consistency, streamline planning processes, and promote data transparency. Working closely with educational organisations, they could help to embed green skills in education curricula, with further education and vocational qualifications promoted, and flexibility incorporated into apprenticeship criteria

- Educational institutions play a crucial role in raising the profile of STEM careers, particularly engineering, and building strong relationships with employers through open days, industry speakers, and engaging career advisors. They could promote digital skills, develop critical and systems thinking, facilitate placements, and focus on meeting market needs.



Messages for people pursuing green tech careers

More support is needed to help job seekers find roles and gain practical experience. There are exciting opportunities in the energy and water sectors, including digital and technological innovations. Currently job seekers need to be proactive in their research and networking. While engineering degrees are often recommended for operational roles, employers are increasingly offering apprenticeships, vocational training and opportunities to learn on the job.

Next steps

There is a significant opportunity to develop and promote green tech jobs and skills in the energy and water sectors due to the shift to cleaner energy, smarter systems, digital transformations, talent shortages, and a lack of diversity across these industries. Sustainability First would like to conduct a gap analysis of training and entry-level opportunities. This involves mapping existing schemes and identifying ways to enhance them. We have primarily interviewed employers, but believe it is also essential to engage with organisations that support young people, diversity, and vocational pathways.

We will explore the potential for a digital fast-stream programme - an entry-level opportunity for apprentices focused on underrepresented groups. Apprentices would rotate between different companies in the energy and water sectors, with job roles available at the end of the programme. This initiative would create a cohort of digital fast-streamers, fostering community support, knowledge sharing, and problem-solving. A multi-stakeholder steering group would guide the programme to ensure it meets sector needs. Other initiatives we are considering include: a digital skills hub to showcase digital careers in the energy and water sectors, a green tech career outreach campaign and schools engagement.



Introduction

The UK government has set an ambitious target to reduce our greenhouse gas emissions to net zero by 2050. The energy and water sectors have critical roles in addressing climate change, adapting to its impacts, cutting emissions, and enhancing biodiversity. This transition will lead to significant growth in green jobs and require new skills.

We are also experiencing a rapid growth in digital technology. From smart energy grids and intelligent water systems to data-driven analytics and predictive maintenance systems, digitalisation is reshaping operations, enhancing efficiency, and promoting sustainability. There is a need to build greater digital and data literacy.

> "The UK has relatively high levels of digitisation, with some of the highest levels of ecommerce. But we still have 10 million adults that struggle with basic online activity."
>
> **Baroness Martha Lane-Fox, President, British Chambers of Commerce**

This digital transformation is not only driving innovation but also creates a demand for skilled professionals in green tech roles, alongside new digital skills for the existing workforce.

> "We are seeing a big shift toward tech and tech-enabled roles. Each year we look at global corporate governance trends, and new technology comes up as one of the top three things Boards are concerned about, along with diversity and sustainability."
>
> **Sarah Galloway, Co-leader of the Global Sustainability Sector, Russell Reynolds**

There is a significant lack of diversity within the energy and water sectors, often dominated by older white males. To address this, concerted efforts are needed to attract underrepresented groups and young people. Initiatives promoting equity, diversity, and inclusion (EDI) are essential, as well as reducing barriers to entry. The case for greater diversity is not just moral, the business case is compelling too.

Engaging young people early requires rethinking education and training programmes to align with evolving demands, fostering creativity, problem-solving abilities, and digital literacy.
Our research report provides insights and recommendations to the energy and water industry, policymakers, educators, and prospective employees.

Clare Bonefant, a STEM recruitment specialist states: "the next boom will be in green tech." Companies working to reduce carbon emissions need people with STEM skills, especially with expertise in the green coding and green systems architecture. The information technology sector which generates an estimated 5% of global greenhouse gas emissions, also needs to reduce its carbon footprint [5].

Research approach

We conducted desk-based research, stakeholder mapping, interviews, theme analysis, and a roundtable discussion to develop insights and recommendations.

Desk-based research

This explored green jobs, skills, and tech opportunities within the energy and water sectors, encompassing a review of literature, reports, and data sources. Focus areas included green jobs, social determinants of health, equality, diversity, inclusion, education barriers for young people, skills, training, digital, and tech trends. Sector specific reports were analysed for tailored insights on energy and water, and we identified gaps in the existing literature.

Interviews

We interviewed stakeholders from across the energy and water sectors. For energy, this included suppliers, renewable generators, network operators, the system operator, energy service and technology providers, trade associations, charities, skills organisations, and innovation centres. For water, this included water and wastewater companies, research organisations, trade associations, environmental organisations, Ofwat and the Environment Agency. We also engaged with the Department for Education and charities that support jobs, skills, and apprenticeship opportunities. Participating organisations are listed in **Annex A**. Thirty five organisations were involved in interviews with chief executives, technology, and innovation leads, and/or directors of human resources. Interviews covered emerging trends, skills requirements, and diversity initiatives, using a standard set of questions, included in **Annex B**.

Roundtable discussion

A roundtable discussion with fifteen people enabled dialogue among energy and water stakeholders, educational institutions, and young people. We discussed talent gaps, explored pathways for individuals entering and progressing in tech roles, and how to enhance equity, diversity, and inclusion across the energy and water sectors.

Report development

The report integrates findings from interviews and roundtable discussions. By keeping the literature review separate, it emphasises emerging themes from the original research, highlighting best practices, success stories, areas for further research, and next steps.

Green tech jobs and skills - overview

What are green tech jobs and skills?

There are no universally agreed definitions of green tech jobs or skills. This report focuses on digital technology roles, which help combat climate change, achieve the net zero target and other environmental goals.

We draw on the Green Jobs Taskforce definition of a green job as: "employment in an activity that directly contributes to - or indirectly supports - the achievement of the UK's net zero emissions target and other environmental goals, such as nature restoration and mitigation against climate risks" [6]. And the OECD (Organisation for Economic Co-operation and Development) definition of green skills as: "those skills needed to adapt products, services and processes to climate change and the related environmental requirements and regulations" [7].

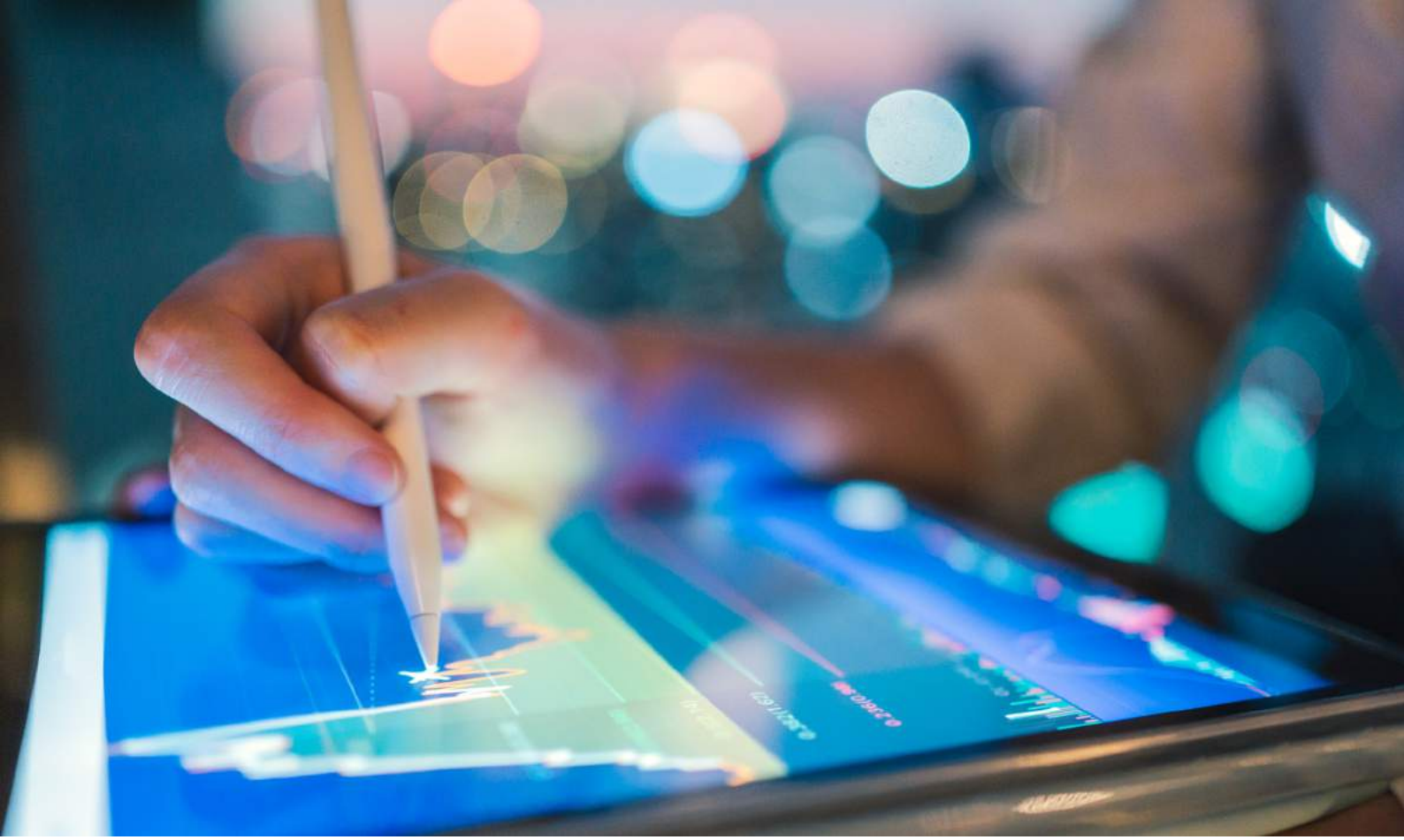
> Green tech is technology that is considered environmentally friendly based on its production process or its supply chain. It can be used as an umbrella term that covers technology and science to reduce human impact on the environment and covers a range of research areas such as energy, agriculture, and hydrology [8].

Many interviewees defined green tech jobs as those helping achieve the government's net-zero target, with some referencing a shift away from fossil fuels. Water firms emphasised climate adaptation, with environmental organisations stressing biodiversity.

> "I see green tech jobs in two ways: people specifically and directly contributing to decarbonisation such as delivering renewable energy, electric vehicles, heat pumps and grid infrastructure, which are dark green tech jobs. There is also a broader definition involving indirect jobs, including digital and data skills, which are light green, these are embedded across roles and contribute to a net zero and resilient
>
> **Emma Weaver, Climate Action Manager, Business in the Community**

Concerns were raised about the term 'green' being vague, overused and potentially part of greenwashing. Respondents noted that most jobs in the energy and water sectors could be or will be deemed 'green'.

> "Just because an organisation calls itself green or produces 'green' products, doesn't mean it is run sustainably. The terminology is changing, people are talking about decarbonisation rather than net zero, and climate tech. People, the planet, and profit are interrelated. The term 'green' can feel single issue."
>
> **Sarah Galloway, Co-Leader of the Global Sustainability Sector, Russell Reynolds**



We have been advised against drawing a strict distinction between the installation of physical technologies and digital roles. There is significant potential for installer jobs and those in the supply chain, to incorporate digital elements into their operations.

> "A wide range of roles are important to both enable and participate in digitalisation for net zero. Recently for example, there's been a shortage of forklift truck drivers, who are important for manufacturers and others to enable the transition to a more advanced and digitalised energy system... and although you wouldn't associate this role with using digital solutions, they use tablets, iphones and update systems live. New digital skills need to be there for everyone in the
>
> **Simon Harpin, Head of Policy, BEAMA (trade association for energy infrastructure and systems)**

We asked respondents about the portion of green tech jobs within their organisations and how many of these were digital jobs. It is impossible to say how many jobs are purely digital, but firms estimate it to be 10% or less. But an increasing number of positions incorporate a digital element. Companies are also buying in skills from other organisations, particularly in areas like artificial intelligence forecasting.

