

nationalgrid



**BUILDING THE
NET ZERO ENERGY
WORKFORCE**

“The energy sector has high strategic value to the UK, with its people providing and operating the infrastructure that supplies the power, light and heat to all our communities, hospitals, schools, homes and large and small businesses. As a vital enabler of the UK transition to a zero carbon future, this valuable report from National Grid sets out clearly the critical role of the workforce in achieving that ambition and the change needed to build the necessary human capital for the future. Beyond thought leadership, National Grid has consistently been a committed partner in building infrastructure workforce sustainability and pioneering many innovative sector initiatives as part of the Energy and Utilities Skills Partnership that they helped to create”.

Nick Ellins
CEO, Energy & Utility Skills

Foreword

For 2020 and beyond, our focus needs to be on tackling the climate crisis by helping the UK reach its emissions target and transition to a net zero economy by 2050.

The way the world views climate change has shifted significantly. People want to see action. From governments to schoolchildren, momentum is gathering.

Businesses are taking notice. Politicians are making commitments to change. The UK is leading the way as the first major economy to pass a net zero emissions law, but we can't delay action as the next 10 years are critical.

National Grid lies at the heart of Britain's energy system. This places us in a unique position to work with others in the energy industry and beyond to help the UK reach its emissions target.

We are already working on the technology required to make net zero a reality: carbon capture usage and storage technology to bring zero carbon power to the Humber and a nationwide charging scheme to remove range anxiety for electric vehicle drivers in the future. We are preparing to introduce low carbon hydrogen into the existing gas network and our sub-sea cables connecting the UK to energy sources in Europe are playing their part in helping to accelerate us to greener, cleaner energy.

This work is already having an impact. It helped us celebrate Britain's cleanest year on record in 2019 when, for the first time, the amount of zero carbon power outstripped that from fossil fuels for a full 12 months.

But people are the real catalyst for change, because it's people who will develop, build and operate the infrastructure we need to deliver cleaner energy. We need to encourage the best and brightest minds, equipped with technological expertise and a passion to address climate change, into the industry. But we must also harness the invaluable experience and knowledge of our current teams.

At National Grid, we sought to understand the employment opportunity and skills required to build a Net Zero Energy Workforce. This report explores the scale of transformation we need to get our energy system

net zero ready, the issues we face and the hope we feel when we talk to colleagues already working in net zero roles. Why? Because we can only succeed if the industry works together to attract and retain the right people, capable of achieving net zero in the energy sector.

I'm proud of all the work National Grid has done, and is doing, to help tackle climate change and enable the transition to cleaner, greener energy in the UK. We know collaboration is key to reducing emissions as quickly as possible – so we are partnering with industry, academics, and policymakers.

As we begin this crucial decade for climate action, we need to put people, energy and action at the heart of the solution. This is the job that can't wait.



Nicola Shaw CBE
Executive Director, UK

Defining the Net Zero Energy Workforce

Building on the Committee on Climate Change's Net Zero report, this report seeks to explore the employment opportunity and skills needed to help the UK's energy sector reach its emissions target by 2050.

The roles included in this analysis are those involved in the operation, generation, transmission, distribution and retail of energy in the UK, as well as those in the supply chain related to building, upgrading, maintaining or operating infrastructure required to reach net zero.

Executive summary

Climate change is the defining challenge of this generation. The decisions we take now will influence the future of our planet and life on earth. We know what we have to do: change the way we live to curb harmful emissions and reach net zero by 2050.

To succeed, every industry, workplace and home will need clean energy. Transforming our national infrastructure so we can generate and distribute clean energy takes time – and the clock is ticking. The energy sector must lead the way and act now to set the UK on the right course.

This decade alone, the industry must:

- Increase low carbon electricity generation by c.50%, from sources such as wind or solar power
- Install low carbon heating systems in **c.2.8 million homes**
- Develop carbon capture usage and storage (CCUS) technology, and develop hydrogen networks
- Install **c.60,000** charging points to power **c.11 million** electric vehicles (EVs)

Viable technologies are emerging. The political commitment is there. Investment will be needed. But none of this will happen if we don't have the right people, with the right skills to deliver. Motivated to tackle climate change, equipped with the skills to transform our energy grid – **the UK needs a Net Zero Energy Workforce.**

This document sets out to understand how the energy sector can build a Net Zero Energy Workforce able to transform the UK's energy system over the next 30 years.

The challenges we face:

- Loss of existing talent due to a baby boomer retirement crunch
- Competition for skilled workers from other sectors, such as finance and technology
- Limited pipeline of young people choosing science, technology, engineering and mathematics (STEM) qualifications
- Lack of diversity





National Grid commissioned an independent research partner, Development Economics, to measure the scale of the challenge. This research found that the UK's energy sector needs hundreds of thousands of people to fill 400,000 roles in the Net Zero Energy Workforce. Of this, 260,000 will be in new roles, while 140,000 will be replacing those who have left the workforce.

The 400,000 breaks down as:

- **117,000** between 2020 - 2030
- **152,000** between 2031 - 2040
- **131,000** between 2041 - 2050

Tens of thousands will be needed in every region across the UK, with significant employment opportunity in the North where nearly 100,000 jobs will become available, the Midlands (over 50,000 jobs) and the devolved nations of Scotland, Wales and Northern Ireland (nearly 90,000 jobs). Net Zero Energy Workforce jobs will include civil, mechanical and electrical engineers, data analysts, machine learning experts and skilled tradespeople. New roles linked to electric vehicles, hydrogen and carbon capture technology will emerge.

The good news is that people are increasingly motivated by a job with purpose, and the energy sector has a clear mission at its heart. Over three quarters of UK adults (78%) want to play a part in reaching the UK's net zero goal and more than half (57%) want to work for an organisation that helps get us there. Tapping into this powerful motivator is key to building a diverse and effective Net Zero Energy Workforce.

National Grid believes everyone with a stake in the UK's energy system must align behind strategic priorities that address the challenge, and collaborate to achieve them at scale.

To succeed we must:

1. Retain and retrain existing employees
2. Reframe a job in the energy sector as joining the Net Zero Energy Workforce
3. Inspire the next generation to choose STEM qualifications

Transforming the UK's energy system to meet our net zero target is one of the greatest challenges the country faces. To succeed we must be single minded in our focus and collaborative in our approach to building a skilled and motivated Net Zero Energy Workforce. It's the job that can't wait.

Chapter 1. The decade for climate action

- The UK led the world on climate action with a legally binding target to reach net zero emissions by 2050
- The Committee on Climate Change (CCC) has given us a route to reaching net zero, with the energy sector at its heart
- This decade will be crucial and will require collaboration from all involved

Last year, people across the world stood up and demanded action to address what many now recognise as a climate crisis.

Warnings about the impact of climate change from the Intergovernmental Panel on Climate Change (IPCC) were amplified by the voices of David Attenborough, Greta Thunberg and concerned citizens all over the globe calling for action before it's too late.

