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Skills for a greener world

Workforce Renewal and Skills Strategy: Workforce resilience workstream

Horizon scan of technologies and issues likely to affect the gas networks workforce

Version 1C

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Part 1 – Desk Research

1. Introduction

1.1.1 This report sets out the findings of the gas network industry horizon scan (desk research and qualitative research) into issues that have the potential to impact upon the workforce and the skills required to deliver a successful future.

1.1.2 This Horizon Scan was conducted by Turquoise Thinking Ltd, an independent market research agency on behalf of Energy & Utility Skills. It is presented in two parts, Part I is findings from the desk research and Part II is finding from the qualitative research.

1.1.3 This paper summarises the findings of a literature review and interviews with industry experts into the following areas:

- Impact on operations and skills;
- Impact, in terms of volume (i.e. quantity of people likely to be affected);
- Timescale;
- Difficulty in acquiring the required skills.

1.1.4 This horizon scan covers all aspects of the gas networks industry – with a focus on installation, operations, maintenance skills, metering and connections.

1.1.5 In the following chapters, a summary is provided of each skill/ operational area technology and why it is important to the future success of the gas networks industry, and its potential impact on the workforce, timescale to deployment and ease of acquiring the necessary skills.

1.1.6 A red/amber/green table is also provided to indicate the level of urgency required:

	Impact – operations & skills	Impact – volume	Timescale	Difficulty in acquiring skills
High	Significant change	Will affect a large proportion of the workforce	Within the next 5 years	Skills do not exist – new provision will be required
Medium	Some change	Likely to affect reasonable numbers	Within 6-10 years	Majority of skills provision is likely to exist
Low	No or little change	No change or limited to very small numbers/ niche areas	11 years +	Skills mostly available within the current workforce

1.1.7 This horizon scan will be used by the National Skills Academy for Gas to determine which issues/areas warrant a “skills deep dive” investigation into the nature and extent of the potential impact on the gas network industry’s workforce.

1.1.8 The skills deep dives will also consider what actions need to be taken, and by whom, in order to meet the challenges and make the most of the opportunities. The National Skills Academy for Gas met on Monday 29th January to review the findings of the Horizon Scan and agree which areas, if any, require a ‘skills deep dive’.

1.1.9 More information about the scope and purpose of the skills deep dives can be found in Chapter 4 below.

2. Executive Summary (desk research and qualitative research)

This Horizon Scan consisting of desk research and qualitative research was conducted by Turquoise Thinking Ltd, an independent market research agency on behalf of Energy & Utility Skills.

In the desk research it was evident that the transition away from existing natural gas infrastructures and technologies to hydrogen blending in the networks for home heating, meant that gas engineers remain in a strong position in terms of demand for their services.

Existing skills will still be extremely valuable, albeit with some upskilling required in the long term – large-scale changes are still likely to be decades away and those with an understanding of how traditional appliances work will be vital in ensuring a smooth transition.

The desk research found that the fundamental skills of a gas engineer are transferable between natural gas and hydrogen so the day-to-day responsibilities of gas engineers are unlikely to change too drastically, and existing skills will still be in huge demand.

Companies will still need highly skilled, experienced staff to maximise current assets, maintain safety and continue improvements vital for ageing infrastructure.

In terms of current skills gaps and shortages, 20% of vacancies were 'skill shortage vacancies' i.e. vacancies that employers find hard to fill due to applicants lacking relevant skills, qualifications, or experience.

The uncertainty around specific timescales remains and depends on a wide range of factors, including the constantly changing political landscape and associated changes in policy. However, the pace of change in the plan to decarbonise the UK power sector in general is happening at a slower rate than expected.

According to Energy UK's predictions, the roadmap between existing heat network infrastructure and this ambitious vision for 2050 could attract between £30-£50 billion investment into the UK. This in turn would directly create between 20,000 and 35,000 jobs, while also supporting local regeneration and levelling up. This indicates that a significant impact on the workforce volume needed to deliver heat networks is likely in the longer-term.

At this stage, because thousands more engineers will need to learn how to install and maintain technologies linked with heat networks, the key difficulty is upskilling the existing workforce at the rate that may be required to keep pace with the ambitious growth path outlined for heat networks.

Overall, the sector needs to develop and sustain a workforce that is ready not only to tackle decarbonisation challenges, but also to find new opportunities and position companies positively for a sustainable future.

In the qualitative research attitudes towards the future of the gas industry were mostly positive. Most claim that they are 'agnostic' as to which technology is used to achieve net zero for customers and the gas industry within the UK. The respondents argued that they are not wedded to one technology or one power source. But although they see a move towards electrification they believed the UK was not ready for the mass move over to heat pumps and electric cars because of a lack of investment in the infrastructure to support it.

In essence, it was felt that the gas industry needs the Government to support it. In addition, the energy industry as a whole needs to work more collaboratively.

Most felt that the future of the gas industry was in green hydrogen. It was thought that there will be a gradual increase in hydrogen in the mix along with upgrading the infrastructure (most of which will be paid for by the consumer).

If the future was not green hydrogen (given the recent cancellation of the Redcar hydrogen village trial because the main source of hydrogen supply would not be available) it would be re-purposing of the pipes and infrastructure or perhaps de-commissioning. The Government is planning to postpone the decision on whether, and if so how, hydrogen will contribute to heating decarbonisation to 2026, leading to increasing frustration in the industry and a sense of a lack of leadership.

The key issue that emerged was the retention of staff and attracting new staff into the industry. This is highlighted in the desk research where it states that decarbonisation challenges are exacerbated by an existing decline in skills in some sectors of the economythat are critical to the transition.

The key challenges were:-

- Confidence in existence and longevity of jobs
- Access to and affordability of skills provision
- Training and retaining skills pipeline
- Parity of esteem for entrants into trade vocations
- Rate of movement of workers between jobs

There was a strong sense that all energy companies are vying for the same pool of talent. Thus there is a need to make the industry and engineering as a profession attractive to young people. There is also the issue that younger employees do not have the same long term outlook or staying in the same job as the previous generation of recruits.

Overall, it was felt that current skills are transferable and that training would be approximately 5 days to 2 weeks to transfer skills to hydrogen. There was discussion of 'pivoting off' core skills such as plumbing, heating, and electrician; the core foundation is in place.

There is a digitalisation 'piece' which is how to harness it and how to get digital natives into the industry so that the gas industry becomes more efficient.