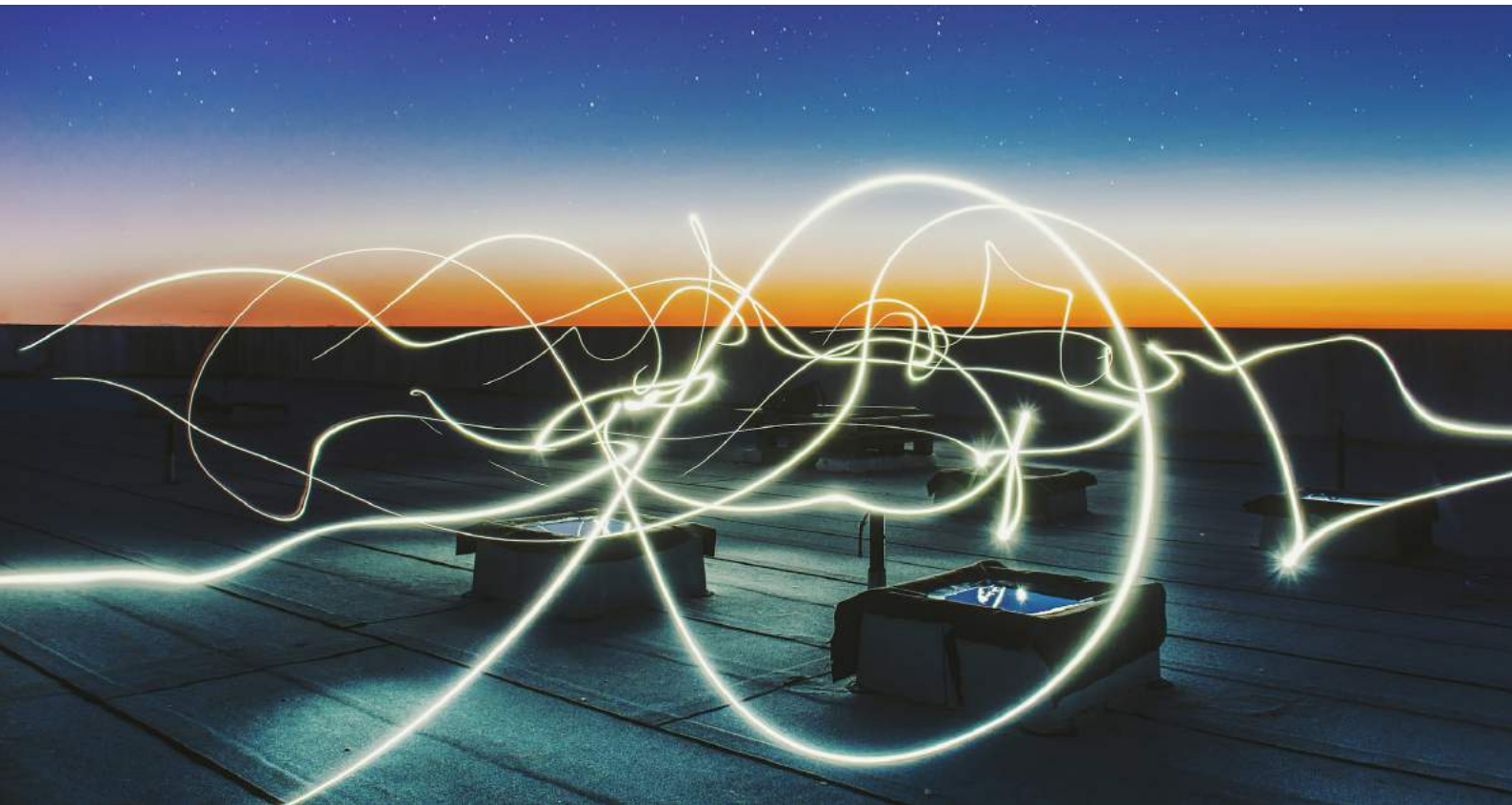
Digital roles span various departments. There is a significant focus in water and energy on collecting and analysing vast amounts of data, with AI and machine learning helping to manage these datasets and inform decision-making. Energy and water companies are increasingly shifting network operations to digital, to accurately understand supply, demand, and maintenance needs. Software development and cybersecurity are crucial for safeguarding critical infrastructure. Digital tools are also being used to improve the consumer experience. We have included a list of digital roles in **Annex C**.

Organisations are grappling with how to integrate digital into their operations. Some companies have created workforce plans, looking five and ten years ahead.

> "We are leading the Great Grid Upgrade with plans for significant investment in new infrastructure and job creation. We've outlined a 10-year workforce plan including managerial, physical, and digital green tech roles. We are particularly focused on skill development within the existing workforce and creating early career opportunities, through apprenticeship and graduate schemes."
>
> **Darren Peiris, VP & Group Head of Recruitment, National Grid**

Some are considering whether to create a dedicated digital team or to integrate digital resources across divisions. Certain organisations have appointed technology leaders to drive change, engage staff and stakeholders clearly, so that technology is represented at the top table. Sometimes the Chief Information Officer becomes a translator for how tech might transform the business for the Chief Executive. Both sectors recognise they have a long journey ahead to fully embrace digital tech, and need people to advocate for digital transformation.

> "All our people are in the process of going through an uplift programme to ensure they have a foundational level of digital and data literacy, regardless of the business area they work in... We are starting to develop a technical leader career pathway focused on digital and data technology.
>
> We are looking for technical leaders, not just technical specialists, but people who can coach and encourage others around them, who can engage with stakeholders outside of the organisation, who can think strategically about the future of technology, where it might go and how to make the most of it, so we can network globally about tech issues."
>
> **Emily Leadbetter, Head of People Experience, Electricity System Operator**



Green tech opportunities and roles

This section delves into digital roles within green tech. It starts by discussing opportunities that are applicable to both energy and water before highlighting specific roles unique to each sector. A list of example roles can be found in Annex C.

Huge investment

The energy sector is making huge investments in new low carbon technologies and infrastructure including wind turbines, solar panels, nuclear power, hydrogen, domestic renewables, heat pumps, new and upgraded networks and battery storage. The water sector is also upgrading ageing infrastructure, investing in new technologies and developing more resilient systems. This lower carbon future is creating jobs at every level, including in infrastructure construction, installation, innovation, operations, and maintenance. Traditional engineering and technical skills remain essential, with a growing need for digital competencies, as technology advances.

> "With orbital welding and robotics, people can now operate a weld from a screen remotely. They need a different set of skills, you're looking at gaming skills rather than hand skills."
>
> **Helen Higgs, Lead on Construction Workforce Capability, EDF Energy**

Digitisation and digital transformation

Energy and water organisations are consolidating information from multiple formats into centralised databases, ensuring accuracy and comparability.

> "Manufacturers are ensuring their data is in a 'single source of truth'. This means they are putting data from multiple sources, such as spreadsheets, hardcopy, independent databases, invoicing systems etc. into a single database, correcting and standardising it. This allows manufactures to provide information to the supply chain, pulling out reports quickly or even automatically. We're also helping companies to make their data consistent and comparable."
>
> **Nick Hayler, Director of Member Services, BEAMA**

Major focus on data

The energy and water sectors gather extensive data about supply and consumption patterns, customer demographics, the condition of their infrastructure, environmental criteria like air and water quality, wildlife populations, weather patterns, sensor readings, and financial transactions. Analysing this data, often in near real-time, is essential for optimising operations, decision-making and enhancing customer experience. The demand for skilled professionals in data science, engineering, and analysis is growing.



> "AI, data science and data engineering skills are needed for efficiently handling large volumes of data. There's a significant push in this field, leading to substantial growth in data teams."
>
> **Alastair Martin, Founder and Chief Strategy Officer, Flexitricity**

There is also a growing emphasis on democratising information, making data more open and accessible to the public.

> "Our ambition for data is that every citizen knows more about their rivers than government does. We want to democratise data and its collection, interpreting it in user-friendly ways."
>
> **Mark Lloyd, Chief Executive Officer, The Rivers Trust**

Some stakeholders believe that the transition to data and digital technologies will fundamentally alter how companies operate.

> "We need to change the mindset from an engineering company, to one that is insight, data and tech driven in the future."
>
> **David Hinton, Chief Executive Officer, South East Water**

Artificial intelligence and machine learning

AI has the potential to significantly expand what humans can do, although its full impact remains uncertain. AI can be used for predictive modelling, automating tasks, informing decision-making processes, and asset maintenance. Organisations see potential for AI to manage vast datasets and turn it into useful information.

AI supports complex system modelling, weather forecasting, and climate predictions, aiding utilities in anticipating renewable power output and extreme weather events. It could also make buildings efficient, support energy assessments, provide insights into behaviours, and integrate with smart building management systems.

> "Machine learning can help anticipate changes by thinking of tens of thousands of scenarios, that the human brain can't, and process this a lot quicker. Humans will need to embrace change, with a flexible mindset."
>
> **Emma Weaver, Climate Action Manager, Business in the Community**

Smarter system operations

Energy and water companies are increasingly using digital technologies to enhance their operations. This involves real-time monitoring of their networks through smart meters, sensors, and communication technologies. By harnessing data, they can predict potential failures, proactively conduct maintenance, and remotely control systems, thereby optimising efficiency and reliability.

> "We are using AI-based technologies to make sense of large datasets and extract valuable information. We use robot-mounted cameras or scanners to inspect underground pipes and tunnels – which generate hours of footage or data-rich 3D scans – and then use AI algorithms to analyse this information. This helps us quickly identify issues, such as sections needing repair due to a range of possible causes such as ground movement, tree roots or corrosion."
>
> **Dan Green, Head of Sustainability and Innovation, Wessex Water**



Electricity network operators can monitor and manage increased loads from electric vehicles and heat pumps, whilst water companies will be able to identify leaks in the system. Extending the lifespan of assets through monitoring and maintenance saves money in the long run.

> "Currently water networks are relatively placid. In the future, you'll get a burst main detected from a flow or pressure sensor rather than a customer phoning it in or us locating it, the sensor will detect it and the location, cutting the mains off automatically, opening valves and redirecting water around the burst main. It will then flag the issue, sending a message for a crew to fix it. For that you need sensors, automated valves, and flow monitors, so the system can control itself to a certain degree, until it needs a physical intervention."
>
> **David Hinton, Chief Executive Officer, South East Water**

Digital twin development

Both the energy and water sectors see potential for developing digital twin models - virtual replicas of a physical system or asset, such as a water treatment plant or an electricity network. It includes the physical components and their digital representations, continuously exchanging data to mirror real-world behaviour and conditions. This provides real-time insights into system performance, enabling predictive maintenance and modelling potential impacts of changes.



While the energy sector is beginning to use these models, particularly for renewable energy integration, the water sector is less advanced; instead it is prioritising integration of near real-time monitoring, smart meters, and sensors to improve efficiency. The transition to fully digital-led systems in water is anticipated to take at least five years to materialise.

Technological innovation

Technologies like nuclear fusion, electric vehicles, smart grids, hydrogen, carbon capture, utilisation, and storage (CCUS), and fast-charging batteries present opportunities for research, development, and implementation of cutting-edge solutions for cleaner energy. Innovations in the water sector include advanced filtration systems, smart water management, integration of nature-based solutions and development of desalinisation facilities.

> "There are various digital opportunities across nuclear, industrial sectors, and renewable energy. These roles involve applying digital technology to enhance operations and research, such as using drones and AI for wind turbine blade inspections, innovations like virtual reality headsets and AI-driven training programmes to improve safety and efficiency in complex tasks."
>
> **Matthew Lay, Head of EDF Nuclear Skills Alliance, EDF Energy**

There is scope to develop new technologies, products, or processes, including by leveraging digital solutions, data analytics and the Internet of Things (IoT), which refers to the network of interconnected devices, objects, and systems that communicate with each other and exchange data over the internet without requiring human intervention. For example, Microsoft recently used AI to identify promising new battery materials, with 70 percent less lithium [9].