The UK led the way, becoming the first major economy to commit to a legally binding net zero greenhouse gas emissions target by 2050.

But to achieve this mission, the nation must urgently match this ambitious commitment with concrete action.

We enter this new decade knowing the UK has achieved a historic milestone in its energy generation. Following 10 years of transformation, National Grid confirmed in January that 2019 was the cleanest year on record for Britain as zero carbon energy sources outstripped fossil fuels.

But the decade ahead demands transformation on an even greater scale.

The UK's route to net zero greenhouse gas emissions by 2050

The CCC landmark report published in May last year sets out the pathway the UK must follow to reach the new emissions target by 2050.

The energy sector has already undergone huge change, particularly in generating clean power. But we must go further because transforming the UK's energy system will enable other sectors such as transport and construction to reduce their emissions too.



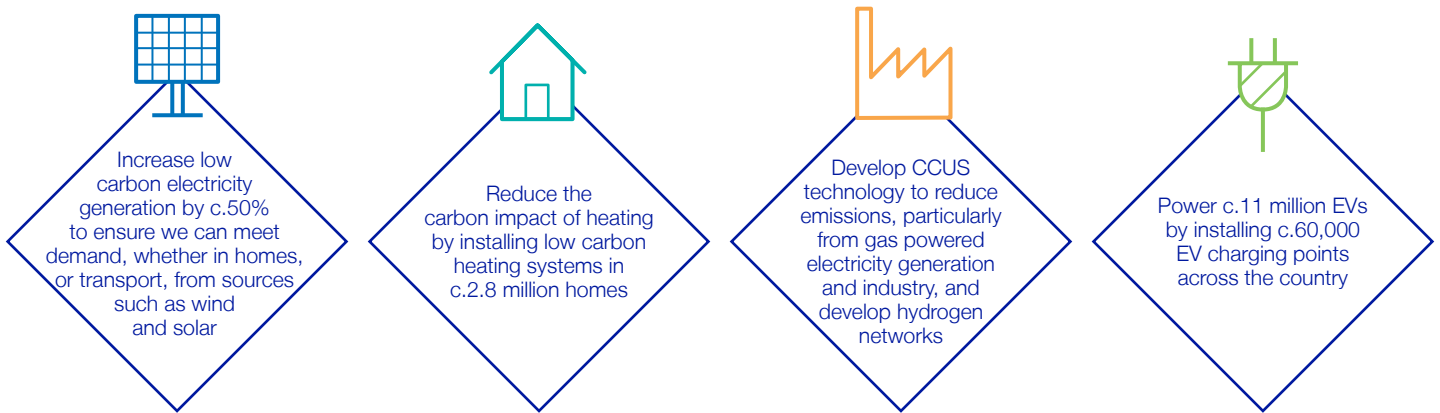
Andrew Benjamin
Head of Project Delivery,
National Grid Ventures

I've been leading on projects to develop carbon dioxide transport and storage systems in the Yorkshire and Humber region. The technology involves capturing carbon and compressing it into liquid, then pumping it through pipelines out to the North Sea, where it's safely injected and stored approximately 1.5km down in a geological store.

Within the UK we're now exploring how we can collaborate and successfully develop systems for CCUS which support our energy and industrial sectors. While our target is to make the Humber's industrial cluster net zero by 2040, it's possible that, with collaborative effort, we could achieve this goal between 2030 and 2035.

One decade, four milestones

To ensure the UK reaches its net zero emissions goal by 2050, the UK energy sector must meet four ambitious milestones within the next decade.



The energy sector must deliver on these milestones and more, while ensuring the reliability of the UK’s energy system.

The next 10 years are critical and while we are only one player, National Grid is committed to working with industry partners, government, regulators, employees, trade unions, NGOs, young people and citizens, education institutions and the communities we serve to align on the best route to net zero.

The target is set. The CCC and others have begun to map the route to net zero. This new decade requires transformation on a major scale, but we can’t succeed without a skilled workforce to make change happen.



Laura Rainey
Former EV Senior Project Manager, National Grid

Have you driven an EV yet? Switching drivers to an EV is one of the most visible, exciting, and essential steps in transforming the UK into a low carbon economy. Today EVs are topping awards lists but market growth depends on building a network of reliable and accessible charging stations. National Grid has developed a proposal to enable a future-proofed rapid charging network at motorway service stations across the country. I led on the strategy to make this

happen, forming cross-sector partnerships between the commercial companies and public bodies involved in its success. I spoke with digital developers who want to create apps for EV consumers one day, and I met with policymakers to understand how the private and public sectors need to work together to reach the UK’s EV targets on the next. No one person or organisation has all the answers – we have to work together to get the right answer for everyone in the UK.

Chapter 2. Net Zero Energy Workforce: context and challenges

- Emerging employment and skills gaps are one of the biggest obstacles to reaching net zero
- Reaching our 2050 target will require a Net Zero Energy Workforce which combines technical expertise, with softer skills and a passion for climate action
- At the start of this crucial decade, a retirement crunch, competition for talent, a shortfall in the skills pipeline and a lack of diversity threaten our ability to build the workforce we need

Reaching net zero will require cutting-edge technology and new infrastructure built on a transformational scale.

However, we can't deliver either without people. This was recognised by the CCC, who identified emerging skills gaps as a major barrier which will need to be overcome.

Today, the energy sector directly employs 144,000 people across the UK and hundreds of thousands

more across the supply chain. The critical nature and scale of this challenge means the UK's entire energy sector must shape its labour force into one motivated by the opportunity, and capable of building, operating and supplying a net zero-ready energy system by 2050. We need a **Net Zero Energy Workforce**.

Defining the Net Zero Energy Workforce:

Building on the Committee on Climate Change's Net Zero report, this report seeks to explore the employment opportunity and skills needed to help the UK's energy sector reach its emissions target by 2050.

The roles included in this analysis are those involved in the operation, generation, transmission, distribution and retail of energy in the UK, as well as those in the supply chain related to building, upgrading, maintaining or operating infrastructure required to reach net zero.



Erinn Sapsford
Asset Business Readiness
Engineer, National Grid

I did an industry year placement with National Grid, and my passion was sparked! I returned as a graduate trainee, and I've just notched up five fantastic years working on big investment projects. I'm currently part of a team planning how we'll run and maintain a new interconnector that's being laid under the North Sea. It's like a giant cable running from Norway to Britain. When we switch it on in 2021, we'll be able to import a flow of 100% clean energy from hydro generators in Norway's fjords.

My job requires a mix of engineering skills, from mathematical calculations to help pinpoint a cable fault, to understanding deep sea robotics, and practical skills, to make at-sea repairs. I also go out to local schools to talk about my work and the different routes into engineering. I'm a big fan of apprenticeships - I see the benefits among my colleagues who've trained this way and gained strong, hands-on experience they'll rely on throughout their careers.