Most feel that the future of the industry is exciting but the sector needs to come together to communicate that working in gas can be a 'fantastic career' with opportunities, variety, and career progression. However, all feel that there is a lack of investment. Moreover, there is not enough recognition of the unique challenges in the gas industry. Ofgem are focusing on supporting vulnerable customers and keeping the bills down not on helping the gas industry through this challenging transition to net zero.

The people we spoke to in the qualitative research believe Energy & Utility Skills is the perfect nucleus to unify the other parties and they should use their influence and network. One GDN asked for 'any help Energy & Utility Skills can give in terms of lobbying on behalf of the gas industry and on the unique challenges that the industry faces'.

Crucially, Energy & Utility Skills needs to support the entire industry, not just gas and to get their weight behind it, working collaboratively across sectors. They need to control the narrative for the gas industry, using their contacts, such as working with unions, to come together in one voice.

3. Horizon scan of issues likely to affect the gas network industry's workforce

3.1 Introductory comments

3.1.1 The Gas Distribution industry in the UK comprises eight Gas Distribution Networks (GDNs) across the UK (including Northern Ireland) and, following an industry restructure in 2005, these are owned by four companies operating regional monopolies (Scotia Gas Networks/SGN, Cadent, Northern Gas Networks and Wales & West Utilities plus Firmus Energy and Phoenix Natural Gas in NI).

3.1.2 Climate goals are driving the transformation of the gas industry. The UK government's commitment to achieving net zero emissions by 2050[1] has spurred gas distributors to explore renewable gases and invest in decarbonising heating processes.

3.1.3 Gas networks and gas appliance manufacturers are increasingly looking at how they can become carbon neutral by utilising technologies and techniques (and skills), with Net Zero targets in mind.

3.1.4 The Gas industry is being rapidly transformed by new technologies and automation, in particular driven by data-enabled digital technologies and hydrogen and safety issues.

3.1.5 The second round of Ofgem's RIIO-2 price control affects the gas industry. The RIIO (Revenue = Incentives + Innovation + Outputs) model ensures that networks operate safely and responsibly while providing reliable service for their customers. This regulation stipulates how much revenue gas distributors can earn, thereby influencing their operational, financial and strategic decisions. For gas distribution and transmission networks, the RIIO-2 period (RIIO-GD2 and RIIO-T2) runs from 2021 to 2026.

3.1.6 However, profitability in the gas distribution industry hinges on regulatory decisions. The industry's high profitability allows for necessary network expansions and upgrades, with regulators ready to compensate for cost rises in their price setting.

3.1.7 The market size of the Gas Distribution industry in the UK is measured at £6.2 billion in 2023.

3.2 The current workforce

Current workforce estimates

3.2.1 Data from the 2022 Business Register and Employment Survey estimates that there are around 16,550 people employed in the UK's gas networks industry.

Figure 1: Employment by region of the UK

National & English Region	Number of employees (2015)	Number of employees (2022)	% growth since 2015
East	400	1,250	+212.5%
East Midlands	100	800	+700%
London	500	1,250	+150%
North East	100	0	-100%
North West	900	1,750	+94.4%
South East	3,000	3,000	0
South West	400	700	+75%
West Midlands	1,750	5,000	+185.7%
Yorkshire & The Humber	500	500	0
Northern Ireland	340	340	0
Scotland	1,500	1,500	0
Wales	900	800	-11.1%
UK	**10,390**	**16,890**	**+64.6%**

1 Revised (Draft) National Policy Statement for Energy

3.2.2 The highest proportions of the gas networks workforce are in the West Midlands and the South East.

3.2.3 The data also suggests that employment in the gas networks industry has increased by 64.6% since 2015. The regional estimates of growth should be treated with caution due to the relatively small sample size but it does appear that the East region, the West Midlands and London have seen their gas networks workforces increase since 2015. It Should be noted that the figures for regional employment are based upon the location of the employer and not where the field workforce is operating.

3.2.4 However, other slightly conflicting estimates of the total number of people employed in the UK gas networks industry exist. According to the IBISWorld report entitled 'Gas Distribution in the UK – Market Size, Industry Analysis, Trends and Forecasts (2023-2028)', the industry has 11,907 employees in 2023. Meanwhile, combined figures publicised by the UK's four gas networks (including Firmus Energy and Phoenix Natural Gas in NI) estimate a combined total of 12,600 people currently working for them:

- Northern Gas Networks – employs around 1,300 people (and provides regular work to around 800 contractors);
- Cadent – employs around 6,000 people;
- Wales & West Utilities – employs around 1,300 people;
- SGN – employs around 4,000 people.

Recent recruitment trends

3.2.5 There appear to be many careers within the gas distribution sector, accommodating diverse skills and expertise. According to Indeed, job opportunities exist in various fields, such as engineering, technical operations, statistical methodology, safety and regulatory compliance, customer service and business development.

3.2.6 Key job descriptions in these fields include the following:

- Engineering jobs
  - ✓ Designing, building and maintaining pipelines, facilities and equipment to ensure natural gas's safe and efficient distribution
  - ✓ Gas engineer – responsible for various distribution aspects including network design, metering and emergency response (some organisations hire gas engineers to specialise in each of these fields for better focus and efficiency)
  - ✓ Network engineers design and maintain gas distribution systems, ensuring compliance with industry standards and regulations
  - ✓ Metering engineers install, maintain and calibrate gas metering devices to ensure accurate consumption measurements
  - ✓ Emergency service engineers respond to critical incidents involving gas distribution systems, assessing situations and performing repairs to minimise risk and restore normal operations

- Technical operation jobs
  - ✓ Regularly operating, maintaining and managing distribution systems to ensure natural gas's safe and reliable delivery. Key job descriptions in these fields include the following:
  - ✓ Gas manager – oversees distribution systems' operation and maintenance, ensuring safe, efficient and reliable delivery of natural gas to customers. They manage personnel, coordinate projects and implement strategies to meet regulatory compliance and company objectives. Gas managers develop and monitor budgets, set performance targets, foster a safety culture and promote continuous improvement. They collaborate with various departments such as engineering, planning and customer service to address challenges and optimise the gas distribution network's performance.
  - ✓ Gas connections coordinator – manages operations that connect new customers to the gas distribution network. They act as a liaison between customers, engineering teams and contractors to facilitate the design, construction and commissioning of new connections. This role focuses on customer satisfaction, compliance with regulatory requirements and prompt completion of connection projects. Connections coordinators help expand gas distribution networks, review and approve designs, get necessary permits, schedule works, monitor project progress and resolve issues
  - ✓ Gas control room operator – these operators monitor and control gas flow through distribution networks from a central control room. They utilise computer systems to track network performance, adjust pressure levels and maintain gas supply within safe limits. This role involves coordinating with field personnel during maintenance and emergencies to ensure the gas network's safe and efficient operation. Control room operators monitor alarms and alerts, respond to network fluctuations, implement contingency plans, communicate with external agencies and produce regular performance reports.
  - ✓ Gas quality analyst – these analysts monitor and guarantee natural gas quality within distribution systems. They conduct tests and analyses to ascertain gas compositions, calorific values and compliance with industry standards. The role encompasses resolving quality issues, maintaining laboratory equipment and offering technical expertise to support operational teams. These analysts help ensure the gas meets quality standards, contributing to consumer safety and optimising the distribution industry's efficiency and performance.