Software development and cybersecurity

Within software development is the growing need for cybersecurity to safeguard critical infrastructure, protect sensitive data, and uphold customer and stakeholder confidence.

Customer experience

Customers are increasingly using digital platforms and applications, to monitor energy and water consumption and set preferences, remotely. Personalised interfaces provide ways to reduce usage, while digital communication channels like chatbots, mobile apps, and online platforms are increasingly helping customers.

> "The deployment of AI includes using chatbots for customer interactions. AI has the capability to converse with customers akin to human agents, leading some to predict the replacement of customer service agents. However, it's crucial to recognise that customers still prefer human interaction."
>
> **Matthew Lay, Head of EDF Nuclear Skills Alliance, EDF Energy**



Energy sector roles

Smart grid technologies enhance grid efficiency and responsiveness, while demand-side flexibility encourages consumers to adjust electricity usage in response to incentives, to help balance supply and demand on the system. Renewable energy modelling and forecasting rely on digital technologies like real-time data analytics and machine learning for accurate predictions. Electric vehicle charging employs software solutions and mobile apps for seamless transactions, and vehicle-to-grid (V2G) technology enables electric vehicles to support energy storage and demand-side flexibility by connecting with the grid.

Water sector roles

In the water sector, digital advancements transform water resource planning and management. Data on water availability and quality are collected, analysed, and mapped to predict future supply and demand accurately, aiding water allocation and conservation. Digital technologies and modelling support various aspects of water management, including flood and urban catchment modelling, wetlands modelling, and sustainable urban drainage systems design, enabling more accurate predictions and informed decision-making. Nature-based solutions harness natural processes to manage water resources better, while real-time sensor data facilitates continuous monitoring of water quality and prompt detection of contaminants.

> "We are investing in digital tools to improve water resource management and environmental protection, aiming to enhance asset efficiency and resilience. Our focus includes near real-time monitoring on how much water is available, how much has been abstracted, and how the different components of the water environment are affected, focusing on ecology. Telemetry advancements have increased the volume of data collected, requiring robust data handling and processing by abstractors and regulators, and improving accessibility of information to all those with an interest in water resources management."
>
> **Andy Turner, Water Resources Resilience Manager, Environment Agency**





Advanced filtration systems and membrane technologies further improve the efficiency and sustainability of water treatment processes using a combination of old and new technologies.

> "We use a combination of old and new technologies. In the old-tech corner there are fundamental microbiology and chemistry-based processes that underpin water and wastewater treatment. These are being complemented by newer tech, such as advanced methods of modelling, or analysing big datasets.
>
> At the same time as using established methods like anaerobic digestion, to treat sewage sludge and produce renewable gas, we are looking at more cutting-edge technologies that could produce materials such as biochar and sequester carbon in the process"
>
> **Dan Green, Head of Sustainability and Innovation, Wessex Water**

Overcoming challenges and gaps

This section outlines key challenges within the energy and water sectors, including developing skills and recruiting.

Poor reputation

Both the energy and water sectors face reputation challenges due to rising costs, perceived high profits and executive salaries, inconsistent customer service, confusing tariff options, lack of transparency in billing and environmental impact. Both sectors need to upgrade ageing infrastructure. Recent media attention on water quality and pollution exacerbates negative perceptions.

Lack of compelling narrative

While both sectors are actively engaged in addressing climate change and increasing resilience, these efforts are not being well communicated to the public.

> "We're facing competition from companies offering attractive salaries and narratives. We have a crucial role in achieving net zero emissions and having a positive impact on society. But we can't assume everyone understands or appreciates this."
>
> **Darren Peiris, VP & Group Head of Recruitment, National Grid**



Developing an exciting narrative, especially regarding the low-carbon transition, with tangible examples of initiatives and available career paths, could make both sectors more appealing to new recruits. Changing the industry's perception from its historical engineering-centric and male-dominated culture to something more inclusive is crucial. Clear communication is needed, without overly complex language. Water arguably has a harder narrative.

> "Utilities are inherently seen as dull. You need to have inspirational leadership, good career paths and compelling employee value propositions to get people to move into these sectors. Making water exciting is difficult when there's limited growth potential. With energy you can be part of the energy transition, with potential to make an impact and promote change."
>
> **Sarah Galloway, Co-Leader of the Global Sustainability Sector, Russell Reynolds**

Skills shortages

There's a significant shortage of skilled workers, especially engineers and in roles such as the installation of heat pumps and electric vehicle charge points. Companies find it hard attracting female engineering candidates. There is increasing demand and a shortage of talent in areas like data science, coding, and software development.

> "All companies want digital and data skill sets, so there is a scarcity of talent at the moment."
>
> **Sarah Galloway, Co-Leader of the Global Sustainability Sector, Russell Reynolds**

Specialised skills like hydrology and hydrogeology are highly sought after and in short supply. Ofwat highlighted the need for more environmental scientists with drinking water expertise. They rely on secondments from the Environment Agency, Drinking Water Inspectorate, and academia.

Competition for talent

Clean energy companies, including offshore renewables, are in competition for talent with traditional oil and gas sectors, which offer higher salaries and tax benefits. There's an opportunity to exchange knowledge and move experienced workers into clean energy roles.

> "Employers say it's challenging to get sufficient skills and develop the workforce needed to deliver the energy transition and net zero targets, there are lots of emerging technologies, new roles, and growing demand for individuals in existing jobs. They are looking at how to transition individuals already working in energy, such as oil and gas, to clean technologies, and how apprenticeships and technical education can support this."
>
> **Institute for Apprenticeships and Technical Education**



There is intense competition for data and digital talent from FinTech (technology in financial services). Utilities could learn from financial services who have experience of managing large data sets.

> "There is a lot of competition for talented people. We lack the glamour of some other employers. There's an opportunity to learn from other sectors and enhance our organisational capabilities by attracting talent from diverse backgrounds. In the energy systems area, we've actively recruited from financial services and banking with skills in handling large data sets."
>
> **Jim Cardwell, Head of Energy Systems Policy, Northern Powergrid**

Ageing workforces

Both the energy and water sectors are dealing with ageing workforces approaching retirement. Programmes are needed to facilitate the transfer of knowledge from retiring staff to newcomers, to maintain expertise. Contracting retired staff as expert consultants could be an option, as long as this does not impact their pensions..

> "We're seeing a significant loss of experience and knowledge across the industry, affecting both large and small companies. This trend is also seen within regulatory bodies, where there's been a decline in experienced personnel. We're also seeing many talented younger individuals entering the field, equipped with skills but lacking the depth of experience and knowledge that comes with time."
>
> **Denise Massey, Managing Director, UK Energy Innovation Centre**

Workforce development, redeployment, and retention

As well as attracting new talent there's a significant emphasis on redeploying talent into new roles, such as former fossil fuel employees into clean energy. Upskilling the workforce is crucial, for example, enabling engineers to integrate their expertise into digital systems. Talent retention is critical, as individuals with technical and digital skills are often susceptible to poaching. Flexibility, autonomy, benefits, and supportive policies are vital to retain staff.

Wider labour market challenges

Employment patterns have changed post pandemic, with remote, flexible and hybrid working often expected. The impact of Brexit on migration means it can be harder getting visas for foreign workers. Smaller firms and start-ups can face constraints that larger firms don't.

Company cultural change

Business models primarily focused on fossil fuels and maximising shareholder returns are outdated. Achieving net zero emissions, adapting to climate change, and embracing environmental social and governance responsibility is an urgent need. Senior leaders can drive cultural change that focusses on purpose and transition.

> "Culture is defined by what leaders, say, think and do. Leaders set the behavioural standards of a community or society. Without accountability, there is no personal consequence, no change."
>
> **Alan Mullett, Development Director, Energy Innovation Centre**

Lack of diversity

The energy and water sectors consistently grapple with a lack of diversity; older white men often dominate. Gender and ethnic diversity are frequently underrepresented, as many companies lack a strategic approach to attract diverse talent. Limited monitoring of recruitment efforts and insufficient data make it difficult to fully understand the extent of the issue. Some companies have implemented targeted recruitment strategies and diversity initiatives addressing women, ethnic minorities, economic deprivation, disabilities, neurodiversity, and mental health support.

Gender diversity in the tech sector remains low. Overall, 49% of UK workers are female but only 19% of tech workers are. One reason for this is believed to be low uptake of STEM subjects among young girls and the perception historically that these subjects are for boys. Similarly, a study by the Institution of Engineering and Technology (IET) found that young LGBTQIA+ were also less likely to take STEM subjects due to concerns of discrimination. However, people from ethnic minority groups are more represented in the tech sector than across the wider UK workforce [10].

> "The industry is dominated by large corporate entities and contractors, with smaller businesses on the fringes. Despite some progress, it remains entrenched in a corporate energy culture, posing challenges for women entering the field. We need more diverse role models, including women. Genuine diversity, encompassing various perspectives and approaches, is crucial for revitalising the sector."
>
> **Denise Massey, Managing Director, UK Energy Innovation Centre**



Young people and underrepresented groups

Numerous surveys have shown that young people are enthusiastic about working in green jobs, viewing them as modern, high skilled and interesting. But they are held back by a lack of knowledge and awareness of the opportunities. For example, data from the National Education Opportunities Network, (NEON) 2022, highlights that young people who are from low-income backgrounds are under-represented in degree apprenticeships, where people earn whilst they study [11].

Young people from certain demographic groups and backgrounds may face barriers to work that do not affect others. They include young people disadvantaged by their financial backgrounds, those with additional needs or Special Educational Needs and Disability (SEND), those from ethnic minority backgrounds, those who have been in care and those who have been involved with the criminal justice system [12].

Access to entry-level opportunities

Some companies are not able to offer apprenticeship and graduate schemes, or struggle to promote the wide range of roles available, resulting in lower uptake or lack of diversity in applicants. Rural areas face challenges, such as transportation issues. There are few entry level initiatives focused on digital skills. Using language that is inclusive when advertising opportunities is critical.

> "We noticed that our engineering apprenticeships used language in their job advertisements that is perceived as "masculine," which limits their outreach. By changing the language to be more inclusive, we saw an increase in applicants and subsequently a rise in appointments."
>
> **Sara McCann, Head of People / Lead HR Business Partner, South Staffs Water**

Uncertain impact of AI on jobs

There are public concerns that AI will affect jobs and might automate tasks, such as customer service, potentially leading to job displacement and reduced service quality without human interaction. Some believe AI may have less impact on jobs in energy and water sectors due to their physical delivery aspects, but uncertainty remains about its influence. Some organisations suggest AI will expand capabilities rather than displace people.

> "In Flexitricity's business area, AI and machine learning are not displacing jobs; instead, they handle tasks that were previously impossible without their capabilities."
>
> **Alastair Martin, Founder and Chief Strategy Officer, Flexitricity**

> "It's important to use the dividend of the growth in digital technology to focus on the added value that human collaboration delivers"
>
> **Jim Cardwell, Head of Energy Systems Policy, Northern Powergrid**

Ensuring data security

AI raises cybersecurity and ethical concerns, highlighting the need for robust data protection and guidelines. Some firms have discouraged staff from using platforms like Chat GBT, and opted for those where data can be safeguarded like Co-pilot. Vetting processes for candidates are crucial, particularly for critical national infrastructure, where access to sensitive data must be limited to trustworthy individuals. However, some high-security level positions, like those in the nuclear sector, face challenges with lengthy and intrusive vetting procedures lasting three to six months, which involve inquiries into personal and family matters, which can put off candidates.