In this decade of climate action, there are four strategic challenges which the UK must overcome if we are to build the Net Zero Energy Workforce.

1. Losing existing talent

Just as the UK energy sector needs confidence in its ability to deliver change on a huge scale, research from the Energy & Utility Skills Partnership warns of two factors that will shrink our existing workforce over the next decade.⁴

Firstly, we face a retirement crunch. One fifth of people currently working in the energy sector are set to retire by 2030 as the ‘Baby Boomer’ generation reaches pensionable age.

Secondly, the workforce continues to lose employees after they have had career breaks. Energy & Utility Skills’ research estimates that more than 75% of women who leave engineering after maternity leave or career breaks want to return but are put off due to inflexible working hours and practices.⁵

Unaddressed, both of these challenges will see people leave the sector when they’re needed most. Even more damaging will be the loss of expertise and experience that needs to be shared with new recruits.

2. Competition for talent

The sector must compete for and attract the best STEM qualified talent. However, competition for these candidates is fierce and every year the energy sector loses out to other industries such as finance and technology.

In the UK last year, more than 40% of physics graduates – a crucial target market for energy sector recruits – opted for careers in banking, finance or technology.⁶ The engineering sector struggles to compete because many graduates have outdated perceptions or low awareness of what a job in engineering entails.⁷

3. The STEM pipeline challenge

Although more young people are choosing to study STEM subjects, building a Net Zero Energy Workforce will require a significant increase. Once a young person opts out of STEM subjects, the route into a net zero career becomes harder. In research carried out for National Grid by YouGov, UK adults cited lack of relevant qualifications as the biggest barrier to getting a job tackling climate change.⁸

This pipeline problem starts at school and runs right through to degree level:

- **STEM uptake in schools:** Britain still needs to increase the number of students studying STEM A levels over the next decade. In 2019, 37,000 students took physics A level and 91,000 completed maths A level. Research carried out by Development Economics for National Grid found that we need to increase the number of A level candidates for physics by 24% and maths by 19% to maintain the pipeline of qualified talent Britain needs.⁹
- **Apprenticeships:** Between 2016 and 2017 England’s apprenticeship starts in engineering and manufacturing technologies fell by 16,000 from 75,000, stemming from the ongoing uncertainty about the future operation and management of the apprenticeship levy (a tax on UK employers to fund apprenticeship training).¹⁰
- **Degree qualifications:** In 2017-18, c.42,000 undergraduates took engineering and technology courses.¹⁰ Development Economics’ research estimates this number must grow by over 30% over the next 30 years, to 56,000 annual enrolments.



4. Lack of diversity in the sector

A diverse workforce in a supportive environment drives success – through different perspectives, new ideas and greater creativity – all of which contribute to more effective problem solving.

The under-representation of women, for example, who currently account for only 12% of the engineering workforce, means the energy sector is missing out on a full-strength gender balanced workforce. The problem starts after GCSE, despite girls’ STEM exam results marginally outperforming boys’ at this stage, and intensifies every year thereafter.

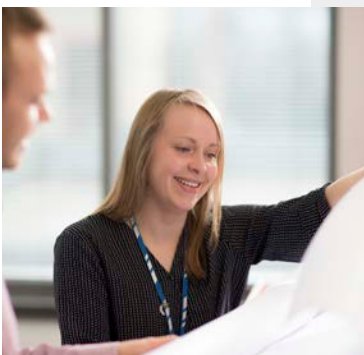
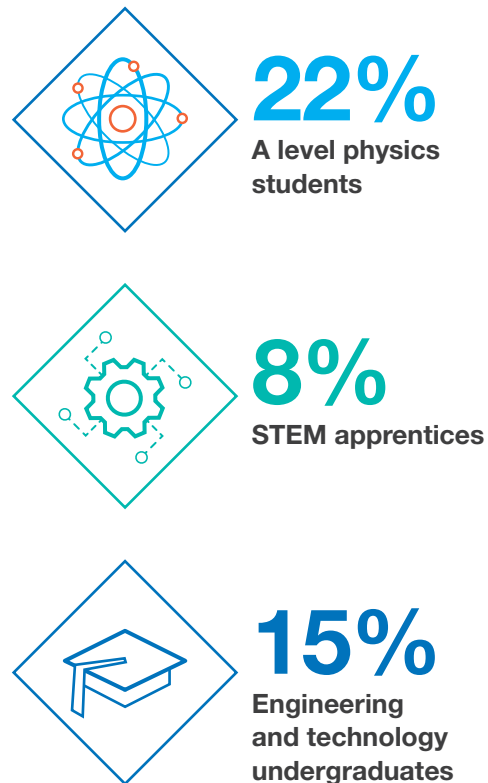
Last year women comprised:

- Only 22% of 37,000 A level physics students
- Only 8% of all STEM apprentices
- Just over 15% of 42,000 engineering and technology undergraduates¹¹

At every stage of education, young women are not taking the qualifications they need to become part of the Net Zero Energy Workforce. And for those that do pursue a career in the energy sector, too many are lost after career breaks. The commitments we have made through the Energy Leaders Coalition recognise the need for more to be done to address this gap.

To reach our emissions goal by 2050, the UK must overcome key challenges to build a diverse Net Zero Energy Workforce of the right scale, equipped with the right skills, and motivated by making a tangible difference. We are at a crossroads, and the UK has an opportunity to forge a path that countries around the world can follow.

Figure 1: Proportion of women at A level, apprenticeship and degree stages



Alison Fulford
Environment Manager:
Carbon Specialist,
National Grid

I oversee and measure the environmental footprint of both our existing energy infrastructure assets and our planned projects, ensuring we make the best low carbon choices without detriment to safety or work quality.

Tackling climate change was a prime motive for my career choice. Even before I went to university I knew I wanted to do something

related to the environment. This is an exciting time to join the industry.

I believe we need to communicate more about how decarbonisation fits into the bigger picture of the biodiversity crisis, and help people understand we’re living within a finite system. We need people with passion.

Chapter 3. Building the Net Zero Energy Workforce

- Development Economics’ research conducted on behalf of National Grid has found that the UK will need to recruit for over 400,000 jobs to build the Net Zero Energy Workforce, and reach net zero by 2050
- The race to net zero will create thousands of jobs right across the UK
- We will need new expertise in areas like artificial intelligence (AI), developing hydrogen networks, heat pump installation and carbon capture technology

Since the UK’s net zero commitment was announced, much has been made of the opportunity that green jobs can deliver for the country. However, as the pathway to net zero becomes clearer, so must our thinking about the scale of the workforce required, and the types of skills we need.

To calculate the number of jobs that need to be filled to build the Net Zero Energy Workforce, Development Economics first examined the future levels of employment needed to operate, manage and maintain the network of increasingly clean energy generation, transmission and distribution.

Secondly, using the initial roadmap to net zero set out by the CCC and National Grid ESO’s Future Energy Scenarios Report (July 2019), it measured the workforce required to transform the UK’s energy system by upgrading existing infrastructure and building new infrastructure.