- Expert technicians
- Expert technicians have skills in specific areas to help install, repair and maintain pipelines, facilities and equipment to ensure natural gas's safe and efficient delivery. Examples of expert technician jobs in gas distribution include:
  - ✓ Gas service technician – installs, repairs and maintains gas appliances and equipment. They perform routine inspections, diagnose and fix problems and ensure that all work meets safety standards. These technicians guide customers on correctly operating and maintaining their equipment, fostering a safe and efficient environment for gas appliance users
  - ✓ Gas leak surveyor – assesses pipelines and other infrastructure components for gas leaks. They use specific equipment and techniques to detect leak sources, assess the severity of leakages and promptly relay their findings to relevant teams for swift repairs. Leakage surveyors ensure the safety and integrity of distribution systems and contribute to preventing environmental hazards and reducing gas loss
  - ✓ Gas mains layer – these individuals instal, repair and replace gas mains and service pipelines. Working with construction and engineering teams, they instal new pipelines, dig trenches and connect channels to the existing gas networks. These individuals help expand and maintain the distribution infrastructure, ensuring a continuous and reliable gas supply to consumers while prioritising safety and operational efficiency.

- Statistical methodology jobs
- These jobs involve using statistical techniques to analyse data and inform decisions relevant to natural gas distribution. They forecast demand and optimise routes. Examples of statistical methodology jobs include:
  - ✓ Gas network data analyst – collects, processes and analyses information relevant to gas distribution systems. They use statistical tools and data visualisation techniques to identify trends, assess network performance and support decision-making processes. These analysts refine data collection methods, ensure information accuracy, work with various departments to integrate insights into strategies and monitor industry developments to enhance their analytical capabilities
  - ✓ Statistical modellers – these modellers use statistical techniques and models to analyse data and inform decisions relevant to natural gas distribution. They analyse large amounts of data relevant to natural gas demand, supply and distribution to identify trends and patterns. They also develop statistical models to forecast future demand and utilise numerical techniques to optimise natural gas distribution. These models help to evaluate the impact of different factors, such as economic conditions and population growth. The models assist in identifying efficient routes for delivery and determining the optimal allocation of resources.

3.2.7 Figures from 2021 for the Gas Industry Profile show that across the UK's gas distribution workforce, 71% were male (compared to 52% for the UK as a whole), 11% were from a BAME background (compared to 13% of those working in the UK) and 15% described themselves as disabled (slightly lower than the UK average of 17%).

3.2.8 The age profile of workers in the gas distribution industry is estimated to be slightly younger than the UK average and employs a slightly lower percentage of people aged 60 years and above (7%, compared to 11% across the whole UK workforce)[2].

3.2.9 In 2021, four in ten (40%) of all employed in the gas distribution sector were employed in either 'Associate Professional/Technical Occupations' or 'Skilled Trades Occupations'.

3.2.10 In terms of skills gaps and shortages, the Working Futures 2019 Report indicated that within the gas distribution industry, 20% of vacancies were 'skill shortage vacancies' i.e. vacancies that employers find hard to fill due to applicants lacking relevant skills, qualifications or experience, while in 2017 in the Utilities sector as a whole 4.7% of the workforce had a 'skills gap' (i.e. they were not fully proficient at their jobs).

3.2.11 According to the government's most recent Shortage Occupation List, there is a current demand for jobs applicable to natural gas such as engineering, quality analysis and technical services.

2 Energy & Utility Skills – National and Regional Labour Market Statistics Report (2019).

4. Horizon scan of issues affecting the gas network industry's workforce

4.1 Summary of the findings

4.1.1 Based on the findings of this horizon scan, the following table summarises the potential impact that a range of issues and new and developing technologies might have on the workforce.

Figure 2: Summary of the RAG status of each issue

Issue	Impact – operations & skills	Impact – volume	Timescale	Difficulty in acquiring skills
Decarbonisation	High	High	Long-term	High
Domestic gas engineers (and a move towards hydrogen-blended gas for heat and transport)	Low	High	Short-term	Low
The move towards other (non-hydrogen) gases	Medium	Medium	Short-term	Medium
Specialist data and digital skills	High	High	Medium-term	Medium
Safety and emergency technologies	High	Medium	Medium	Medium
Growth in heat networks	Medium	Medium	Long-term	Medium

5. Decarbonisation

5.1 Industry Context

5.1.1 The gas industry is facing its greatest challenge since the introduction of natural gas in the 1960s, with new technological developments and the need to greatly reduce carbon emissions before 2050. To meet this challenge, the current energy networks must evolve to meet the needs of the future customer.

5.1.2 The 2050 drive to net zero is creating a fundamental shift for oil, gas and chemicals businesses. It is raising questions on the role of hydrocarbons in a rapidly changing energy economy, leading companies to reinvent their business models and operations. It is also creating opportunities for businesses to re-establish their position in society and engage in the UK's decarbonisation effort. Companies that build a motivated, digitally driven workforce with the right skills and capabilities will be at the forefront of this change [3].

5.1.3 Today, gas still meets around 40% of total UK energy demand, and the renewable integration achieved to date has been successful in part due to the ability of the gas generation fleet to flex output in times of low wind or sun. However, transitioning towards net zero while maintaining a reliable and affordable energy system will require a continued, if different, role for natural gas [4].

5.1.4 In addition, in November 2023, the government confirmed its plans to grant new North sea oil and gas licences every year, in order to "reduce reliance on volatile international energy markets and hostile foreign regimes", with the government stating that, "this bill will support the future licencing of new oil and gas fields, helping the country to transition to net zero by 2050 without adding undue burdens on households". This announcement would mean that the demise of gas networks is unlikely for quite some time.