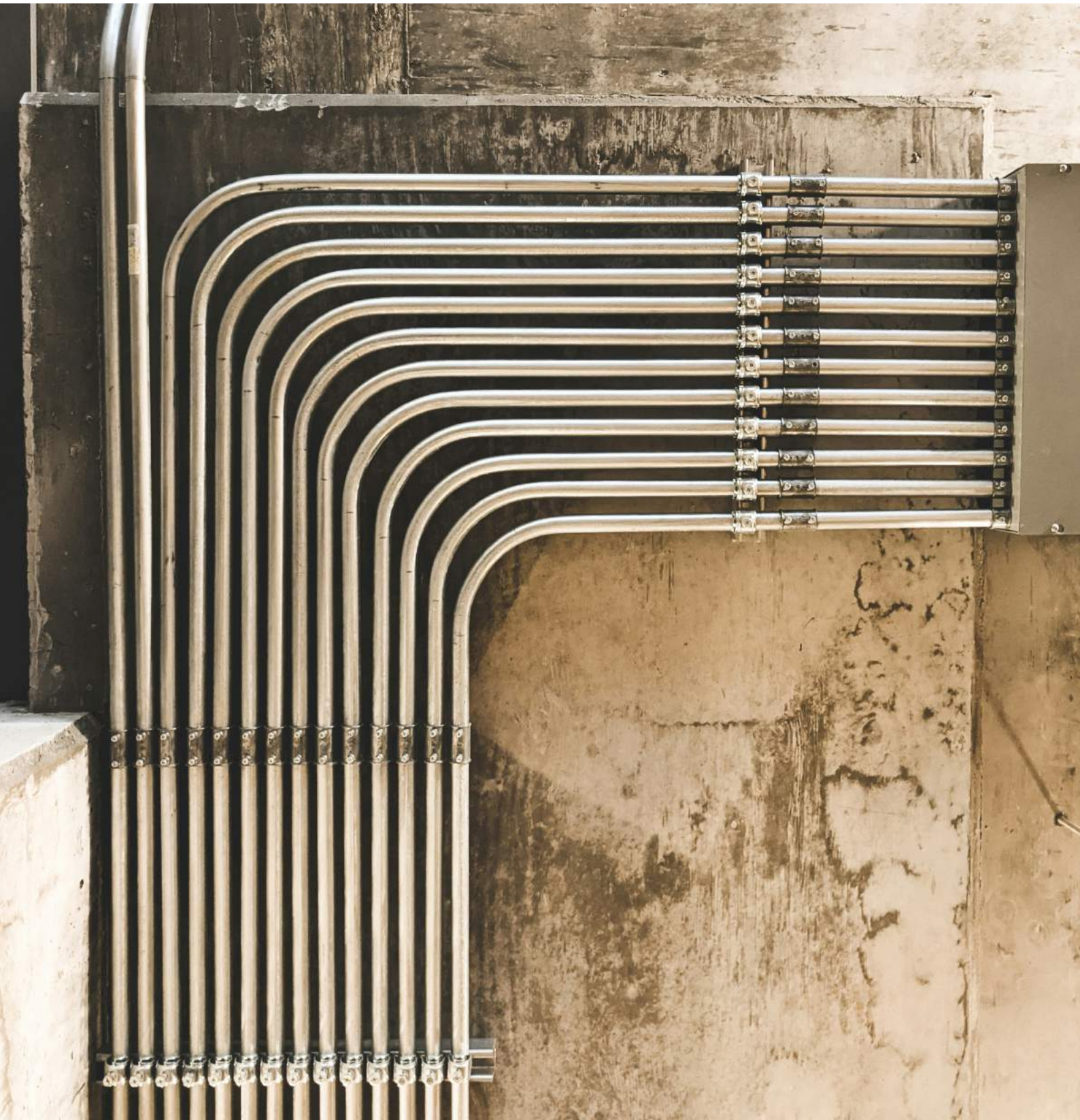
Lack of political leadership

The lack of clear political leadership and inconsistent messaging on climate change affects investor confidence in the energy and water sectors. Investors need consistent government policies to make informed decisions about funding. Failure by political leaders to provide a stable regulatory framework creates uncertainty and deters much-needed investment.

> "Politicians are massively influential. It's not helpful in creating a genuine desire for green tech or green jobs, if there's a sense of uncertainty about whether you will have a career or not. These jobs are going to be available and we're going to help make them happen. That's an important narrative for politicians to set out."
>
> **Paul Spence, Director of Strategy and Corporate Affairs, EDF Energy**

Routes into green tech

This section considers various pathways into green tech roles, outlining the necessary qualifications, skills, and competencies. It emphasises the importance of mentorship, training, apprenticeship programmes, and education in fostering inclusivity and considers future skill requirements and strategies for attracting and retaining talent.



Qualifications and training

Graduates

For green tech roles, organisations often take on recruits with environmental, engineering or computer science degrees. Larger organisations may offer graduate schemes and early career programmes that provide experience in different parts of the business. Some firms recruit from their supply chain and locally as well as bringing in talent from the oil and gas sector. Some universities offer placements for work experience and some employers sponsor degrees.

> "We collaborate with University College London (UCL) to provide placements for masters students specialising in energy, sustainability, and data. We share data-related challenges and the tutors select the two that are most. Students then apply to base their theses on solving these problems."
>
> **André Pinho, Chief Technology Officer & Co-Founder, Paua Tech**

Employers are becoming more open to candidates without degrees, and the grade of degree is becoming less important. In an attempt to democratise recruitment, some organisations no longer review CVs at the interview stage for apprenticeships and graduate appointments.

Apprenticeships

Apprenticeship schemes combine practical experience with classroom instruction. They typically last from one to four years, and may involve collaboration between industries, educational institutions, and government bodies. Funding is often facilitated by the government's apprenticeship levy, with employers covering salary expenses.

> "Apprenticeships are a big gap for the sector. National Grid offers apprenticeships as an alternative path to starting a career without the need for university education, attracting individuals from diverse backgrounds. Half of our intake consists of apprentices who enter the workforce, learn valuable skills, and pursue long-term careers with high engagement and low turnover rates. It can take five to eight years to fully train and develop engineers, while non-technical roles in the corporate office typically require one to two years. National Grid's CEO himself started as a graduate, reflecting the organisation's commitment to developing talent internally."
>
> **Darren Peiris, VP & Group Head of Recruitment, National Grid**

Companies stress the importance of developing apprenticeships across supply chains to enhance industry-wide skills. Rotations of three to six months allow apprentices to gain exposure to different teams and roles, with opportunities for long-term positions afterward. Cross-sector apprenticeship schemes are welcomed by some companies, with initiatives like the Power Academy potentially expanding to digital tech roles. The Institute for Apprenticeships and Technical Education collaborates with employers nationwide to create standards, with specific expertise provided by panels like the Energy and Utilities Advisory Panel.

Many programmes offer clear career progression paths, enabling apprentices to advance to higher levels or pursue further education, which fosters loyalty and reduces turnover rates among apprentices. In addition to young people, apprenticeships now attract more mature individuals, bringing a wider range of transferable skills. Apprenticeships with well-known organisations are often oversubscribed. Many candidates could be redeployed elsewhere, while small and medium sized enterprises find it harder to offer apprenticeships.

> "We understand that some small and medium sized businesses face challenges bringing on apprentices. For example, they may lack the confidence to employ an apprentice, especially as a new business, as they need to be able to consistently pay wages for 18 months to 3 years. The government has recently increased support to cover the full cost of training for any apprentices up to the age of 21 employed by small businesses."
>
> **Institute for Apprenticeships and Technical Education**

T Levels

Technical and vocational qualifications are increasingly valued as an alternative route to traditional higher education. T Levels are two-year, level 3 technical qualifications that follow GCSEs, offering vocational education and work experience for students aged 16 to 19. They are being rolled out in a phased approach in colleges, schools, and other providers. Each
T Level is equivalent to three A Levels and includes an 80% classroom-based and 20% industry-placement structure. This blends academic and technical training, preparing students for skilled employment, further study, or apprenticeships.



Twenty T Levels will soon be available, with practical options like building services engineering for construction (electrical installation pathway), along with three T Levels focused on digital and data fields. T Levels have been developed with input from colleges, employers, and delivery partners, to ensure that the qualifications meet the needs of industry and give students a head-start in their career. According to the Department for Education, last year 97% of T Level students who applied for higher education received at least one offer. In 2022 providers recruited around 10,200 new students to T Levels – more than double the 2021 figure.

> "T levels give people the opportunity to gain qualifications, practical experience, and transition into workplaces to acquire essential employability skills. T Levels in data will be especially beneficial, focusing on how to use data and tell the story. It's not just about formulas and datasets, it's also about understanding the data's significance, its implications, and how to apply it effectively to drive business decisions and enhance customer experiences."
>
> **Gemma Betney, Head of Workforce Demand and Resourcing, Anglian Water**

Science, Technology, Engineering, and Mathematics (STEM)

Across the energy and water sectors there is an emphasis on STEM skills, particularly for operational roles. This runs through from GCSEs (level 2), A-Level and T-Level (Level 3) and equivalent qualifications like BTEC (Business and Technology Education Council) and NVQ (National Vocational Qualification), to degree level. Attracting young people's interest in these subjects early, at school is needed. Some organisations recognise the importance of the arts to enhance learning and creativity, and have extended STEM to STEAM (Science, Technology, Engineering, Arts and Mathematics).

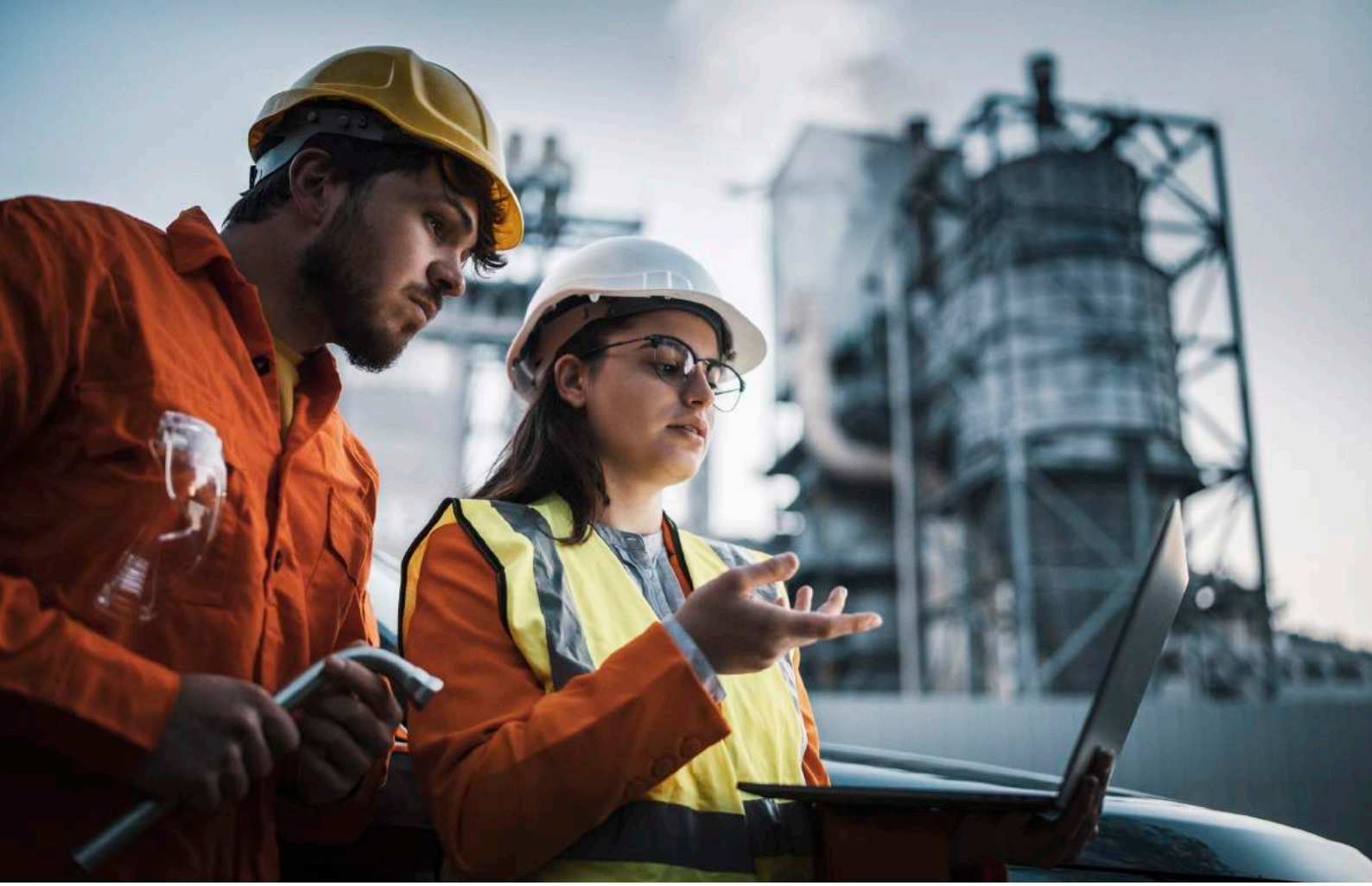
> "We're evolving from a focus on STEM to talking about STEAM - Science, Technology, Engineering, the Arts and Maths. Because when you look at some of the great minds and geniuses, they don't just focus on one aspect, they engage the left brain and right brain."
>
> **Emily Leadbetter, Head of People Experience, Electricity System Operator**

Practical experience

Employers are increasingly valuing people who can learn on the job, with some prioritising practical experience and ability to learn over qualifications, sometimes removing qualifications from job adverts. Real-world experience of past digital projects are sought. However, obtaining practical experience can be a challenge without the necessary technical skills or industry connections.