To meet operational and construction requirements for net zero, the energy sector will need to begin a significant recruitment drive.

Development Economics’ research found that to get the UK to net zero, the energy sector must recruit for 400,000 jobs by 2050. Of these, 260,000 will be new roles, while 140,000 will be replacing those who have left the workforce. The new roles created will largely be driven by an increase in people needed to build and upgrade energy infrastructure on a massive scale.

Breaking this 30 year recruitment need down, the energy sector will need to recruit for 117,000 jobs between 2020-2030 if it is to achieve the pace of change required.

More than half of the 117,000 jobs required this decade (65,000) will be needed to fill new roles such as data analytics to forecast energy demand and engineers with expertise in renewables. The remaining 52,000 recruits will be needed to replace workers forecast to leave the sector.

Between 2031-2040, recruitment will need to pick up, requiring 152,000 jobs to be filled as the step change involved in renewable energy construction, delivery networks and transformation of home heating gathers pace.

And a further 131,000 will be required between 2041-2050 as we enter the final years of our net zero mission.

Figure 2: How the number of net zero jobs in the energy sector breaks down by decade





Since transforming the energy grid is a key facilitator of the UK's net zero mission, this research has focused on the needs of the energy sector.

As other sectors such as transport, construction and agriculture map out their journey to net zero and consider the people and skills required to get there, employment opportunities and the net zero workforce opportunity will expand.



Lloyd Mitchell
Gas Transmission
Engineer, National Grid

I'm really excited to be working on projects that will give us the knowledge we need to make hydrogen a low carbon replacement for our current gas supply.

It could be a great game-changer: just think how many homes use gas for heating, and how many businesses depend on gas for manufacturing up and down the country. And that's the tricky thing.

Our current transmission system is like a massive underground motorway, with thousands of miles of interconnected pipes. It's colossal existing infrastructure worth billions of pounds. Why reinvent if we can repurpose it? So I'm researching and testing what we can use or adapt for hydrogen. It's work that makes me feel I can influence the future of the energy system.

A country-wide opportunity

Demand for net zero roles will be spread across the country and will require a range of skills and expertise. It will need new entrants, recent graduates and experienced hires. Over time, the path to net zero will necessitate the creation of new roles, based around cutting edge skills including carbon capture scientists, clean gas experts, engineers with renewable energy skills and heat pump and EV charge point installers.

To ensure progress, the sector will need to attract a diverse and talented workforce. Nobody can be overlooked or left behind.

Net zero will become a major strategic opportunity for every region and nation of the UK. In the north of England, for example, nearly 100,000 job opportunities will open up alongside new industries and anticipated outside investment (shaded in map, fig 3).

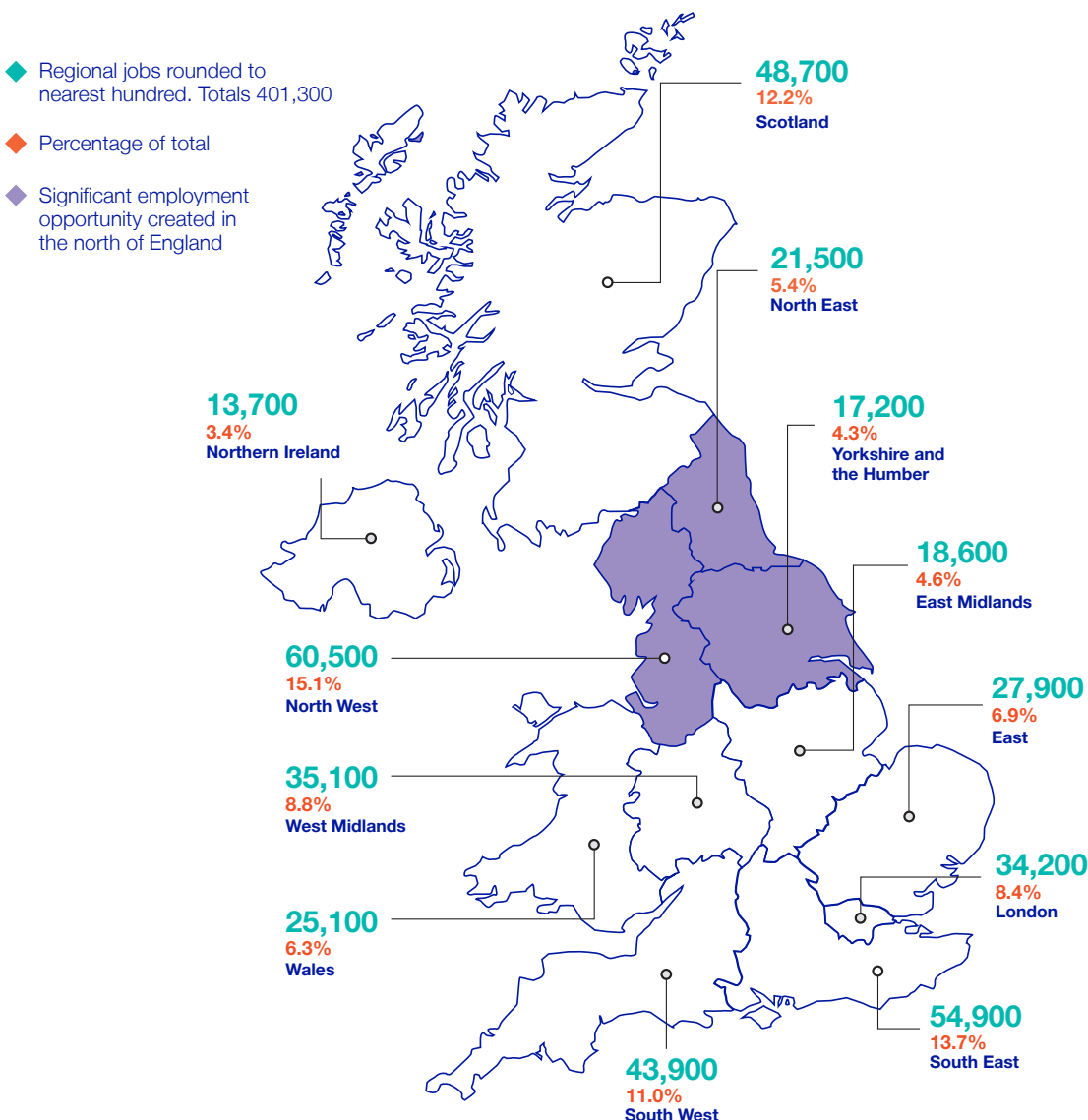
Expansion of offshore wind and workforce attrition in England’s third most populated region means there will be over 60,000 jobs that need to be filled in the North West.

The North East, Yorkshire and the Humber will need to recruit for almost 40,000 more jobs to deliver offshore wind, carbon capture and support decarbonised industries. The continued growth of on-shore and offshore wind power will drive the need for almost 50,000 jobs in Scotland by 2050.

