

## The human capital implications of net zero on the energy sector



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## Introduction

- **Energy & Utility Skills** delivers initiatives, products and services identified as essential for the long-term sustainability and attractiveness of the sector by its members
- The majority of the UK's largest utility-based employers
  
- **Rob Murphy, Workforce Planning and Labour Market Lead**
  - 30 years as a skills and labour market researcher
  - 17 years with Energy & Utility Skills
  - Supported most of the UK's regulated companies and their supply chain partners in understanding their current workforce dynamics and their wider labour market environment
  - A member of BSI's Human Capital Committee (HCS/1)
  - A Certified Member of The Market Research Society

## Overview

- With the UK on a path to reach “net zero” carbon emissions by 2050, the sector must:
  - increase low carbon electricity generation
  - install low carbon heating systems
  - develop carbon capture usage and storage (CCUS) technology
  - develop hydrogen networks
  - install around 60,000 EV charging points
- To deliver this, National Grid estimates 400,000 roles
  - 260,000 new roles
  - 140,000 replacements for leavers
- This will require a more robust talent pipeline of young people (especially those from under-represented groups and disadvantaged communities) and substantial upskilling/reskilling
- Clearly this is a massive challenge for a sector, which has traditionally struggled to attract a diverse workforce

## Methodology

- This presentation draws together the findings of two major research projects carried out by Energy & Utility Skills on behalf of the National Skills Academy for Power (NSAP):

1. A detailed quantitative assessment of the power sector's skills and labour requirements over the course of the next ten years (2020-2029), covering transmission and distribution networks and their strategic supply chain partners

Based on workforce data provided by all of Great Britain's Transmission Operators (TOs) and Distribution Network Operators (DNOs), with a set of assumptions applied relating to likely future retirement and staff turnover rates and an industry-level resourcing strategy developed

1. A "skills deep dive" covering a range of technologies related to big data, artificial intelligence, automation, smart networks, and the transition of DNOs to DSOs

This considered the impact of new technologies on the power sector's workforce was based on a literature review and 25 interviews with industry experts

## D&I in the current workforce

- The power sector’s “technical” workforce falls short of national averages when it comes to employing young people, females, ethnic minorities and people with a physical or learning difficulty

Personal characteristic	Electricity	
	sector	UK – All sectors
% aged 16-24	8%	12%
% aged 60+	12%	10%
% Female	23%	47%
% Ethnic minority	2%	11%
% Physical/learning disabilities	11%	15%

- A key aspect in addressing this issue is increasing the opportunities available to people in/from disadvantaged communities, where ethnic diversity tends to be greater and, often, educational attainment lower
- However, certain cultural and generational attitudes towards post-compulsory education routes, as well as the energy sector, present barriers

## Estimated demand for people

- An estimated 22,000 vacancies will be created over the next decade within the electricity transmission and distribution “technical” workforce – equivalent to 77% of the current workforce

Cause of vacancies	Number of vacancies	% of current workforce
Retirements	10,000	36%
Voluntary staff turnover	12,000	41%
<b>Total vacancies</b>	<b>22,000</b>	<b>77%</b>

- The Contractor workforce is expected to lose the equivalent of 115% of its current workforce – compared to 46% of the TO workforce and 56% of the DNO workforce
- While the network operators tend to invest heavily in Apprentices, Graduates and internal progression, contractors rely much more on the external labour market to supply the skills they need

Company Type	Apprentice	Graduate Programme	Internal move	External
Network Operators	33%	7%	40%	20%
Contractors	7%	0%	25%	68%

## Impact of new technologies on the power sector's workforce

- Extensive literature review and 25 interviews with industry experts
  
- Technologies considered:
  - Domestic low carbon technologies
  - Electric vehicle charging points installation
  - Digital and data literacy
  - Artificial Intelligence and data science
  - Automation
  - Augmented Reality and Virtual Reality
  - Cyber security and specialist IT skills
  - Smart networks
  - The transition from DNO to DSO

## Domestic LCTs

- LCTs are very sensitive to government policies and incentives
- Between 2012 and 2020 there was a steady decrease in the number of job postings relevant to LCTs
  - falling from 30,000 in 2012 to 14,000 in 2019
- In the year to May 2021, there were 21,500 job postings, signalling a potential revival in the market and a strong bounce-back from the impact of the Coronavirus pandemic
- Demand for several occupations will be high in:
  - Construction Project Managers
  - Plumbing and HVAC Trades – technology specialists
  - Labourers
- By around 2028/29, workforce levels will reduce as the industry moves into a long-term maintenance and repair phase (broadly stable at around 250,000 more than the 2019 baseline)