Vocational training and skills bootcamps

Some organisations provide vocational training and leadership programmes, aimed at assisting young people and career changers, especially from underrepresented communities.



Skills bootcamps are intensive, sector-specific, short-term training programmes aimed at equipping individuals with skills needed in high-demand industries. These bootcamps typically last up to 16 weeks and offer flexibility for learners to balance their studies with other commitments. They cover various fields including digital (like data engineering, software development, and marketing), technical (such as construction and engineering), and green (including electric vehicle maintenance and heat pump technology).

> "Skills Bootcamps have been designed with employers to meet short-to-medium term skills shortages and boost productivity. They are 16-week courses designed to address skill shortages, and are free to learners. They are primarily funded by DfE, with large businesses paying up to 30% of the total cost, 10% for SMEs. Skills Bootcamps offer participants with job interview opportunities upon completion. They are organised by employers in collaboration with training providers, with procurement at national or local levels. They are available in a broad range of sectors, including digital, HGV driving, green skills, early years education, and
>
> **Ali Flanagan, Policy Advisor, Department for Education**

Moving between sectors needs to be encouraged. For instance, individuals trained as smart meter engineers might be redeployed for Electric Vehicle (EV) charge point installation, but current barriers like the requirement for full electrician qualification hinder this transition.

> "Smart meter installers have compatible skills for electric vehicle charge point installation, so they could be retrained and redeployed. However, they would need to be fully qualified as electricians. There could be a more flexible approach, to enable skill to be transferred, to support the energy transition."
>
> **Stephen Barrett, Director of Membership and Strategic Engagement, Energy and Utility Skills**

In January 2024, the Department for Education launched "It All Starts with Skills," a campaign to engage learners and employers, promoting government-funded qualifications and programmes like Skills Bootcamps to enhance skills and support economic growth. The Lifelong Learning Entitlement (LLE) from 2025/26 offers a £37,000 loan for up to four years of post-18 education. It covers full years of study at higher levels and, for the first time, valuable course modules, allowing flexibility in learning pace and choice of study providers. Learners can space out their studies and build qualifications, enhancing access to life-changing skills.

"I began my journey into green tech during the Covid-19 lockdown. Meeting a video game developer sparked my interest in programming, particularly Python. With free online resources, I taught myself to code, realising the value of community and networking for learning. Mentorship from groups like Ladies of Code London and now Tech Risers Women guided me into ensemble coding projects, bringing in people from around the country and world. I saw how Python was used in data science and how this was applied in the energy sector, along with important softer skills like communication. I saw the obvious digital skills gap, people making data-driven decisions with outdated forecasting models and Excel based processes.

Despite the scarcity of female data scientists in the energy sector, I persisted in upskilling, being curious and finding new ways to approach challenges for the sector. I attended networking events online, and searched for opportunities on LinkedIn. I now work as a Digital and Data consultant for the Energy Systems Catapult alongside Data Scientists."

Elisa Evans, Digital & Data Consultant, Energy Systems Catapult

Unclear pathways

The ways into jobs within energy and water are often unclear and complex.

> "Young people don't know what all the opportunities are, the breadth of roles and the levels of reward, or how to build the skills and career path to get there. They don't know anyone who's working in that area already, to know how to get started."
>
> **Paul Spence, Director of Strategy and Corporate Affairs, EDF Energy**

There is an opportunity to showcase potential roles and skills more clearly. The Institute for Apprenticeships and Technical Education has been working on developing occupational maps to assist learners and career advisors in navigating this space.

"We run a transformative environmental youth leadership programme called Bright Green Future (BGF), focusing on diversifying the energy sector and empowering 16-19 year olds across the UK. Participants engage in immersive residential experiences, interactive workshops, and career webinars. The programme fosters personal growth, environmental awareness, and career exploration.

A recent cohort saw 70% of students being young people of colour, with 92% reporting increased sustainability knowledge and 96% feeling more confident in considering sustainability careers. BGF was last funded by National Grid ESO."

Ian Preston, Director of Household Energy Services, Centre for Sustainable Energy



The Bright Green Futures residential at Mill on The Brue in Somerset. August 2022.

Sought-after skills

The following skills are in high demand and face a shortage:

- **Engineering** – there is a strong emphasis in the energy sector, and to some extent the water sector, on recruiting skilled engineers. Including basic degrees in electrical and mechanical engineering, or a Higher National Diploma (HND). Some companies require engineers to attain chartered status for operational roles, mainly due to safety requirements. Whilst others will accept individuals with equivalent experience.

- **Computer science, digital and data** – specific skills such as computer science, data analysis, use of AI, coding, programming, software engineering and mathematics, are highly desired especially when combined with sector knowledge.

- **Experience of data and programming tools** – some companies look for experience or provide specialist training in data and programming tools, such as in Microsoft Power BI which allows users to visualise and analyse data from various sources, and Python, a programming language used for data analysis, simulation, scientific computing, and modelling.

> "We require specialised training in Python and R programming for our modellers, as the complexity of their work surpasses what is typically taught in universities. Recruiting individuals with these skills is challenging. Many of our teams, whether local or national, use Microsoft Power BI apps to analyse and manipulate data in novel ways. While some employees possess these skills upon entry, others do not, highlighting the need for additional and bespoke training."
>
> **Pam Reynolds, Training and Skills Senior Advisor, Environment Agency**

- **Water management** – this requires a range of skills spanning science, chemistry, biochemistry, biology, mathematics, chemical engineering, civil engineering, hydrology, and geography.

- **Systems thinking** – many companies recognise the need for interdisciplinary skills and systems thinking to address climate change effectively.

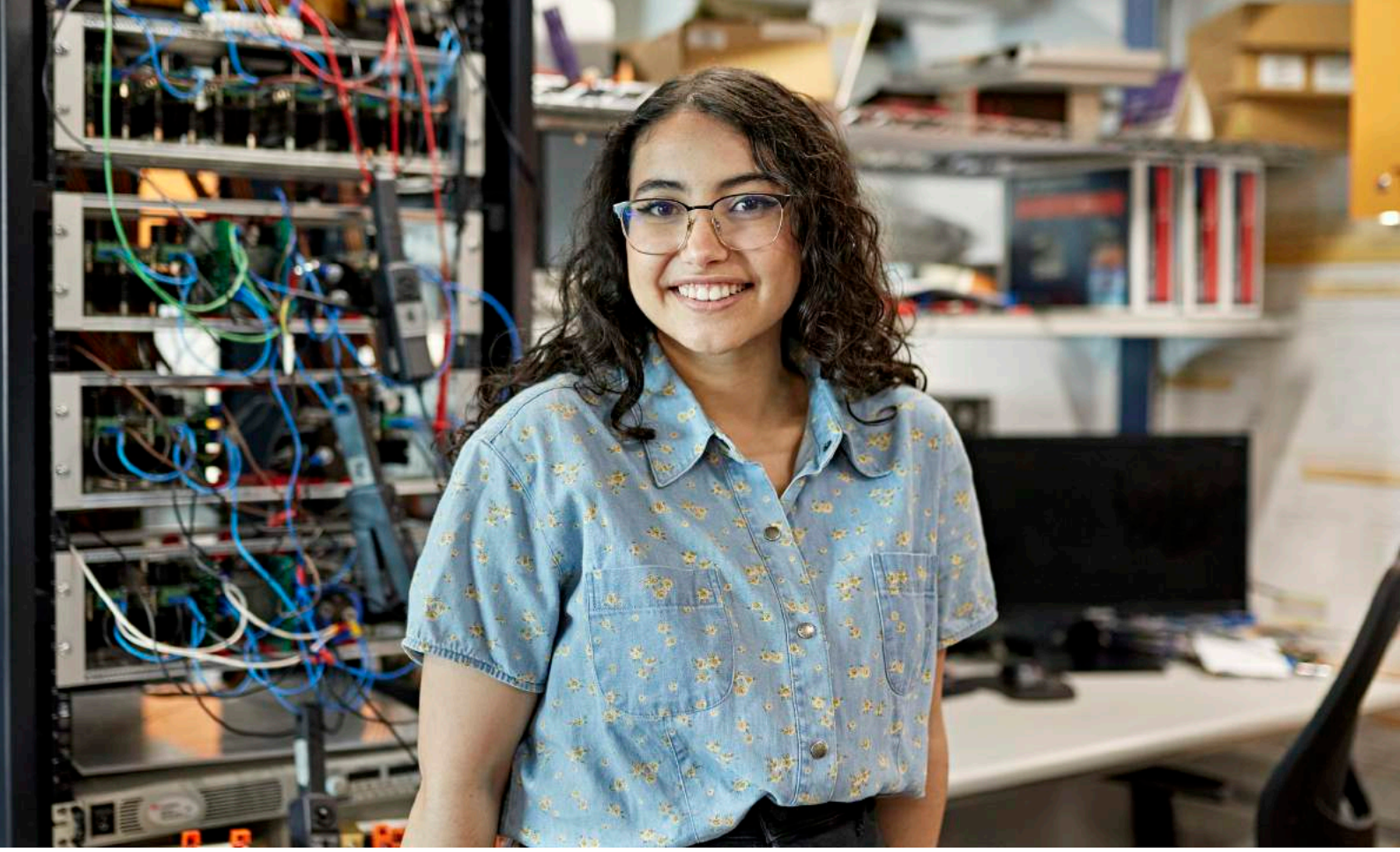
> "You can't wait until university, you need to get people engaged, excited, and interested in energy, utilities, and green tech much earlier. The difficulty is that things change so quickly. The tech I use now didn't exist when I was at university so there's an element of having to learn on the job. What's needed is a basic underpinning of logical thinking, problem solving and systems thinking."
>
> **Emily Leadbetter, Head of People Experience, ESO**

- **Accounting** – there is a growing emphasis on carbon accounting, and social and environmental metrics for responsible business reporting.
- **Core skills** – numeracy, literacy, and communications skills. Some apprenticeship roles require certain levels in Maths or English.
- **Wider skills** – including flexibility, problem-solving, understanding of human behaviour and emotional intelligence, are also valued by employers. Employees need to be adaptable to continuously changing landscapes in energy and water. Organisations

Plan International commissioned research into young people's preparedness for the green economy. Of the skills they though most important were environment and ecosystem skills, leadership and strategic thinking, research, and data analysis and finally adaptability, flexibility and resilience [13].