The energy revolution will create new net zero hubs across the UK. For example, the Humber could become a world leading centre for carbon capture, while the Port of Blyth will continue its growth as a leading support base for offshore wind. New jobs are already being created in Port Talbot, as investment in decarbonised industry in South Wales pays dividends.

The UK’s journey to net zero will create jobs directly within the energy sector, and will also lead to greater investment in the supply chain. It is vital that the sector works in collaboration with its supply chain so they can undertake workforce planning to understand the skills they need to help the UK reach net zero.

Figure 3: Geographical breakdown of jobs needed to get the UK to net zero by 2050



Emerging skills required to deliver net zero in the energy sector

Operating and maintaining an increasingly decentralised energy system on ever greener power and gas will require a spectrum of skills across a whole range of experienced workers.

Digital and data skills:

To harness AI to maximise the reliability, responsiveness and accuracy of the UK's energy system, the sector will need to attract experts in machine learning. Digital skills and data analytics will become core skills for the Net Zero Energy Workforce, with big data used for network planning, more efficient maintenance and improving risk mitigation.

Designing and implementing new technologies:

The Net Zero Energy Workforce will require highly skilled scientists, engineers and designers to design, test and maximise the potential for new technologies such as effective carbon capture, hydrogen gas, and to enable growth in networks that deliver energy from source to people's homes.

Scientists and engineers skilled in renewable energy:

From installing new wind farms to building solar capacity, huge changes to how the UK generates its electricity are required if we are to increase low carbon generation by c.50% this decade.

Skilled technicians to install and maintain clean energy solutions:

Project managers, technicians and skilled trades people will be needed to change how millions of Britons heat their homes and roll out a nationwide EV charging network.



Jack Kelly
Senior Technical Consultant,
National Grid ESO

National Grid is building AI skills through external partnerships

Growing our machine learning expertise will enable us to predict weather patterns and trends, so we can more efficiently manage energy demand and supply from renewable sources. To ensure our skills remain at the cutting edge, National Grid has partnered with leading institutions across the UK, including the Turing Institute and Sheffield University. These partnerships have improved our internal capabilities and fostered innovation.

Industry communication and change management skills:

The pace and scale of change means organisations can't go it alone. To address the challenges we face requires partnership working across the sector and beyond.

Expert communicators will be needed to facilitate collective technical advancements. The shift in focus required to deliver these breakthroughs at pace will demand cultural change and the onus is on the sector to explain how net zero will impact consumers.

National Grid's analysis has uncovered what the Net Zero Energy Workforce needs to look like in terms of size, skills and spread across the country. But a workforce without drive and passion is like a machine without an engine. We can only achieve the UK's ambitious net zero goal if we are powered by a highly motivated workforce.



Artificial intelligence can help reduce carbon emissions. I previously worked for Google DeepMind and now I use my knowledge of machine learning to get computers to predict power generation of our renewable resources like wind and solar power.

Forecasting how cloud patterns affect solar generation, or air currents influence wind turbine performance helps us better plan and balance the

supply and demand of electricity. It also means we reduce the 'spinning reserve' of generators kept on stand-by to step in and produce energy if renewable production dips. This spinning reserve is like having a car engine idling, producing carbon but not going anywhere. So the less of this spinning reserve we have, the more carbon-efficient we become.



Figure 4: Some of the new and existing jobs that will make up the Net Zero Energy Workforce



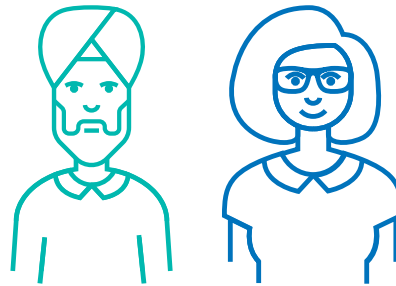
Chapter 4. The rise of Generation Net Zero

- More than half of UK adults want to work for a company helping the country to reach net zero
- Tapping into this motivation is key to mobilising Generation Net Zero and to attracting diverse talent

Young people and adults in the UK are increasingly searching for ways to play their part in tackling climate change, spurred on by powerful cultural moments, from climate strikes to David Attenborough's nature documentary series on BBC and Netflix. But how far is the climate conscious consumer prepared to go to make a difference?

Attitudinal research conducted by YouGov on behalf of National Grid has found that people's drive to be part of the solution could be key to unlocking the Net Zero Energy Workforce. Put simply, people want a career that helps the planet.

More than three quarters of UK adults (78%) think it's important to play a part in the UK's journey to reaching net zero emissions – and more than half (57%) are interested in working for an organisation that specifically contributes to reaching net zero.



78%

Said they think it's important to play a part in the UK's journey to reaching net zero emissions

57%

Said they are interested in working for an organisation that specifically contributes to reaching net zero

This drive was consistent across men and women, all age groups and all parts of the UK. And for young adults (aged 18-24) a career tackling climate change was the second most popular cause they wanted to be part of their job, after helping provide education for young people.



Robin Gupta
Senior Innovation Engineer, National Grid

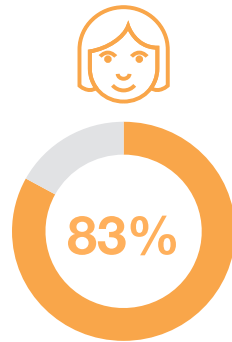
I'm responsible for the Zero-2050 project, which aims to develop the best possible ways to decarbonise the whole energy system in South Wales. By taking a collaborative approach, the project aims to create a regional, whole system solution.

Having a job that tackles climate change is not just important to me – it's important for the prosperity of our future generations. I'm convinced what we learn from this South Wales project will influence decarbonisation blueprints for other UK regions, and be a global inspiration.

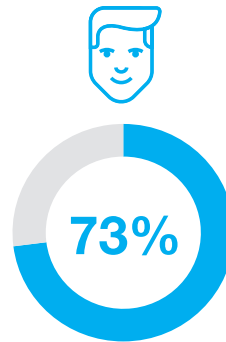
Tapping into people's desire to choose a career that fights climate change can unleash the motivated workforce the UK needs.

Our research shows that the journey to net zero matters to everyone – even those not traditionally attracted to a career in the energy sector.