## Electric vehicle charging points installation

- The EV installer workforce could develop in a number of ways:
  - A dedicated EV charging point installer workforce
  - A multi-skilled “Electrician+” workforce which is capable of routine domestic electrical work as well as the installation of domestic EV charging points
  - A multi-skilled “Low Carbon” installer workforce capable of installing EV charging points as well as one or more domestic low carbon technology (e.g. PV)
- There are also a range of support functions growing in demand:
  - Technical customer service staff
  - Installation Auditor
  - Fault findings and repairs, it is unlikely that this will require a qualified/ certified installer
- Recruitment activity in this has increased substantially over the past couple of years



## Digital and data literacy

- **Digital literacy** – the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills
- **Data literacy** - the ability to read, write and communicate data in context, including an understanding of data sources, analytical methods and techniques applied – and the ability to describe the use, application and resulting value
- **Cyber security awareness** – the ability of end-users to understand and identify cyber security threats, the risks they introduce and utilising best practices to guide their behaviour
- In 2019, digital skills were required in at least 82% of UK online advertised job openings – an amount that is likely to grow over the coming years.

## Artificial Intelligence and data science

- Energy companies are employing AI to optimise, schedule, and automate their operations without disrupting energy performance
  - E.g. load forecasting, predictive maintenance and demand management
  
- Skills needed to harvest, analyse and make actionable insights based on data collected from both the assets and customers requires both core data analytics/ mathematics **as well as technology/ energy sector context**
  
- Demand for data scientists and data engineers has risen by over 231% in the past five years
  
- Attracting experienced hires into the energy sector could prove challenging



## Automation

- Automation of repetitive and rule-based processes, for example in energy trading, finance and accounting and procurement
- Robots and drones in:
  - Maintenance, inspection, and repair of dangerous, time-consuming, or hard to reach assets
  - Installation and setup of technologies (e.g., offshore wind and solar panels)
  - Wearables and sensors can be worn by workers that allow for digital tracking to predict accidents (e.g., pulse rate monitoring to establish accident risk profiles)
  - IT automation can improve price forecasting, custom reporting, secure file transfers, file archiving, provisioning, onboarding, and auditing .
- Automation could occur in three waves:
  - Wave 1 (to early 2020s): algorithmic
  - Wave 2 (to late 2020s): augmentation
  - Wave 3 (to mid-2030s): autonomy
- During the first and second waves, women could be at greater risk of automation due to their higher representation in clerical and other administrative functions.

## Augmented Reality and Virtual Reality

- Use of AR and VR technologies in the power sector can be categorized into three main purposes:
  - Training - Use of immersive technologies can simulate realistic and dangerous situations to produce a more hands-on training experience
  - Operational Processes and Asset Maintenance – VR can be used to troubleshoot in the event of a problem, as the cause of failure can be identified more efficiently and safely using the virtual version of the plant
  - Knowledge transfer – Using AR to pass on data to a subject matter expert, guiding on-site technicians through remote consulting
- While energy companies will likely out-source the initial development of AR/VR technology to specialist developer companies, they will need to facilitate the development:
  - Communicating the company's needs (be an intelligent client)
  - Possessing sufficient background knowledge to be instructed by the provider on how to be a trainer ('train-the-trainer')
  - Analysing quantitative or qualitative feedback and communicating findings and their implications

## Cyber security and specialist IT skills

- Wherever digital communications exist, there also exists the potential for security breaches – with technology comes vulnerability
- The cyber security roles in greatest demand include:
  - Engineers
  - Analysts
  - Architects
  - Managers
  - People who need to be able to communicate risks and good practice in an engaging way to non-cyber staff, while working collaboratively across the business to develop a holistic cyber security strategy.
- Cyber security specialists are highly skilled, with academic achievements to match
  - Around 90% of job postings required a degree qualification or higher
  - 75% require 3+ years' industry experience
- Apprenticeships can be a strategic way for the energy sector to attract and develop its cyber security workforce, providing them with the required technical skills and also the necessary business knowledge/context