- **Positive attitude and work ethic** – employers highlighted the need for a proactive approach, integrity, curiosity, willingness to engage, and passion for the subject.
- **Focus on strengths** – some organisations are shifting from competency-based questions such as: "tell me about a time when…" to strength-based questions: "what would you do if…". This shift allows candidates with less experience to showcase their potential. As a result, organisations are seeing a broader range of applicants and more diverse pools of candidates.
- **Work experience** – employers emphasise the importance of practical work experience. For specialist digital roles, this may include a portfolio showcasing past projects, designs, and practical outputs. This should demonstrate a candidate's ability to achieve results, whether through building software tools or handling server-related challenges. Real-world experience and insights into problem-solving are crucial aspects that illustrate how well they can handle situations.
- **Skills for the future** – companies highlighted the growing need for digital skills and the potential for AI. Organisations highlighted that vocational qualifications and apprenticeship programmes are geared toward the existing job market.

> "The current skills system is providing what industry needed five years ago and it is not keeping pace with what the industry needs now or in future."
>
> **Emma Weaver, Climate Action Manager, Business in the Community**



Attracting and retaining talent

Organisations use human resources teams or executive search firms to find suitable candidates and often collaborate with partner organisations to reach wider talent pools. For large infrastructure projects social regional partnerships are critical, as organisations cannot always rely on individuals from immediate areas. Some firms target specific demographics, postcodes, and educational institutions in more deprived areas.

Candidates commonly discover opportunities through job sites, LinkedIn, and personal connections, highlighting the importance of networking. A strong brand plays a crucial role in attracting top talent. Emphasising a sense of purpose, training opportunities, and aligning company values with employee expectations are crucial for retaining talent, especially considering the evolving priorities and attitudes of today's workforce, including on mental health and flexibility.

> "I've noticed that students are much savvier than I was at their age. If they see a company saying something but not doing it, they lose interest and move on quickly. They want to understand the company's values. This plays into their decisions about taking a job and staying with the company long-term. They need to see action, constantly from the company, otherwise they won't stay, they'll go
>
> **Paul Sobers, UK Graduate and Student Recruitment Lead, National Grid**

Post-COVID, employees expect a greater degree of flexibility and an emphasis on work life balance is crucial to retain people. Some start-up organisations, unable to compete with the salary packages of established employers, offer equity in the business as another way to attract talent and promote a sense of ownership among employees.

> "We offer equity in our business to all employees as a significant incentive for retention. Providing equity in a start-up not only fosters a sense of ownership among the team but also enhances the overall attractiveness of the compensation package, especially when it's challenging to compete on salary
>
> **André Pinho, Chief Technology Officer & Co-Founder, Paua Tech**

Being part of a bigger vision is also a key attraction for employees.

> "There is a difference between recruiting traditional power systems engineers versus tech, digital and data people. One of our external stakeholders in the tech space said, that when you talk with people working in our control room, who control the flow of power around the network, many of them are driven by passion for being the people who keep the lights on. They feel a strong sense of purpose and immense pride. But that may not work in the same way for tech and AI
>
> **Emily Leadbetter, Head of People Experience, Electricity System Operator**



Equity, Diversity, and Inclusion (EDI)

This section examines how major green tech employers and agencies are addressing talent gaps and enhancing Equity, Diversity, and Inclusion (EDI). It discusses diversity challenges and strategies for promoting talent.

Most respondents highlighted the lack of diversity in the energy and water sectors, where older, white males from middle-class backgrounds predominate. Many organisations aim to reflect the demographics of the communities they serve or the UK population but struggle. They highlighted difficulties in recruiting diverse candidates, including the underrepresentation of women, ethnically diverse individuals, and those from lower-income communities. Initiatives promoting equity, diversity, and inclusion are vital.

> Organisations excelling in gender, racial and ethnic diversity tend to be financial leaders. Diverse companies often attract top talent, leading to enhanced customer focus, employee contentment, and better decision-making [14].



Approaches to enhance EDI

Make diversity and inclusion a priority.

Organisations should be honest and transparent, acknowledging historical discrimination. Open communication about challenges, goals, and progress builds trust and accountability. A clear diversity statement with tangible actions needs to be adopted across departments. Beyond the moral case for diversity, the business case drives innovation, better decisions, greater understanding of diverse customer bases and improved customer satisfaction.

Gather data to measure progress.

Organisations need to know the makeup of the workforce to understand what needs to change, including attrition rates and retention levels across different groups. Collaboration with supply chains to promote diversity initiatives at all business levels is crucial. Some organisations focus on specific diversity targets, such as percentages of leadership positions held by certain groups. Narrow goals may not always be the most helpful; nuanced diversity metrics should be developed.

Ensuring equal pay and fair working conditions for all employees, regardless of gender, race, and other demographics, is vital, as well as plans to address disparities and report progress. Some organisations publish their gender and ethnic pay gaps. Regularly assessing diversity metrics and adjusting strategies based on feedback is important.

Understand multiple dimensions and lived experiences.

Gender diversity is a significant challenge highlighted by many respondents.
It is crucial to consider how other characteristics like race, sexuality, disability, and socioeconomic status overlap. Analysis in this area often lacks depth and coherence. Some companies have implemented supportive policies targeting various groups, such as those with disabilities, neurodiverse individuals, and members of LGBTQIA+ communities. Actively listening to feedback from employees with diverse backgrounds and understanding their lived experiences helps address barriers to inclusivity. Cross-industry Initiatives are also important.

> "Gender diversity has got worse not better. This is due to a combination of factors, including child caring responsibilities during the Covid pandemic, the specificity of skills in technology, and micro and macro cultural reasons. There's a smaller pool of women. There is no one answer. If there was, we would have done it. It takes many micro actions, like how you advertise, recruit, appraise and support people in the company. There is more understanding than there has ever been on diversity issues. There has been talk, now we need to see specific actions."
>
> **Baroness Martha Lane-Fox,**
> **President, British Chambers of Commerce**

Showcase diverse role models.

Highlighting success stories and role models is vital, including featuring visible female and ethnically diverse leaders, as well as different socio-economic backgrounds. This can serve as inspiration for women and underrepresented groups to pursue careers in the field. Refreshing imagery and language in job postings and marketing materials can help attract a broader employee pool. However, differences between advertising and organisational realities can lead to disappointment.

> "Using diverse stock imagery can come across as disingenuous. Especially when people come in and see that the reality is different. Organisations should use case studies of real people, and if they don't have any, that should ring alarm bells."
>
> **Mac Alonge, Founder and Chief Executive Officer, The Equal Group**

Using real case studies of diverse employees and sharing their experiences authentically can effectively showcase the inclusivity of the organisation.

> "We highlight success stories of people within the energy sector to inspire others. We emphasise the importance of diversity in leadership, noting that diverse leaders are more inclined to build diverse teams. Most of the senior leadership team are women and there is dedicated Chief Diversity Officer. Everyone shares responsibility for promoting diversity. Through over sixteen inclusion and diversity groups, we actively work to integrate diversity into everyday operations. Ultimately, National Grid aims to have a workforce that reflects the diversity of the UK, as we serve all communities across the country."
>
> **Darren Peiris, VP & Group Head of Recruitment, National Grid**

Develop fair and inclusive recruitment practices.

To enhance diversity, some organisations have joined up with recruitment firms or educational institutions and community organisations to attract candidates from underrepresented groups. Cultivating an inclusive culture involves reviewing job roles and adverts to ensure gender-neutral language and avoid jargon that may deter potential candidates.

It is critical to address unconscious biases; measures such as anonymous CVs, unconscious bias training, and diverse interview panels help promote fair hiring. Measures like an informal meeting with one of the interviewers before formal interviews, can foster a sense of belonging and familiarity for diverse candidates.

> "The familiarity you feel when walking in the room affects your confidence and comfort level, which impacts your performance. A solution that we've implemented with some organisations for senior level appointments is for someone from the interview panel to meet a candidate for an informal coffee prior to the interview, say a week before, so there's at least one familiar person at the table, which helps give a sense of belonging."
>
> **Mac Alonge, Founder and Chief Executive Officer, The Equal Group**



Actively reach out to young people and underrepresented groups.

Engaging early with schools and communities in STEM subjects and promoting careers in the energy and water sectors is vital for fostering a diverse talent pool. Recruitment efforts need to include higher education colleges and non-elite universities, specifically those with high percentages of women and ethnic groups. Organisations can also partner with youth employment organisations, young people's networks, and universities, leveraging social media platforms to connect with young people. Using engaging video content on these platforms can help.

Some organisations work with local and regional partners, such as local authorities, prisons, charities and disability forums to offer employabiity support. While inspiring young entrants is important, providing opportunities for older workers is also crucial, as they bring valuable skills, knowledge, and perspectives. Some organisations are actively facilitating knowledge transfer from outgoing employees to new hires.

Create an inclusive culture.

It can be challenging for companies in the energy and water sectors to get the culture right. Head office and operational sites tend to have distinct cultures. Ongoing support, networks, and policies can help foster a sense of belonging for individuals from diverse backgrounds. Employees need to be encouraged and supported through open discussions, feedback, and ideas-sharing. Mentorship programmes, including reverse mentorship initiatives, help individuals build confidence. Some organisations promote family-friendly policies, with flexible work arrangements, maternity and menopause support.

The energy and water sectors are aware of the need for change. It is critical that organisations prioritise EDI, with clear initiatives to target, recruit and support underrepresented communities.

Stakeholder recommendations

Recommendations for energy and water sector employers

- **Communicate career opportunities** - provide clear communication about green tech opportunities and raise awareness of career pathways. Use short videos, first-hand experiences, and case studies to showcase the array of opportunities available.
- **Clarify the existing skills gaps** – across the energy and water sectors and develop targeted initiatives to address these.
- **Engage early with schools** – to promote STEAM and increase energy and water literacy. Offer opportunities for students to see technology in action through visits to industry facilities, control rooms, and other relevant sites.
- **Provide practical experience** – through internships, apprenticeships, and hands-on training.

> "We have a supported internship programme where we invite people from schools with special educational needs to do a placement in the organisation, supported by job coaches. Some have been absolute whiz kids with data. We had one situation where two teams ended up both wanting to offer one of the interns a job at the end of their internship because the individual's data modelling capabilities were off the charts."
>
> **Emily Leadbetter, Head of People Experience, Electricity System Operator**

- **Develop long-term partnerships** – between companies, regulators, and government, working with local authorities, universities, and further education colleges on local employability initiatives and to promote sector awareness, job opportunities, and facilitate work experience.
- **Develop an entry-level initiative** – for apprentices and graduates focusing on digital and data with initial training, rotations across organisations, and mentoring support. Larger organisations can show leadership in the development of these comprehensive skills, facilitating access to apprentices and graduates for small and medium sized organisations.
- **Prioritise diversity** - and foster a culture of inclusion, showcasing role models and sharing best practice. Engage underrepresented groups proactively, including working with partners.
- **Look beyond academic achievement** – shift the emphasis on degrees and academic qualifications and develop initiatives targeting diverse educational backgrounds and vocational training.

Recommendations for policy makers and regulators

The Government has several initiatives to bolster green jobs and skills. Most companies expressed satisfaction with the level of support provided, with some observations and recommendations.