Figure 5: Demographic breakdown of YouGov consumer attitudes findings



Of women said it was important to play a role in the UK's journey to net zero

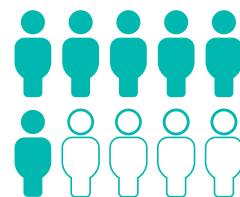


Of men said it was important to play a role in the UK's journey to net zero



81%

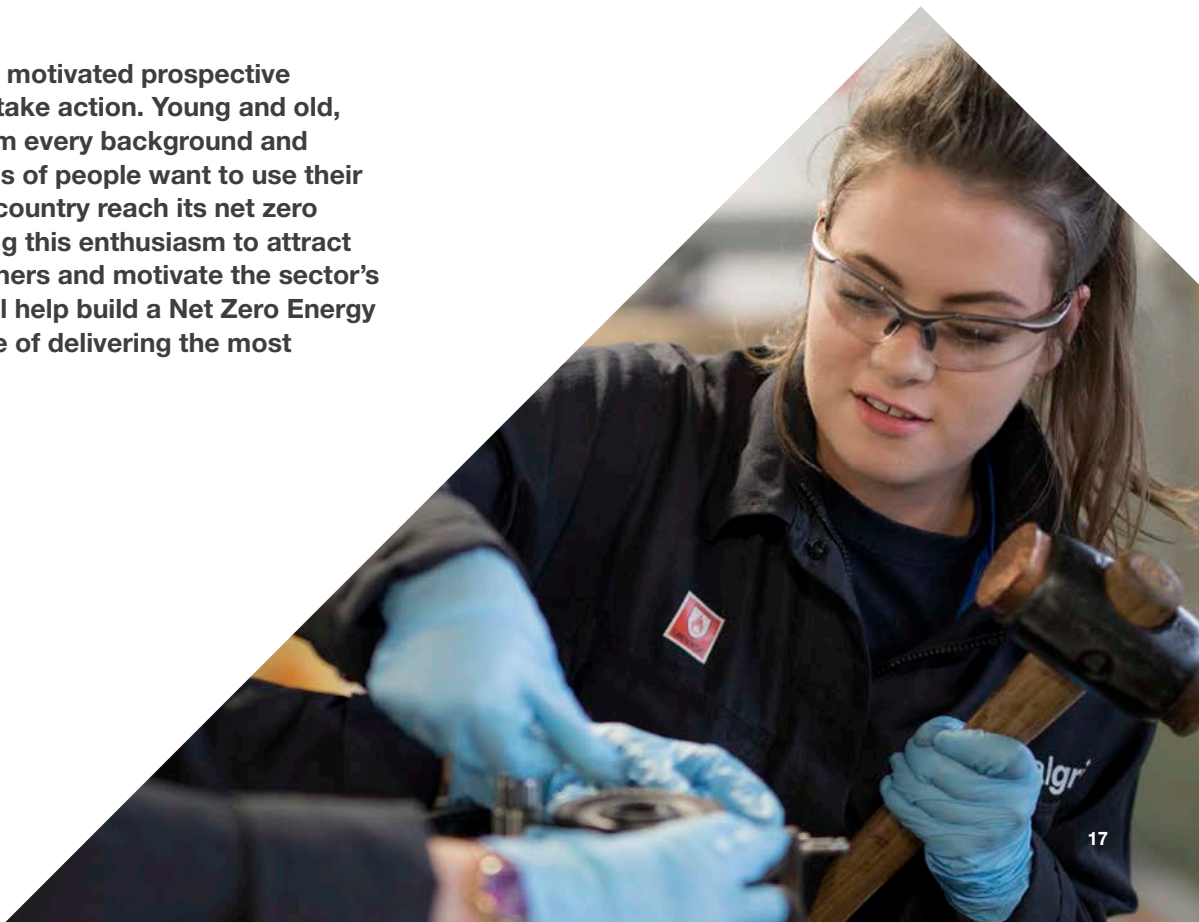
Of respondents who are 18 to 24 think it's important to play a role in the UK's journey to net zero



58%

Of respondents who are 18 to 24 want to work for an organisation that specifically contributes to net zero

The UK has a highly motivated prospective workforce ready to take action. Young and old, of every gender, from every background and community – millions of people want to use their careers to help the country reach its net zero ambition. Harnessing this enthusiasm to attract prospective new joiners and motivate the sector's existing workers will help build a Net Zero Energy Workforce – capable of delivering the most ambitious targets.



Chapter 5. Our plan to build the Net Zero Energy Workforce

- The energy sector will need to retain and retrain its current workforce to ensure workers of all ages and backgrounds and from every community in the UK can play their part in the journey to net zero
- By leveraging people's passion for climate action and a desire to work in a net zero career, the energy sector can attract the best and the brightest
- We need to increase the number of young people studying STEM subjects at school and university, with a particular focus on increasing diversity at every stage

To turn millions of motivated people into a Net Zero Energy Workforce, the UK now requires a clear strategy.

Ahead of the UN's Climate Change Conference, COP26, in Glasgow later this year, National Grid is calling for greater collaboration on these issues between key players - industry partners, government, regulators, employees, trade unions, NGOs, young people, education institutions, and the communities we serve.

1. Retain and Retrain

The next 30 years will see new jobs emerge, while some traditional roles will change or decline. Engineers, for example, who today work in North Sea oil and gas fields will have the chance to move over to work in CCUS. Elsewhere, gas engineers will learn new skills to work with hydrogen.

Investment in training existing colleagues and upskilling new recruits will be essential. While this can be achieved through in-house initiatives, external partnerships can support cross-sector training in new and emerging skills such as artificial intelligence (AI).

National Grid ESO, in partnership with Energy UK, TechUK, and OVO Energy, recently called on government to consider developing an International Centre for AI and Climate Change which would act as an innovation hub for AI technology. AI is set to become an essential tool for reaching net zero, forecasting solar and wind power, optimising the grid and managing demand side response.

Recent analysis from PWC suggests that over the next decade, AI can help cut global emissions by up to 4% by 2030 compared to business as usual with existing technology.¹²

By investing in retention and retraining, and working collaboratively with government and unions, the sector can help ensure a fair energy transition, one in which workers of all ages and backgrounds and from every community in the UK can play their part.





Steve Johnstone
Senior Innovation Specialist,
National Grid

A Net Zero Energy Workforce needs people willing to learn new skills. I left school at 16 and signed up for an electrical and mechanical engineering apprenticeship over 30 years ago.

I worked in TV manufacturing and learned to use computer-aided design (CAD), a skill that helped me move into the gas industry when I was 20. I had to learn a lot about the energy business, but in less than 10 years I had risen to a management role, making sure we could manage supply in an emergency.

Most recently I moved into another new role, this time within our

innovation team. Being able to use my years of industry knowledge to help decarbonise the gas system was exciting. People seek my counsel and advice on their projects. My 30 years of hands-on, practical experience is invaluable in developing new, innovative ideas to support our journey to net zero.

I'm proud to work for National Grid. I hope the work I'm doing will leave a lasting legacy and a better transmission system as I pass my knowledge on to those who'll follow after me.

National Grid's investment in training

National Grid's 'Our Academy' training and development team invests over £7.5million per year in UK training to ensure its people have the skills to meet the changing needs of a net zero nation.

Employees receive an average of 5.3 days of training a year and the flagship training facility at Eakring, near Nottingham, offers 800 courses including net zero modules, such as cyber security, introducing and managing renewable energy sources to the system and maintaining interconnector links. It delivers around 45,000 training days per year and is rated Outstanding by Ofsted.