5.1.5 Whilst their existing role is almost certain to change, there is a continuing opportunity to remain in the business of transporting gaseous substances – whether it is biomethane, hydrogen, or carbon dioxide as part of a CCS scheme. Distribution networks, in particular, will likely play an important role in transporting gaseous fuels to household and commercial users, although some aspects of the transmission network may find it difficult to retain a role as the pattern of flows changes [5].

5.1.6 The three main market sectors for gas in Europe are domestic and commercial heating, industrial process load, and power generation. There are a wide range of decarbonisation options in the heating and industrial load markets, including biogas/biomethane, bio-synthetic natural gas (SNG), producing hydrogen from methane (either via methane reforming plus CCS or methane cracking) and converting power to gas.

5.1.7 Longer term, hydrogen from renewable sources (green hydrogen) is likely to play the most significant role with hydrogen blended into existing methane flows a possible intermediate step.

5.1.8 In some regions with large renewable electricity production there is already excess electricity production compared with local demand. This gives the greatest potential for power to gas and will lead to closer sector coupling. Some gas network companies have already started working with their electricity counterparts to develop an integrated infrastructure outlook.

3 Deloitte – The Net Zero Workforce (Oil, Gas & Chemicals) Report (June 2021)
4 National Grid ESO 'Future Energy Scenarios' (July 2023)
5 The Oxford Institute for Energy Studies – 'The Future of Gas Networks, Key Issues for Debate' Report (2019)

5.1.9 The use of CCS as part of a hydrogen development will be determined in part by the availability of suitable storage facilities and, perhaps more importantly, the degree of public acceptance. In some countries (for example, Germany and Italy) there has been strong opposition to CCS in recent years as it was seen as "a costly diversion from renewables and other technologies to reduce carbon emissions". However, in late 2023 the German Green Party has recently undergone a "pragmatic shift" under their new leader and have decided to embrace carbon capture and storage technology. In addition, the change of heart on CCS was also on display at the European Commission's Carbon Capture, Utilisation, and Storage (CCUS) Forum that took place in Aalborg, Denmark on 27-28 November. There, Energy Commissioner Kadri Simson gave a keynote speech and announced that "as many as 14 CO2 transport and storage projects" will receive funding as part of the EU's updated list of projects of common interest [6].

5.1.10 Regulation is also a key issue. In the UK, and in most countries, existing regulatory objectives may need changing in order to align with government decarbonisation aspirations and the achievement of targets.

5.1.11 The most recent COP28 deal (reached on 13th December 2023) calls for a global transition away from fossil fuels for the first time and also includes commitments to increase renewable energy from sources such as sunlight and wind. However, the text of this deal does not yet make specific reference to reducing methane emissions.

Likely impact on the workforce – operations and skills

5.1.12 According to Able Skills[7], a construction industry training specialist, 85% of UK homes still rely on gas for heating and there are twenty-two million existing boilers that will need servicing and repairs the same way they have done for decades. This will also have an impact on the gas network workforce – some activities will change slightly because of the nature of hydrogen compared to natural gas, leading to the need to upskill the workforce (including within the emergency services) in the areas of Health & Safety and emergency procedures.

5.1.13 A transition away from existing natural gas infrastructures and technologies to hydrogen blending in the networks for home heating, will still mean that gas engineers remain in a strong position in terms of demand for their services. Existing skills will still be extremely valuable, albeit with some upskilling required in the long term – large-scale changes are still likely to be decades away and those with an understanding of how traditional appliances work will be vital in ensuring a smooth transition.

5.1.14 The fundamental skills of a gas engineer are transferable between natural gas and hydrogen – successful trials have taken place with hydrogen gas being introduced into existing public networks and most modern boilers are already built to a 'hydrogen ready' standard, meaning the day-to-day responsibilities of gas engineers are unlikely to change too drastically, and existing skills will still be in huge demand.

6 Hydrogen under the spotlight, CCS back in fashion
7 What does the future of the gas industry look like?

Likely impact on the workforce – volume

5.1.15 According to Deloitte's 'Net Zero Workforce' report in June 2021, companies will still need highly skilled, experienced staff to maximise current assets, maintain safety and continue improvements vital for ageing infrastructure. Understanding which skills are core and which capabilities can be transferred to other sectors is also becoming critical and could put businesses on a more sustainable footing. Overall, the sector needs to develop and sustain a workforce that is ready not only to tackle decarbonisation challenges, but also to find new opportunities and position companies positively for a sustainable future.

Timescale

5.1.16 The uncertainty around specific timescales remains and depends on a wide range of factors, including the constantly changing political landscape and associated changes in policy. However, the BEIS 'Decarbonisation of the Power Sector' Report in April 2023[8] concluded that the pace of change in the plan to decarbonise the UK power sector in general is happening at a slower rate than expected. The report cites that 'a whole host of regulatory and policy barriers continue to impede the deployment of clean technologies', although it does not make specific reference to the gas networks sector. It concludes, 'We reiterate the calls of both the Climate Change Committee and National Audit Office for the Government to publish a comprehensive, long-term delivery plan for a decarbonised power system by 2035', indicating that the majority of decarbonisation is going to be long-term in its timescales.

Difficulty in acquiring new skills

5.1.17 The UK government's 2022 'Mission Zero: An Independent Review of Net Zero'[9] report states that decarbonisation challenges are exacerbated by an existing decline in skills in some sectors of the economy that are critical to the transition. Some crucial areas show concerning existing skills gaps, including tradespeople, where depending on the sector, we have seen a 5-30% decline over the past three years, which could undermine the UK's ability to repair and maintain domestic gas boilers and, at the same time, undertake retrofitting and install heat pumps. Other challenges that this report identified through their discourse with many industries, including utilities as a whole, included:

- Confidence in existence and longevity of jobs;
- Access to and affordability of skills provision;
- Training and retraining skills pipeline;
- Parity of esteem for entrants into trade vocations;
- Rate of movement of workers between jobs.

5.1.18 The solution relies on clear long-term policy support to help people access training and re-training (and know where the opportunities lie), clear and coherent training pathways – including the role of the education sector in building STEM skills from school age to higher education – and building capacity in local areas where the jobs of the future will be created.