- **Provide stability and confidence** – the biggest challenge for organisations is policy instability and uncertainty which affects investor confidence and can create confusion. Organisations need clear and consistent long-term signals in strategy and policy.
- **Set clear targets and delivery plans** – for achieving net zero and environmental commitments.
- **Support a fair transition** – develop a workforce transition plan from oil and gas to clean energy, leveraging the expertise and considering ways to address challenges such as pay differentials. The water sector is going through a big systemic change as well. DEFRA needs to take on this challenge, with policy focus and investment in this area to build capacity and skills.
- **Streamline the planning process** - to facilitate the connection of low carbon technologies, we need to streamline the planning process. Implementing planning tools specifically designed for renewables will enable the industry to expand more rapidly, and lead to growth in regional jobs.
- **Embed green skills in education** – organisations urge the Government to embed green skills in the national curriculum and encourage universities and colleges to integrate sustainability into courses. The Department for Education's Sustainability and Climate Change Strategy supports schools in teaching climate change, nature, and sustainability, including teacher development, free curriculum resources, and a new natural history GCSE.
- **Greater emphasis on further education** – while universities and schools receive attention from politicians, further education can be overlooked. It lacks adequate funding. Further education can be an excellent platform for future career development.
- **Vocational qualifications and training** – organisations welcome the introduction of T Levels. There's a growing need for fully vocational routes to meet industry demands for practical skills. The boot camp approach for targeted training and skills development has been helpful. The Department for Education is incorporating environmental aspects into their broader apprenticeships and curricula, e.g. plumbing and heating, now includes a module focusing on green technologies such as heat pumps.
- **Flexibility in apprenticeship criteria** – increase flexibility in apprenticeship admission criteria to accommodate students who narrowly miss GCSE requirements, promoting social mobility. Use the apprentice levy to support pre-apprenticeship schemes, and funding for academic development and work readiness, and to broaden access for apprenticeships.
- **Skills without borders** – the approaches of Scotland, Wales, and Northern Ireland differ from England, emphasising the need for collaborative efforts to achieve parity across the nations. Energy and Utility Skills is undertaking occupational mapping to facilitate this.

Recommendations for educational institutions

Below are recommendations for schools, colleges, universities, vocational training centres, and other organisations focused on providing formal education and training.

- **Raise the profile of STEM careers, and particularly engineering** – Share exciting examples of the types of careers that STEM subjects could lead to. Promote engineering careers during school presentations and highlight the diverse scope and purpose of engineering. In the UK, engineering can be perceived to lack glamour, whereas in countries like France, engineering enjoys prestige through dedicated institutions like Les Grandes Écoles. It is important to encourage more women and people from diverse ethnicities to pursue engineering courses by engaging with primary schools and increasing their visibility in the sectors.
- **Build relationships with employers** – establish strong and lasting ties with industry employers to improve educational programmes, ensuring that what students learn matches what the industry needs in practice. Employers can assist by communicating opportunities to educators. Ensuring that career advisors have a clear and up to date understanding of the energy and water sectors and career opportunities.
- **Industry open days and speakers** – to bridge the gap between academia and industry, universities can invite industry professionals for open business days as guest speakers. Hiring experienced professionals from industries to work in universities could further strengthen this connection, but academic salaries may deter them compared to rates in companies.



- **Seeing technology in action** – students in schools, colleges and universities need to see technology in action not just understand the theory. For example, seeing a heat pump installation, a nuclear power station, the National Grid control room or real data being analysed.

> "It's important for universities to work with organisations, ask them where they use green tech, with real life examples and mentoring. We run an academic forum, where we take a project into a university. Data is collected by students, for example on water consumption. We use and analyse that data, then go back in to share the results, talk about what the data means and how it can be used. It makes students more aware of the work we do and builds understanding of careers in hydrology."
>
> **Pam Reynolds, Training and Skills Senior Advisor, Environment Agency**

- **Facilitate placements** – provide opportunities for student placements within companies to gain practical experience and engage in real-world projects.

> "We benefit greatly from offering student placements, and universities are eager to secure placements for their students. These placements typically last a couple of months and provide students, including those transitioning from A-levels to university in computer science, with opportunities to engage in data science projects, for example during the longer summer holidays."
>
> **Jim Cardwell, Head of Energy Systems Policy, Northern Powergrid**

- **Focus on market need** – ensure that training providers focus on market needs and concrete job opportunities. Also work with employers to consider future skills and training. It can be difficult to get the balance right. Sometimes employers have developed courses based on government policy, such as for heat pumps, but the industry growth predicted has not materialised and there has been no course uptake.
- **Promote digital skills** – there is a growing demand for digital skills across all sectors and different job roles, so it is important to prepare learners for a more digital world.
- **Develop critical and systems thinking** – it is crucial to teach critical thinking and the practical application of theoretical knowledge, alongside collaboration with industry to offer real-world exposure. This includes helping students grasp complex systems and develop learning agility, enabling them to adapt.

> "We are at a pivotal time where we need to reimagine what the future looks like, how people consume energy and water. The drive to sustainability requires a more socially conscious mindset than we have ever had in the sector. We need more creative, strategic, and critical thinking."
>
> **Mac Alonge, Founder and Chief Executive Officer, The Equal Group**

Messages for people pursuing green tech careers

We asked organisations what advice stakeholders would give young people or those from underrepresented groups aspiring to green tech careers. Most did not offer specific advice, but many underlined their role in contributing to a sustainable future, the use of cutting-edge technology and problem-solving challenges. They also emphasised the importance of considering which future skills will be in demand.

A respondent shared an anecdote about a young man in London. While seeking donations for a charity fighting knife crime, he enquired about the respondent's job, which was in energy tech. He asked: "How do I get into that?" and the respondent said: "Just keep putting yourself out there and asking that question." Afterwards she reflected that she didn't have an answer. Organisations need to articulate what opportunities exist and how to apply in much clearer terms.

Organisations advised job seekers to research the sectors and explore leading companies in sustainability and innovation. They emphasised researching various roles and seeking opportunities for secondments and placements to gain practical experience and broaden skills. While unpaid work experience might be impossible for those on low incomes, leveraging free online resources for skill development were encouraged. Additionally, platforms like LinkedIn can help enable contact with industry professionals.

Engineering degrees are still critical for those exploring operational roles although many roles offer apprenticeships and on-the-job training without requiring a degree. Job seekers are encouraged to express their passion in their applications. Companies aim to hire diverse talent. As diversity grows, role models from various backgrounds can support new hires.

Conclusion

This report highlights the growing importance of green tech jobs and skills in the energy and water sectors. These sectors must transform significantly to address the climate crisis through decarbonisation, enhance resilience to climate change, and upgrade ageing infrastructure. This includes developing new technologies, networks, systems, and processes.

The sectors are undergoing technological and digital transformation. This includes managing vast amounts of data, leverage AI, and innovations that lead to new digital roles and teams, with green tech jobs spanning various departments. There is a need to enhance digital skills across organisations.

Digital roles include data collection and analysis, smarter system operations, software development, cybersecurity, and customer services. These roles appear to be growing in number and importance, as organisations are reviewing their structures to make tech a priority. Some are ensuring that green tech is represented at the board and executive levels.

Despite these opportunities, some organisations struggle to attract talent due to negative public perceptions and competition from sectors like oil and gas and FinTech. There are shortages of skilled workers, including engineers, data scientists, and hydrologists. Additionally, ageing workforces necessitate the transfer of knowledge from retiring staff to newcomers.

Some larger organisations offer entry-level opportunities like graduate and apprenticeship schemes, but small and medium-sized organisations may find it harder to provide these opportunities.

A lack of diversity remains a significant issue across the energy, water, environment, and technology sectors. Organisations need to take a lead by changing their cultures, proactively reaching out to different people, and prioritising Equity, Diversity, and Inclusion.

Sustainability First thanks the Hg Foundation for its support in examining the landscape for green tech jobs and skills in the energy and water sectors. We are eager to continue working with stakeholders to change company cultures, develop skills, and promote diversity.

Next Steps

Sustainability First would like to conduct a gap analysis of training and entry-level opportunities. This involves mapping existing schemes and identifying ways to enhance them. While we have primarily interviewed employers, we believe it is essential to engage with organisations that support young people, diversity, and vocational pathways.

Digital Fast Stream Initiative

We will explore the potential for a digital fast stream programme, an entry-level opportunity for apprentices focused on underrepresented groups. Apprentices would rotate between different companies in the energy and water sectors, with job roles available at the end of the programme. This initiative would create a cohort of digital fast-streamers, fostering community support, knowledge sharing, and problem-solving. A multi-stakeholder steering group, including representatives from the energy and water sectors, government, regulators, educational providers, and early career talent, would guide this programme to ensure it meets sector needs.

Additional Initiatives

- **Digital skills hub** – this hub would showcase digital careers in the energy and water sectors, map career pathways, and signpost helpful resources and organizations. It would also identify gaps in current provisions. We would involve prospective green tech talent in its design and user experience.
- **Green tech career outreach campaign** – this campaign would raise awareness about career opportunities in the net zero transition, including digital roles. It would involve creating online resources, short videos, and collaborating with organisations for physical events like tech innovation festivals or conferences. Young people, and underrepresented groups would be involved in content creation.
- **School engagement** – we see an opportunity to engage with schools on green tech careers and future skills development, such as systems thinking. This would highlight the importance of STEM education in schools, potentially incorporating art to foster creative thinking (STEAM). It would include workshops targeting schools in deprived areas or with diverse populations and teacher training sessions.

We are eager to discuss these initiatives with stakeholders. If you are interested, please get in touch with **clare.dudeney@sustainabilityfirst.org.uk**.

Sustainability First team

Clare Dudeney is an Associate at Sustainability First and led this project. Clare has twenty years' experience in the sustainable energy sector. Clare recently worked on the Fair Transition project with National Grid, focussing on stakeholder and citizen engagement to explore how we can create a fair and affordable shift to clean energy. She also supported the development and delivery of our youth-forum with Ofgem, helping lesser-heard voices connect with policymakers. Clare also helped to steer National Grid through the development of Power Responsive, redefining the energy market in the UK to enable 'demand-side flexibility in our energy system. She is director of the consultancy firm Creative Climate, undertakes art and science outreach in schools and is also an artist. She has MA degrees in Environment Politics and Globalisation and Fine Art, with a BSc in Geography.

Sophie Grinnell is our Researcher. Sophie holds degrees in Environmental Engineering, and Water, Energy, and the Environment. Her doctorate (2019) examined the social impacts of hydraulic fracturing (fracking) on communities. She is also a part-time associate lecturer at Cardiff Met University and has previously worked for the water company United Utilities.

Clare Davidson has over ten years' experience as a journalist, including at the BBC's business desk, as well as a reporter in Brazil and the USA. Clare leads on the charity's communications and public affairs strategy and helps our staff and associates to present clear and accessible communications output. On recent projects with National Grid and Ofgem, she helped to translate complex, technical language into a more accessible format, empowering members of the public to constructively challenge both organisations on their climate work.

David Murray is Sustainability First's Executive Director. He has over twenty years' experience in the voluntary sector, working on environmental, international development, and social justice programmes. Career highlights include an innovative active travel programme with the Department for Transport bringing hard to reach groups into everyday cycling (at Cycling UK), thought leadership on responsible investment for climate action (at the think tank Preventable Surprises), and more recently at Sustainability First helping regulators and businesses to see the social value of direct public engagement for effective policymaking.

Our project team also has access to a wider group of energy and water associates for peer review, research input, and project delivery. This group has deep sectoral knowledge and experience and includes Zoe McLeod, Martin Hurst, Judith Ward, Maxine Frerk, Martin Crouch, George Day and William Baker.