There is further, continuous training for employees on the use of innovative tools and processes, once proven and adopted. For example, technicians and damage assessors in our Gas Transmission team are being trained in how to use digital 3D scanners to model and assess wear on gas pipes.

Finally, our learning tools will continue to evolve to match the digital capabilities and expectations of our colleagues.

2. Harness motivation for a career tackling climate change to attract new and diverse talent

YouGov's research on behalf of National Grid has found that being part of the solution to tackling climate change is a big, untapped motivator for men and women of all ages and backgrounds.

By tapping into this powerful driver, the sector can attract a larger, more diverse group of talented recruits – and motivate existing employees.

Over the next year, there will be countless opportunities to reshape young people's perceptions of the energy sector around net zero. This affords the sector a chance to put diversity and inclusion at the heart of its recruitment strategy, opening it up to new voices by drawing on the broadest talent pool possible. To reach the widest possible audience, diverse voices in net zero related roles should feature prominently during COP 26 and in the climate debate broadly.

Tapping into a career with purpose, showing how a job in the energy sector helps achieve net zero will attract the talent we need. It can also motivate and retain existing employees, keeping vital expertise within the sector. By combining new talent with experienced employees, we can build the Net Zero Energy Workforce we need.

National Grid's most recent recruitment campaign

In the summer of 2019, National Grid launched a recruitment campaign called The Job That Can't Wait that positioned a job with the company as helping to tackle climate change. This led to a 760% increase in expressions of interest for National Grid's 2020 new talent schemes.



Neil Rowley
Gas Market Development
Manager, National Grid

I joined National Grid with a degree in sports science. So, while my background wasn't a direct match, the company felt I was a good hire, and supported me to gain the knowledge I needed with a modular based, two-year HND course in engineering.

That was more than 17 years ago. I've been able to build a great career, first working in renewable wind energy, helping new companies get the approvals they needed to start supplying the grid. I've also worked on developing rules for electricity market participants, together with developing and contracting services to help balance the electricity system. Now I'm leading a project to explore

and prepare the gas market ahead of our shift into low carbon gases. As we are seeing with electricity, gas will undergo significant changes in the coming years as we change the way gas is supplied and used to meet our decarbonisation obligations. It is essential we create a fair market, while ensuring end users get good value.

There are many opportunities at National Grid for people with a non-engineering background, including customer management, data specialists, and people with strong commercial experience. You'll get the support you need to retrain and develop your skills.

Westminster City Hall

JCDecaux

IT'S TIME TO CUT THE CARBON

Our resilient grid will be ready for
carbon free electricity by 2025.
The job that can't wait.

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3. Inspire more young people to choose STEM qualifications

We need to increase the skills pipeline in the UK to ensure that every sector striving to reach net zero has the STEM skilled workforce it needs. To do this, we need to inspire more young people to choose STEM subjects at school and take them into higher education.

According to Development Economics' research, it is estimated that over the next ten years, the UK needs almost half a million physics A level candidates (c.480,000) and over one million maths A level qualifications (c.1.2 million) to maintain a strong workforce pipeline up to 2030. National Grid wants to use this research to shape ongoing conversation between government, businesses and secondary education about how this can be achieved.

We need to inspire children from all backgrounds, to study STEM subjects at A level and beyond. Being clear it is the gateway to a net zero career, is key.

Part of the solution should be a greater emphasis on climate science in secondary school. More than half of UK adults (54%)¹³ think this would encourage more young people to consider a career in the Net Zero Energy Workforce.

Highlighting more diverse role models, to change people's perspectives of a job in the sector, also helps. The Royal Academy of Engineering's 'This is Engineering' campaign, highlighted a greater number of female engineers last year. Research showed the campaign prompted 19% of

students to change their mind about choosing a STEM subject. National Grid's Women in Engineering Day also encourages more young women to see their future in the Net Zero Energy Workforce.

And making sure the clean energy transition leaves no-one behind, is a commitment National Grid takes seriously. Through a new partnership with the Prince's Trust, we will reach 5,000 young people from disadvantaged communities over the next five years, in 17 skills centres across the country. We will track their progress and support them right through to employment in a net zero related industry.



We need to attract a greater diversity of young people into the sector, especially in STEM related roles. No single company can address the diversity imbalance alone.

National Grid wants to become an industry leader in gender balanced recruitment. If the sector can meet these challenges, we can be ambitious in building a more diverse workforce. Through collaboration and commitment, National Grid wants to work towards gender parity in STEM recruitment by the end of the decade.

By repositioning a job in the energy sector as a role with real purpose, investing in continuous training and reskilling, and finding new ways to inspire the next generation, we can build the Net Zero Energy Workforce the UK needs.

National Grid is inspiring more young people to choose STEM

Every year, National Grid supports STEM-related activities for tens of thousands of school children around key infrastructure projects. We visit primary and secondary schools to teach young people about energy projects in their area, and provide grants for STEM equipment.

With Hinkley Point, for example, where we are connecting a major new power station to the network, 130,000 school children have enjoyed using new STEM equipment funded by National Grid.

Meanwhile, our interconnector project teams have reached 15,000 children with STEM-related activities in communities near our new sites in Hampshire, Northumberland and Lincolnshire. A new Energy Education Centre opened its doors to young people in Blyth, Northumberland, last summer. The free community facility uses interactive displays to explain climate change and how to change behaviour around energy usage. Around 2,000 children are expected to visit the centre in the next year, to learn more about how the North Sea Link interconnector, which touches land in their community, will connect Britain's power grid to Norway's hydropower.



Sarah Woolham-Jaffier
Senior Innovation Engineer,
National Grid

I'm working on National Grid's London Power Tunnels project, a new, deep underground high voltage cable circuit running from Wimbledon to Crayford. In a nutshell we're rewiring the city. It brings a lot of benefits: a more secure and reliable supply; more capacity for the capital's power needs; and a system that is better prepared for renewable energy supplies.

My role is project management and, although I'm still a graduate trainee, I've had to take on lots of responsibility quickly.

Every day is different, from managing and awarding contracts, coordinating with internal teams and external contractors, to dealing with planning consents. I also do community outreach with neighbourhoods and schools, so people can learn about the project and what it means for London and Londoners. I love the fact that although I'm principally a civil engineer, I get to be a public face of National Grid and have the opportunity to explain the benefits of our work.



Conclusion

As we begin the pivotal decade for reaching net zero, there are reasons to be confident and optimistic. The UK has a vision for where we need to get to, and is developing a route map to get there.

As with every great leap forward, success will depend on having the right people and expertise at every stage of the journey.

If we are to achieve our ambitious 2050 target, the energy sector will need to fill over 400,000 jobs to build the Net Zero Energy Workforce over the next 30 years. Work is already well underway and we need to recruit for 117,000 jobs to stay on track this decade.