8 Decarbonisation of the power sector
9 Mission Zero

5.1.19 The Review also heard that without a significant supportive decarbonisation policy mix in partnership with industry, the UK will not have an appropriately skilled workforce at the scale and pace required to deliver the transition. For example, pre-pandemic Engineering UK analysis projected shortfalls of between 37,000 to 59,000 in meeting an annual demand for 124,000 core engineering roles requiring Level 3+ skills, including an expected graduate-level shortfall of at least 22,000 per year. Although this is based on all industries, by proxy this is also likely to apply to the gas networks industry as much as for other utilities.

5.1.20 Another recommendation of this report is that Government and the Green Jobs Delivery Group should explore a range of targeted options, including:

- Increasing the flexibility of the Apprenticeship Levy and assessing whether the Levy aligns with Government Net Zero and growth priorities, and whether shorter and more intensive courses should be available alongside exploring the role of T Levels;
- Options for retaining talent within business and access to international labour;

Summary

Figure 3: Summary of RAG status by category

Category	RAG status
Impact – operations and skills	High
Impact – volume	High
Timescale	Long-term
Difficulty in acquiring skills	High

5.2 Domestic gas engineers (and a move towards hydrogen-blended gas for heat and transport)

Industry context

5.2.1 Environmental concerns have led different industries to look for new energy sources, with hydrogen at the forefront as the most commonly regarded alternative as it is a very versatile, low cost, and low emission fuel. There are five types of hydrogen:

- 'Grey hydrogen' is currently the most common, and the cheapest, form of hydrogen production. It is used as a fuel and doesn't generate greenhouse gas emissions itself, but its production process does. Grey hydrogen is created from natural gas using steam reforming, which separates the hydrogen from the natural gas. However, the technologies used don't capture the carbon emissions created during the process, which are instead released into the atmosphere;
- 'Blue hydrogen' is also extracted using the steam reforming process, but it differs from grey as the carbon emissions released are captured and stored, which reduces the emissions in the atmosphere, but doesn't eliminate them. Blue hydrogen is sometimes called 'low-carbon hydrogen' as the production process doesn't avoid the creation of greenhouse gases, just stores them away; Renewable 'green hydrogen' doesn't generate any emissions in its entire life cycle as it uses renewable energies in the production process, making it a true source of clean energy. It is made by electrolysing water using clean electricity created from surplus renewable energy from wind and solar power. The process causes a reaction that splits water into its components of hydrogen and oxygen (the H and O in H2O). This results in no carbon emissions being released in the process. It's a great alternative to grey and blue, but for now the main challenge is in reducing the production costs of green hydrogen to make it a truly obtainable renewable and environmentally friendly alternative.
- 'Yellow hydrogen' is generated through electrolysis using solar power specifically.
- 'Pink hydrogen' is generated through electrolysis using nuclear energy.

5.2.2 For domestic heat, hydrogen can be mixed with natural gas as a way to lower greenhouse gas emissions for space heating, water heating and cooking. Hydrogen can be safely added to the existing infrastructure and appliances at up to 20% volume without making any changes to pipes or regulations.

5.2.3 For transport, hydrogen can also be used as a biofuel in cars or stored in fuel cells as an alternative to batteries for electric cars which will require new skills in handling, storing, and using hydrogen. Electric vehicles will be dominant in personal cars, van fleets and some trains and trucks – however hydrogen-powered vehicles will be required to fulfil heavy-duty transport needs, such as ships and planes. It will also be needed to fuel some lorries, coaches and longer bus routes, as well as emergency and construction vehicles, and agricultural machinery[10].

5.2.4 For industry, many – including those that make the chemicals, steel and household goods we all rely on, will need the high temperature process heat that low carbon hydrogen will supply. This will be critical to decarbonising these industries and keeping jobs in the UK[11].

10 ENA Report – 'A Hydrogen Vision for the UK' (April 2023)
11 ENA Report – 'A Hydrogen Vision for the UK' (April 2023)

5.2.5 A recent Financial Times article[12] states that to get the sector on track and in line with net zero ambitions, the Paris-based International Energy Agency (IEA) says more effort is needed "to create demand for low-emission hydrogen and unlock investment that can accelerate production scale-up and bring down the costs of technologies for producing and using clean hydrogen, such as electrolysers, fuel cells and hydrogen production with carbon capture". More effort is also required to develop the infrastructure that can produce hydrogen and transport it to where it is needed. The IEA and other energy authorities are also clear that governments must ensure that regulatory regimes are in place to allow the necessary investment and that common international standards are established to enable the cross-border transport and storage of large volumes of hydrogen.

5.2.6 Although the revised UK government White Paper on Net Zero in 2022 laid out the roadmap for decarbonisation in the UK, the government's Energy Efficiency Taskforce, which was charged with reducing the UK's overall energy use by 15% by 2030, was scrapped in late September 2023, only months after it was established – part of this Taskforce's remit was to encourage retrofitting of gas boilers.

Likely impact on the workforce – operations and skills

5.2.7 The workforce requires upskilling and retraining especially in hydrogen storage and safe handling. As well as in the UK, industry influencers in other countries such as Australia have recommended skills training and educational programs to both build the necessary skills for the hydrogen industry and build community understanding and support for hydrogen.

5.2.8 In the UK, some level of upskilling will be inevitable as regulations are updated to ensure a safe transition away from natural gas. Initially, it is likely that an add-on module will be introduced to the Accredited Certification Scheme (ACS) qualification. This could take the form of a 1-2 day uplift skills course that adds to existing gas qualifications. Given that gas engineers must renew their qualifications every five years at an approved ACS training centre, and with the new skills easy to integrate with existing ones, this shouldn't be seen as a major hurdle.

5.2.9 In April 2023, the UK government launched the latest phase of the Home Decarbonisation Skills Training Competition[13], with £9.2 million funding to upskill people working in the energy efficiency, retrofit and low carbon heating sectors in England.

5.2.10 However, on 13th December 2023, a press release from the Department for Energy Security and Net Zero[14] announced that eleven new green hydrogen production projects will invest around £400 million up front over the next 3 years, growing the UK's green economy and offering new certainty for industry as government sets out its hydrogen ambitions, including future production, transport and storage rounds. This is predicted to create more than 700 jobs, representing the largest number of commercial scale green hydrogen production projects announced at once anywhere in Europe, and will deliver 125MW of new hydrogen for businesses including:

- Sofidel in South Wales, who will replace 50% of their current gas boiler consumption with hydrogen at their Port Talbot paper mill;
- InchDairnie Distillery in Scotland, who plan to run a boiler on 100% hydrogen for use in their distilling process; and
- PD Ports in Teesside, who will use hydrogen to replace diesel in their vehicle fleet, decarbonising port operations from 2026.