Annexes

A: Participating organisations

We are extremely grateful to all the organisations who participated in this research through interviews and informal conversations, including:

Alt HAN Co is a company involved in alternative home area network solutions. www.althanco.com

Anglian Water is a water and wastewater company operating in the east of England. www.anglianwater.co.uk

BEAMA is a trade association representing manufacturers of electrical infrastructure products. www.beama.org.uk

The British Chambers of Commerce plays a central role in promoting trade, economic growth, and business interests both domestically and internationally. www.britishchambers.org.uk

Business in the Community (BITC) is a business-led charity focusing on societal issues such as community development, diversity, and environmental sustainability. www.bitc.org.uk

Cenergist is an organisation involved in energy and water management solutions www.cenergist.com

Centre for Sustainable Energy is an organisation focused on promoting sustainable energy solutions through research, advocacy, and consultancy services. www.cse.org.uk

Demand Logic is a company specialising in building management solutions, using data analytics to optimise building performance and energy efficiency. www.demandlogic.co.uk

Department for Education (DfE) is a UK government department responsible for education policy and funding, supporting schools, colleges, and universities. www.gov.uk/dfe

EDF energy is an energy company providing electricity and gas services, including nuclear power generation, renewable energy, and supply services. www.edfenergy.com

Energy and Utility Skills is an organisation focused on workforce development in the energy and utilities sector, providing training and accreditation for industry professionals. www.euskills.co.uk

Energy Systems Catapult is an organisation focused on innovation in energy systems, supporting the development and deployment of new technologies and business models. www.es.catapult.org.uk

Energy Unlocked is an organisation focused on unlocking energy-related solutions through innovation, collaboration, and education. www.energyunlocked.org

Environment agency is a UK government agency responsible for environmental protection, managing water resources, and protecting natural habitats. www.gov.uk/environment-agency

The Electricity System Operator (ESO) oversees the management of the electricity grid in Great Britain, ensuring its stability and reliability. www.nationalgrideso.com

Flexitricity is a company providing demand response services, helping businesses and organizations optimize their energy usage and participate in energy markets. www.flexitricity.com

Greenworkx is a national platform connecting job seekers with employers, offering diverse green job opportunities and tailored resources for sustainability careers. www.greenworkx.org

Institute for Apprenticeships and Technical Education (IFATE) is an employer led organisation that supports technical education and apprenticeships in the UK and is funded by the Department for Education. www.instituteforapprenticeships.org

Kensa is a company involved in heat pump solutions. www.kensaheatpumps.com

National Grid is a company responsible for managing the UK's electricity transmission network. www.nationalgrid.com

Northern Powergrid is an electricity distribution network operator. www.northernpowergrid.com

Ofwat is the Water Services Regulation Authority for England and Wales. www.ofwat.gov.uk

Paua is developing innovative solutions to simplify the electric vehicle charging experience. www.pauatech.com



The Prince's Trust is a charity supporting young people with programmes, mentorship, and resources, empowering them for education, work, or entrepreneurship. www.princes-trust.org.uk



Reactive Technologies is a company providing grid optimisation solutions. www.reactive-technologies.com



Russell Reynolds Associates is a global leadership advisory and search executive search firm. www.russellreynolds.com



South East Water is a water-only utility company operating in the South East of England. www.southeastwater.co.uk



South Staffs is a water-only utility company operating in South Staffs. www.south-staffs-water.co.uk



SSE develops, operates, and invests in diverse electricity infrastructure and businesses, including renewable energy, transmission networks and flexible response. www.sse.com



The Equal Group specialises in providing tailored diversity and inclusion consulting services to organisations. www.theequalgroup.com



The Rivers Trust is a charity focused on river and waterway conservation. www.theriverstrust.org



UK Energy Innovation Centre (EIC) supports innovation in the energy sector, by connecting innovators with energy partners to solve challenges and support ideas. www.ukeic.com



UK Power Networks (UKPN) is a company responsible for electricity distribution in London, the East and Southeast of England. www.ukpowernetworks.co.uk



Vattenfall UK is a subsidiary of Vattenfall, one of Europe's largest producers of electricity and heat, focusing on renewable energy and sustainable heating systems. www.group.vattenfall.com



Wessex Water is a water and sewerage company operating in the South West. www.wessexwater.co.uk

B: Interview questions

1. Can you tell us a bit about your role in the organisation?
2. How would you define “green tech jobs” in your sector and can you share examples?
3. What are the trends in green tech jobs within your sector?
4. What do you feel will be the biggest opportunities and growth areas in green tech jobs in your sector?
5. What gaps or challenges do you experience in recruiting and retaining talent for green tech roles in your sector and how could these be addressed?
6. What are the routes into green tech roles, the skills, and qualifications that you look for as an employer?
7. What experience and competencies are crucial for individuals pursuing green tech careers in your sector?
8. Are you able to recruit a diverse mix of individuals, based on gender, ethnicity and economic background, and do you have specific recruitment initiatives to encourage this?
9. How could your sector ensure diversity and inclusion in the recruitment and development of talent for green tech roles more widely, have you seen successful initiatives?
10. How can educational institutions prepare students for careers in green tech within your sector, do you have any examples of good practice?
11. Are there specific training programs or initiatives you believe are or would be beneficial?
12. Are there policy and regulatory changes that could enable of green tech jobs and skills?
13. What other recommendations would you make to encourage green tech jobs and skills in your sector?
14. What advice would you give to young people or those from underrepresented groups who aspire to pursue careers in green tech within your sector?
15. Do you have any question for us?

C: Green tech roles

Below are examples of green tech roles in the energy and water sectors, focusing on digital expertise.

Both sectors:	Example roles
Technology leaders	Chief Technology Officer (CTO) Chief Information Officer (CIO) Chief Product Officer (CPO) Chief Digital Officer (CDO) Chief Innovation Officer (CIO)
Data	Data analyst, scientist engineer and architect
System operations and maintenance	Smarter systems operations manager Smart metering specialist Systems maintenance engineer
Digital twin development	Digital twin engineer
Modelling and forecasting	Climate modeller Predictive modeller Forecasting analyst Financial analyst Carbon footprint analyst
Customer experience	Customer experience or service manager User experience (UX) or user interface (UI) designer Digital marketing manager Customer insights analyst
Artificial intelligence (AI) and machine learning	Head of AI AI engineer or research scientist Machine learning engineer
Technological innovation	Director of Innovation Innovation Manager
Cybersecurity	Cybersecurity analyst
Software development	Software engineer App developer

Energy sector:	Example roles
Energy management systems	Energy management system (EMS) engineer Energy efficiency specialist
Smart grid and demand side flexibility	Smart grid operations, engineer, or analyst Demand-side flexibility manager or analyst Distributed energy resources (DER) manager
Renewable energy modelling and forecasting	Renewable energy modeller Renewable energy forecaster
Energy market analysis	Energy market analyst
Electric vehicle charging	EV charging network manager

Water sector:	Example roles
Water resource planning and mapping	Hydrologist Water resource engineer / planner
Water management	Hydraulic modeller, software engineer or planner Geographic information system (GIS) specialist Remote sensing specialist Catchment modeller Sustainable urban drainage systems (SuDS) designer
Nature-based solutions	Natural resource manager Climate adaptation specialist
Water quality monitoring	Water quality specialist, engineer, researcher, or inspector
Water treatment	Water treatment process engineer, plant operator or data analyst

D. Glossary of terms

Ageing infrastructure	Refers to the deterioration of physical assets over time, such as water or electricity networks, often requiring upgrades or replacement.
Apprenticeships	Formal programmes that combine on-the-job training with classroom instruction, typically leading to a known qualification.
Artificial intelligence (AI)	Technology that allows computers to perform tasks that typically require human intelligence, such as problem-solving, learning, and decision-making.
Carbon capture, utilisation, and storage (CCUS)	Technologies aimed at capturing carbon dioxide emissions from industrial processes and power generation, repurposing, and safely storing the carbon underground to mitigate climate change.
Carbon footprint	The total greenhouse gas emissions, primarily carbon dioxide, generated by individual activities, organisations, or products, contributing to climate change.
Clean energy	Energy derived from renewable sources such as wind, solar, and hydroelectric power, or technologies with near zero carbon dioxide emissions, such as nuclear power.
Data analysis	Examining, cleaning, and interpreting large sets of data to find useful information, patterns, trends, and insights.
Data science	Using various methods and tools to gain insights and make predictions from complex data sets.
Demand side flexibility (DSF)	The ability of consumers to adjust their electricity usage patterns in response to changes in electricity prices, grid conditions, or other signals, thereby helping to balance supply and demand.
Digital transformation	Integration of digital technologies into all aspects of an organisation, fundamentally changing how it operates and delivers value.
Digitisation	Converting information into a digital format, enabling it to be stored, processed, and transmitted electronically.
Digital twin	A virtual representation of a physical object or system that enables real-time monitoring, analysis, and simulation to improve performance and efficiency.
Electric Vehicle (EV)	Automobiles powered by electric motors and batteries, eliminating the need for traditional engines, gas, or diesel.
Environmental, Social, and Governance (ESG)	Criteria used by investors to evaluate a company's ethical and societal impact alongside its financial performance.

Equity, Diversity, and Inclusion (EDI)	Principles and practices aimed at ensuring fairness, representation, and equal opportunities for all individuals, regardless of their background, identity, or characteristics.
FinTech	Short for Financial Technology, refers to the use of technology to provide financial services and products, encompassing applications such as online banking, mobile payments, cryptocurrency, and peer-to-peer lending platforms.
Heat pump	A system that absorbs heat from the air or ground and compresses it using electricity, to heat or cool buildings.
Green tech	Technology designed to promote sustainability, address climate change and other environmental challenges.
Internet of Things (IoT)	This refers to the network of interconnected devices, objects, and systems that communicate with each other and exchange data over the internet without requiring human intervention.
Investor confidence	The trust and assurance that investors have in the stability, transparency, and profitability of financial markets or specific investments.
LGBTQIA+	Stands for Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, and Asexual, and encompassed diverse sexual and gender identities.
Machine learning	A subset of artificial intelligence that enables computers to learn from data and improve performance over time.
Membrane technologies	Processes that use membranes to separate components in fluids or gases, commonly used in water treatment and purification.
Nature-based solutions (NBS)	Approaches that use natural processes, like wetlands and forests, to help manage water resources better, improve water quality, reduce flooding, and make ecosystems healthier.
Net zero	The amount of greenhouse gases emitted into the atmosphere is balanced by the amount removed or offset, resulting in no net increase in atmospheric greenhouse gas concentrations.
Offshore renewables	Renewable energy technologies located at sea, such as offshore wind farms and tidal energy installations.
Power BI	A business analytics tool that allows users to visualise and analyse data from various sources.
Python	A high-level programming language known for its simplicity and readability, widely used for web development, data analysis, artificial intelligence, and scientific computing.
Remote sensing	The use of satellites, aircraft, or drones to collect information about the Earth's surface without physical contact.

Renewable energy	Energy derived from naturally replenishing sources like sunlight, wind, water, and geothermal heat, which are considered sustainable and environmentally friendly alternatives to fossil fuels.
Renewable energy modelling	The use of computer simulations and mathematical models to predict the behaviour and performance of renewable energy systems, such as solar and wind farms.
Skills bootcamps	Intensive, short-term training programmes designed to quickly equip individuals with specific skills needed for employment in high-demand industries.
Smart meters	Advanced devices that measure and record energy or water consumption in real-time, providing consumers and utility companies with accurate usage data for better management and efficiency.
Smart grids	Intelligent electrical grids that use digital technology to monitor, control, and optimise the generation, transmission, and distribution of electricity, enhancing reliability, efficiency, and sustainability.
STEAM	Stands for Science, Technology, Engineering, Arts, and Mathematics. It is an educational approach that integrates these disciplines into cohesive learning experiences, emphasising creativity, critical thinking, and problem-solving skills.
STEM	Science, Technology, Engineering, and Mathematics (STEM) are academic disciplines encompassing scientific and technical knowledge, essential for various industries and fields.
Sustainable urban drainage systems (SuDS)	Environmentally friendly techniques designed to manage surface water runoff by mimicking natural drainage processes and reducing the risk of flooding in urban areas.
Telemetry	The automatic measurement and transmission of data from remote sources, often used for monitoring and control.
T Levels	Two-year technical qualifications providing vocational education and work experience, aiming to prepare students for skilled employment or further study.
Unconscious bias	Unconscious prejudices or assumptions that influence decision-making processes, often leading to unfair treatment or disadvantage for certain individuals or groups.
Vehicle-to-grid (V2G)	A technology that allows electric vehicles to connect with the power grid, enabling them to both take electricity from and feed excess electricity back into the grid.

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Sustainability First is a charity working in energy and water, aiming to improve environmental, social, and economic well-being.

We would like to thank the Hg Foundation for supporting this project and all participants who took part in the interviews and roundtable event. We would welcome your feedback on this report. Please contact the project lead, Clare Dudeney at **clare.dudeney@sustainabilityfirst.org.uk.**

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