Building the Net Zero Energy Workforce presents a challenge for the UK, but also an opportunity. The race to net zero will create new jobs across the country. The North West, North East, Scotland, South West and South East will all be major beneficiaries, seeing the creation of thousands of new jobs, with innovation at their heart.

The key to reaching our goal is understanding the challenges we face. None of these are new, but they are now more pressing. The energy sector is facing a retirement crunch, competition from other sectors for talent, and the STEM pipeline remains too small - with women and minority groups still underrepresented.

To build the Net Zero Energy Workforce the UK needs, we must retain and retrain our talent, use the race to net zero as a motivator to attract the best and the brightest, and further expand the STEM skills pipeline by making a career tackling climate change aspirational.

These solutions aren't a panacea and no single organisation will have all the answers. We need to foster collaboration between industry partners, government, regulators, trade unions, NGOs, education institutions and campaigning groups. Only by working in partnership, on our shared ambition, can the UK lead the way in delivering the change the world needs.

Next month, National Grid will restart the conversation with businesses, government and unions by hosting a roundtable and series of discussions to encourage cross sector collaboration on five key goals:

1. Inspire young people of all ages to choose and excel in STEM subjects so they can pursue a career in the Net Zero Energy Workforce.
2. Build a skills pipeline through A levels, degrees, technical education and apprenticeships.
3. Ensure a fair transition, whereby workers of all ages and backgrounds, from across the UK, can access training and retraining to be part of the Net Zero Energy Workforce.
4. Boost diversity within the energy sector to ensure the Net Zero Energy Workforce doesn't miss out on the best talent from every community.
5. Help the UK to become a world leader in people-powered climate innovation and technology by fostering research and investment in cutting-edge technologies.

By delivering on these five goals, together we can ensure that people of all ages, genders and backgrounds, from every community across the UK, can play a part in the UK's Net Zero Energy Workforce.



Methodology

National Grid has worked with Development Economics, a highly respected economic research company to understand the workforce implications and requirements of Britain's 2050 net zero emissions target for the energy sector.

Development Economics based the energy sector definition on classifications from the Office of National Statistics (ONS).

Step 1: Mapping out the route to net zero

To calculate the number of people that need to join the Net Zero Energy Workforce, Development Economics first examined the likely clean energy mix required to reach net zero - encompassing generation, transmission and distribution.

To do this, Development Economics analysed the CCC's Net Zero 2050 report and National Grid Electricity Systems Operator's Future Energy Scenarios report (FES) (July 2019), to understand the most likely trajectory for changes in supply from each energy source over the period leading up to 2050. In particular, the detailed workbooks accompanying the FES report identified a mix of energy sources and technologies that could deliver the net zero commitment by 2050.

This research enabled Development Economics to make an informed assessment of the energy mix required to reach net zero greenhouse gas emissions in the UK by 2050.

Step 2: Annualising estimates of changes in energy networks and supply

Having assessed the energy roadmap required to reach net zero, Development Economics then sought to understand how this would break down over the next 30 years so they could assess the annual workforce demand.

Using the CCC's research and the FES workbooks, Development Economics assessed, analysed and estimated the most likely specific contributions to the energy supply from each technology (e.g onshore and offshore wind power, solar, marine energy and nuclear energy) on an annual basis up to 2050.

This produced an assessment - consistent with the FES net zero scenario - of the rate at which different energy technologies would be deployed across the UK on an annual basis between 2020 and 2050.

Step 3: Understanding the resulting workforce implications

Development Economics then sought to ascertain the levels of employment required to build, operate, manage, maintain and decommission the network of increasingly clean energy generation, transmission and distribution infrastructure. They used evidence from a wide range of projects to derive estimates of the average number of construction and operational jobs required, per unit of installed energy generation capacity, across each of the established energy technologies.

These assumptions were developed following analysis of:

- Business Register and Employment Survey (BRES) data from the Office of National Statistics (ONS)
- Workforce jobs by industry (JOBS02) data from the ONS
- Sector-level trend data provided by the quarterly Labour Force Survey data series published by the ONS (for the period 2011-2019)
- ONS trend data on the occupational mix of the operational and construction workforce (from the Labour Force Survey) and how this varies by region
- A review of information submitted in support of planning applications (for specific projects e.g. offshore wind)
- Assessments of the employment impacts of completed onshore wind farms by various developers
- Independent future forecasts for both energy sector operational jobs and civil engineering jobs
- Development Economics' own database of energy development projects for existing technologies
- Desk-based research covering emerging technologies

Methodology continued

This research was then used to extrapolate the number of jobs associated with the development of each energy source, with an annualised estimate of employment implications. This research produced an estimate of the required numbers of construction jobs and operational jobs for each energy source.

Given that the estimates are required for a 30 year period up to 2050, additional assumptions were made regarding the expected average annual productivity gains across the energy sector. Productivity assumptions were made using trend data for the UK energy sector based on both energy production data and UK employment data published by the ONS.

Step 4: Understanding replacement demand

Development Economics then worked to assess the future need to replace the portion of the energy sector workforce that can be expected to leave the sector annually over the next 30 or so years. This will be due to workers deciding to retire, or for other reasons such as ill-health, caring responsibilities or taking a new career direction.

A set of assumptions for the energy sector workforce for each job occupation category was developed based on a review of available data and literature, including sector-level analysis undertaken by the UK Commission for Employment and Skills (UKCES). Future estimates of replacement demand for both construction-related employment and operational employment were derived using information generated by the Working Futures series of reports published by UKCES.

Additional sources of predictions about potential future workforce trends – including the expected future occupational structure of the sector and gender representation within the sector – were developed based on interrogation of sector level trend data provided by the quarterly Labour Force Survey data series published by the ONS for the period 2011-2019.

In addition, Development Economics made use of national and regional forecasts for the UK economy disaggregated by sector for the period 2020-2050 published by Experian.

By combining the expected expansion demand with the necessary replacement demand, Development Economics were able to make an estimate of the overall workforce requirements stemming from net zero.

Step 5: Understanding the labour supply

Estimates of future labour supply were developed based on current demographic forecasts for the UK using official population projections published by the ONS.

Additional assumptions regarding future potential workforce supply were made based on 10 year trends in levels of participation on university and vocational training courses relevant to engineering and other disciplines relevant to the expected future workforce needs for the energy generation and distribution sector.

Workforce jobs

This report has used the Workforce Jobs (WFJ) metric for measuring the impact of net zero on the workforce. We have used this Office for National Statistics' (ONS) classification as it is widely viewed as the best metric for measuring workforce changes within sectors.

This metric measures the numbers of jobs (including self-employment) within a sector. It will be higher than the number of people employed given that some may have two or more jobs. WFJ estimates are mostly based on employer surveys, which are considered by the ONS to be more reliable in providing an industry classification than the Labour Force Survey (LFS), which is of individuals.

More information can be found on the ONS website.

Endnotes

- 1.** <https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/>
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