12 How hydrogen could help us achieve net zero
13 Home Decarbonisation Skills Training Competition Phase 2
14 Major boost for hydrogen as UK unlocks new investment and jobs

Likely impact on the workforce – volume

5.2.11 Naturally, older engineers who have been in the industry a long time may drop out, due either to retirement or a reluctance to complete the additional training needed to upskill to work with hydrogen. This could leave a skills shortage which may provide new opportunities for anyone considering training now.

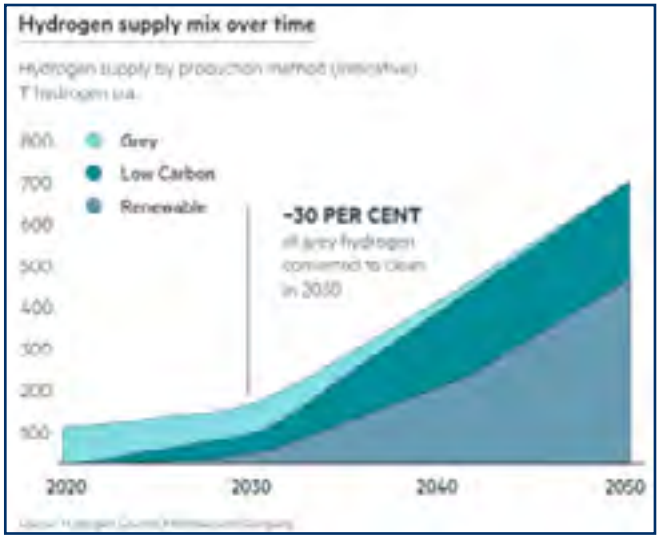
Timescale

5.2.12 In the UK, the timeline for the impact on gas engineers will depend on government policy. According to a Greenmatch article in November 2023[15], the ban on sale of new gas boilers was initially set to take effect in 2035. However, reportedly this could get extended after the backlash from homes that cannot afford to make a switch. Climate experts warn that this delay could make it "unthinkable" to achieve net zero targets.

5.2.13 There have been some insider indications from the government that the phasing out of the gas boiler plan could be well postponed to 2040, after receiving some backlash that the low carbon alternatives may not be affordable to all.

5.2.14 As figure 5 (below) shows, the EU for its part has set itself the ambitious target of producing ten million tonnes of renewable hydrogen and of importing the same amount by 2030, and certain EU member states have set their own hydrogen strategies. Spain, Germany and France have committed, for example, to install 4, 5, and 6.5 gigawatts respectively of green hydrogen by 2030.

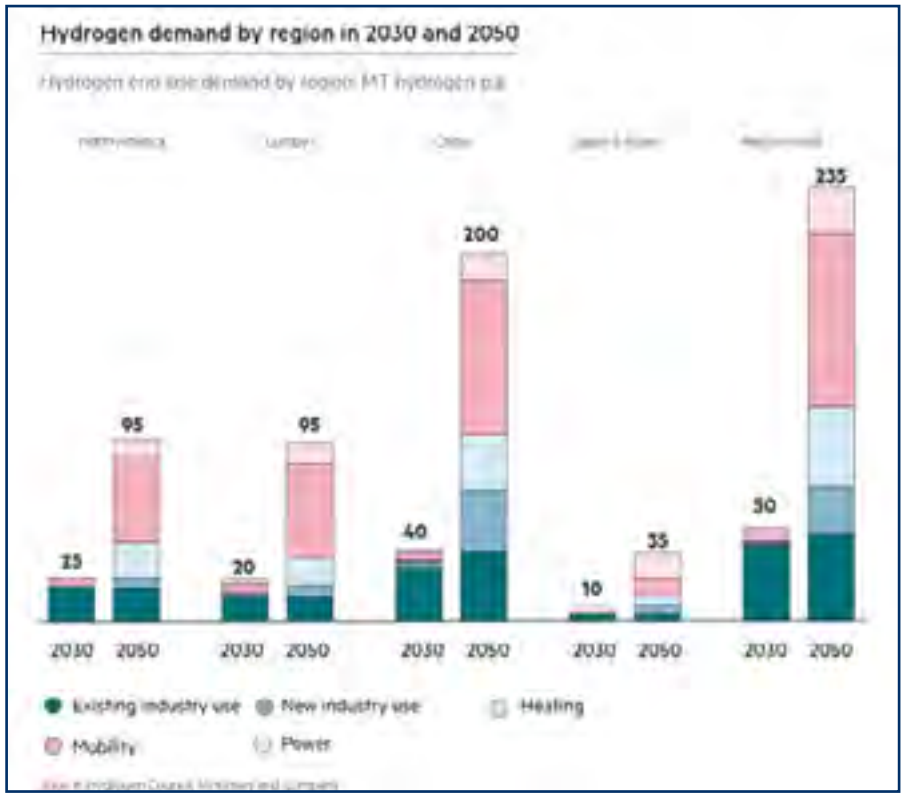
Figure 4: Hydrogen supply mix over time (EU-wide)



5.2.15 But there is a long way to go. Novel applications of hydrogen in heavy industry and long-distance transport account for less than 0.1 per cent of hydrogen demand today, while the IEA's Net Zero Emissions by 2050 Scenario believes these uses will account for one-third of global hydrogen demand by 2030.

15 UK Gas Boiler Ban – In Effect from 2025 or 2035?

Figure 5: Hydrogen demand by region in 2030 and 2050 (by world region)



Difficulty in acquiring new skills

5.2.16 The key issue in acquiring new skills for hydrogen developments in the gas networks industry appear not to be with retrofitting existing domestic gas boilers but with training and reskilling both the existing workforce and new recruits in working with the increasing number of hydrogen developments generally.

Summary

Figure 6: Summary of RAG status by category

Category	RAG status
Impact – operations and skills	Low
Impact – volume	High
Timescale	Short-term
Difficulty in acquiring skills	Low

5.3 The move towards other (non-hydrogen) gases

Industry context

5.3.1 The gas network also has the potential to transport gases other than blended hydrogen outside the current GS(M)R (Gas Safety Management Regulations) range. However, challenges lay ahead relating to different gases entering the network – for example, the network will need flexibility to match consumer demand with the varying energy content of these gases. Ongoing innovation and technology developments are focused on understanding the impact of a wider range of gases on the gas network and on domestic, commercial and industrial consumers[16].