## Smart networks

- Smart networks mean structural changes to reinforce or upgrade the network assets, implement decentralised energy data processes, change processes and business models, establish more flexible energy markets, and modernize system operations
- There is likely to be increased demand for roles such as:
  - LV protection engineers
  - Automation engineers and technicians
  - System and network planners
  - Data network engineers
  - Engineering and connections design roles
  - EHV network design engineers
  - **Senior Authorised Persons**
- Potential for a Smart Network Craftsperson/ Technician/ Engineer Apprenticeship standard/ framework at circa Level 4

## The transition from DNO to DSO

- The three roles of a Distribution System Operator are :
  - Planning and network development
    - Plan efficiently in the context of uncertainty, taking account of whole system outcomes, and promote planning data availability
  - Network operation
    - Promote operational network visibility and data availability
    - Facilitate efficient dispatch of distribution flexibility services
  - Market development
    - Provide accurate, user-friendly, and comprehensive market information
    - Embed simple, fair, and transparent rules and processes for procuring distribution flexibility services
- A number of capabilities where current DNO levels were well below the anticipated requirements for DSOs have been identified, primarily in areas such as:
  - Commercial Relationships & Whole System Pricing
  - Customer account management
  - Despatch
  - Forecasting
  - Regulatory codes and frameworks
  - Settlement
  - Whole system co-ordination



## External challenges to workforce resilience

- In addition to the specific challenges highlighted above, we must consider the wider context that the energy sector operates in:
  - The most recent data shows that the labour market is continuing to recover from the Coronavirus pandemic
    - Employment is increasing and unemployment is decreasing
    - Redundancy rates have returned to pre-pandemic levels
    - Job vacancies have reached a record high
  - Investment levels in the UK's essential infrastructure is planned to exceed £600bn over the coming five years, with the utilities sector accounting for one in every five pounds of investment, including 31 individual projects worth more than £1bn, many of which will run concurrently
  - An estimated that 25% of vacancies in England were skills shortages.
    - 29% within "Primary Sector & Utilities" - only "Manufacturing" (36%) and "Construction" (34%) report a higher proportion of skills shortages
  - Brexit appears to have had only an indirect impact the energy sector in that it has reduced the general supply of construction/engineering construction trades in the UK labour market, particularly at the lower-to-mid skill levels.

## Conclusions

- Over the coming years, the following skills/job roles will be heavy demand and will require the sector to take both individual and collaborative action to ensure supply meets demand:
  - For electric vehicle and domestic low carbon technologies – reskilling/multi-skilling to enable competencies across a wider range of installations (e.g. heat pumps and EV charging points)
  - Engineering occupations – with data, digital and commercial skills
    - LV protection engineers
    - Automation engineers and technicians
    - System and network planners
    - Data network engineers
    - EHV network design engineers
    - Senior Authorised Persons
  - Development of a “Smart Network Craftsperson/ Technician/ Engineer” Level 4
  - ICT Specialists (Data Analyst, cyber security, ICT Technician) – with industry context knowledge
  - Project Managers, Business Developers, Commerce and Trading

## Conclusions

- The success or failure of a digital, data or cyber security strategy depends on the skills, knowledge, and actions of the entire workforce – and all should be included in relevant and appropriate training
  - Digital literacy
  - Data literacy
  - Cyber security
  
- Energy companies should consider the ways it reaches out to prospective employees to ensure that opportunities are available to all, no matter what their age, gender, ethnicity, disability status or where they live.
  - Entry requirements may be exacerbating diversity and inclusion issues
  - Requiring a Degree or industry experience (where, in reality, they are not essential) could effectively rule out many from disadvantaged communities and certain ethnic minorities.
  
- The benefits of employing neurodiverse people in data areas is increasingly being recognised
  - Including people with Autism, Dyslexia, Dyspraxia and Attention Deficit Hyperactivity Disorder (ADHD).

## Conclusions

- The reporting of robust and transparent human capital metrics to both internal and external stakeholders can help employers demonstrate its commitment to its people
- To support this aim, the National Skills Academy for Power is currently working with DNOs to develop a framework which seeks to measure and benchmark workforce resilience from a skills and resourcing perspective.
- It is likely that metrics will be developed relating to the following aspects:
  - Attraction
    - Workforce characteristics
    - resourcing
  - Skills development
    - Upskilling, multi-skilling and new skills
  - Retention
    - Leavers
    - Succession planning
    - absenteeism

## Questions and further information

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