5.3.2 Biomethane is a clean, sustainable gas produced from organic material such as green waste, food industry waste, agricultural waste, industrial waste and domestic sewage and is set to play an increasingly important role in the UK's energy mix. Biomethane plants start by breaking down organic matter with bacteria in an oxygen-free environment, a process known as Anaerobic Digestion (AD). The resulting biogas contains a mix of carbon dioxide and methane. The carbon dioxide is split off from the methane, other impurities removed, and then the resulting biomethane is injected into the gas grid.

5.3.3 Biomethane presents the most technically feasible (and practical) short term option for decarbonisation, although a range of views exist regarding cost-effectiveness and scalability. Furthermore, many biogas projects may develop outside the existing gas transport infrastructure.

5.3.4 Gas networks such as Northern Gas Networks help biomethane producers – including other utility companies – to get their gas into the NGN grid by offering a comprehensive support service allied to the government's financial support programme. An example of this is Northumbrian Water's anaerobic digestion plant at Howdon on Tyneside, which produces biogas from sludge and then purifies it into biomethane so that it can be injected directly into the grid at a rate of 1,500 cubic metres of gas per hour, helping to heat homes and businesses in the area.

5.3.5 The government supports biomethane production via the Non-Domestic Renewable Heat Incentive[17] and the Green Gas Support Scheme (GGSS)[18].

Likely impact on the workforce – operations and skills

5.3.6 In order to get more biomethane production facilities connected to gas networks[19], engineers will need to conduct initial assessments, then work up detailed designs for connections and then, once approved, construction work on the connections are carried out, often by a gas network-appointed contractor, followed by a gas network site examination.

5.3.7 At the moment, the regulations around gas quality for billing purposes mean that propane must be injected to enrich this green gas. SGN are working together with other on proposals that would revise the spectrum of permitted gases, reducing or eliminating the addition of propane – a move that would lead to significant reductions in cost and carbon output. And by deploying new technologies like bidirectional flow metering – one of the innovative sensor systems developed under SGN's 'Real Time Networks' project[20], they hope to significantly lower the amount of propane enrichment and make the gas even greener.

16 Energy Networks Association 'Gas Network Innovation Strategy' (2017)
17 Non-Domestic Renewable Heat Incentive (RHI)
18 Green Gas Support Scheme guidance
19 Green Gas Guide
20 Real-Time Networks

Likely impact on the workforce – volume

5.3.8 Gas networks such as SGN state that they are committed to increasing the amount of biomethane in their network to reduce carbon emissions as they move towards a net zero future[21]. They have connected thirty-five biomethane plants to their networks to date, delivering clean heat to 258,000 homes.

5.3.9 Such developments will naturally create the need for a skilled workforce of skilled engineers and safety technicians to make these changes happen.

5.3.10 Natural gas essentially comes from a couple of sources and is injected into a small number of sites – there are now a growing number of small producers that want to inject into the grid/local networks. With the skills required to operate and maintain a larger number of sites being similar, more employees will be needed to set up and operate/maintain these injection sites.

Timescale

5.3.11 With SGN stating that fourteen more plants are in the pipeline currently, SGN are confident that it puts them in a strong position to reach their target of delivering clean heat to 450,000 homes by March 2026 – although it is not clear whether this will be achieved using existing technically-trained engineers and those in other technical functions or whether additional recruitment will need to be undertaken. Although the timescales for this are uncertain, this is likely to grow in the future as more biogas production takes place – a factor that is also on the agenda in other areas such as for water companies and agriculture.

Difficulty in acquiring new skills

5.3.12 Companies like Future Biogas[22] – currently the largest producer of biomethane in the UK – already have an operations team of 60+ staff across the 11 sites they operate, consisting of skilled engineers, technicians and operators, as well as a CHP servicing team. They also equip their staff with Safety, Health, Environment and Quality Management training – all disciplines that are relevant to employees working in gas networks In addition to offering apprenticeships relating to the area of biogas generally, these are some of the core biogas training areas that will need to be considered by the gas network providers and training providers, in order to keep pace with a potential demand for such roles in the short to medium term.

Summary

Figure 7: Summary of RAG status by category

Category	RAG status
Impact – operations and skills	Medium
Impact – volume	Medium
Timescale	Short-term
Difficulty in acquiring skills	Medium

21 Biomethane
22 Operations

5.4 Specialist data and digital skills

Industry context

5.3.13 New technological and digital innovations have the power to revolutionise gas industry operations. The gas network industry requires new thinking, and data and digital technologies have the power to unlock levels of innovation and efficiency that are currently not possible in order to allow net zero goals to be reached.

5.3.14 To achieve net zero, gas networks must harness the power of data and digital to improve modelling and forecasting, as well as improve operational intelligence and insight for proactive maintenance and asset management to safely extend the life of gas network infrastructure assets. Gas networks such as SGN have a Digital Strategy Action Plan[23] already in place to address both current and future challenges and opportunities for differing aspects of their overall organisational operations.

Figure 8: SGN's digital vision (December 2022)

5.3.15 As pointed out by the ENA[24], as this shift occurs, the challenges and opportunities associated with data across the gas networks are becoming more prevalent. Taking a whole energy systems approach to data and digitalisation is critical to ensuring an optimised energy system (i.e. aligned with other utilities such as electricity) that works for everyone.

5.3.16 The Energy Networks Association (ENA) are working with Ofgem, BEIS, UK Research and Innovation and others to progress and deliver the recommendations of the Energy Data Taskforce[25] and deliver modern, digitalised energy networks for customers.

23 SGN Digital Strategy Action Plan
24 Data transition
25 A Strategy for a Modern Digitalised Energy System – Energy Taskforce Report (2020).

5.3.17 Smart sensors and the industrial Internet of Things (IoT) enable remote asset inspections through the live streaming of inspections and surveys from distant locations. Industry workers can access real-time information through smartphones, tablets, and digital cameras and save up to 35% on inspection costs and mitigate safety risks from mobilising people to inspection sites. As more organisations are moving towards predictive asset maintenance and digitalisation, data platforms and data sharing systems become more significant to the Gas industry.

5.3.18 On a wider (non-gas networks industry) scale, the Department for Business, Energy & Industrial Strategy (BEIS) are working with the Department for Digital, Media, Culture and Sport (DCMS) and the Department for International Trade (DIT) to promote digital technologies, including AI, robotics, digital twins, and autonomous systems, as a solution to industry's energy efficiency needs in the short term and their role in wider decarbonisation for the long term[26].

Likely impact on the workforce – operations and skills

5.3.19 An Australian research report in 2019[27] revealed that automation technology in resource industries such as Gas is divided into three categories, all of which will require a range of different – and new – skills to be onboarded to both current and new employees:

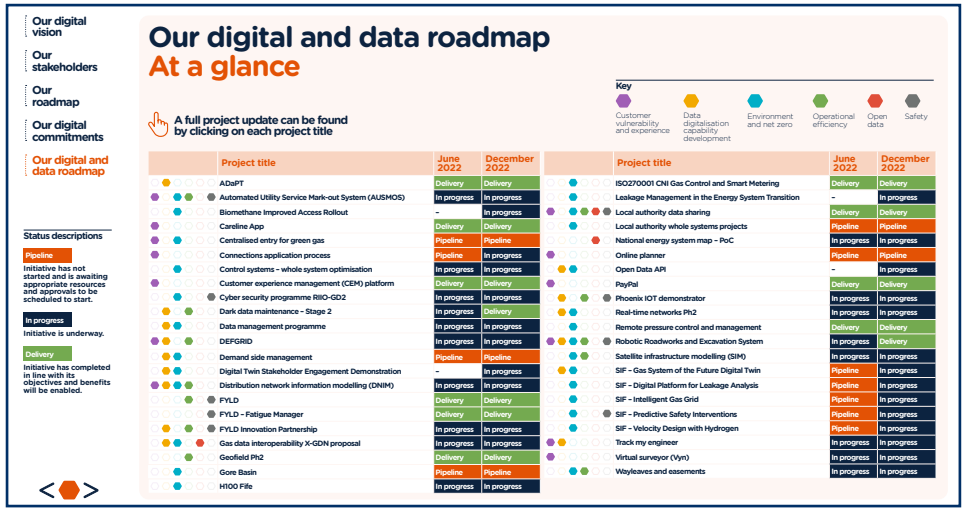
- Automated operational hardware tools where digitally enabled tools operate either independently or remotely assisted by workers;
- Connected workers where technologies such as tablets, sensors, analytics and wearable technologies enable improved executions of activities; and
- Artificial Intelligence (AI) and connected systems where AI-enabled tools and algorithms process large volumes of data to optimise autonomous equipment and operational performance.

5.3.20 Quality data can lead to actionable intelligence which is achieved through analytical data to enhance strategic decisions and control processes in order to maximise instrument uptime and improve overall operational productivity. Therefore, it is a priority to build workers' skills in processing information and handling data based applications. As these devices become more mainstream, gasfitters and workers in the Gas industry will need to further develop skills around how sensors are installed, monitored, and maintained.

5.3.21 According to an OPITO report[28], there will also be new demand for expertise in areas such as low carbon energy, data science, data analytics, artificial intelligence, machine learning, robotics, material science, remote operations and cyber security.

5.3.22 SGN's Digital Strategy Action Plan is already underway and a full picture of all of SGN's operational areas that were in the process of being updated as of December 2022 are summarised below – this appears to cover every aspect of SNG's operations, both in technical and non-technical roles.

Figure 9: SGN's digital and data roadmap (December 2022)



26 HM Government – Mission Zero, Independent Review of Net Zero (2022).
27 AlphaBeta – 'Staying Ahead of the Game' Report (2019)
28 Offshore Petroleum Industry Training Organization (OPITO) 'UKCS Workforce Dynamics: The Skills Landscape 2019-2025' Report.

Likely impact on the workforce – volume

5.3.23 Based on the evidence of SGN's activities in this area to date, the likely volume impact on the existing workforce would appear to be significant, due to the requirement to upskill the existing workforce and also provide training to any replacement staff or new recruits. However, with the increasing advancement of data and digital technologies in the gas networks, it is likely that new roles will also need to be developed to ensure the effective operations and monitoring of these new advancements, especially in the cyber security and real time data monitoring/interpreting areas.

Timescale

5.3.24 As seen with SGN's digital and data roadmap, this is a factor that will affect the short-term, medium-term and long-term operations and upskilling of the gas networks industry.

Difficulty in acquiring new skills

5.3.25 In 2019, work conducted by Energy & Utility Skills[29] revealed that many employers in the energy and utilities sector are reporting difficulties in recruiting IT-related skills. The importance of data security and the driver to gain new insights from the growing amounts of customer and asset performance data now being collected by utilities companies is increasing being reflected in the need to recruit and retain these skills in the face of stiff competition from all sectors of the UK (and global) economy.

Summary

Figure 10: Summary of RAG status by category

Category	RAG status
Impact – operations and skills	High
Impact – volume	High
Timescale	Medium-term
Difficulty in acquiring skills	Medium

Industry context

5.4.1 Historically, accidental damage from third parties digging and excavation has been a major threat to the safety and performance of the gas network. In 2017, the ENA set out their aim to seek to continually improve and invest in new technologies, and improved processes and procedures – for example, solutions that better highlight where the pipelines are, or they could be solutions that physically protect the pipelines. In 2017, the Health and Safety Executive stated that, 'There are now more companies involved in digging holes across the UK than ever before. Latest figures estimate around four million holes dug by utility companies annually and this excludes any excavations made as part of construction projects. Third party damage to underground services of all types continues to be a source of danger and financial loss to workers, members of the public, utility companies and contractors'.

29 Energy & Utility Skills – National and Regional Labour Market Statistics Report (2019).

5.4.2 In addition, much of the gas network has already reached the end of its original design life. Safe operation is maintained by replacement and repair work. As the materials used in pipelines degrade, and components wear out, there is an opportunity to introduce new materials and techniques to maintain world class levels of safety. Currently, the ENA must robustly plan for how to respond to anything that could occur on the gas network that might have significant implications for safety and/or loss of supply. With the move toward decreasing the use of carbon in energy supplies, our emergency response may need to be modified or extended to take account of changes in the gas being transported; for example, the increased use of hydrogen[30].

5.4.3 An Arup report into 'The Future of Britain's Gas Networks' in October 2023 states that there is evidence that large amounts of the existing network is already suitable for hydrogen, as pipework made from polyethylene (PE) pipe and low strength steel are suitable for hydrogen. However, there is still some uncertainty over high strength steel used in parts of the high pressure network, while there is a current assumption that iron isn't suitable due to safety concerns (as per the Health and Safety Executive). This means that 83% of the network today is considered suitable for hydrogen, and by 2032 when the 'iron mains risk reduction' programme is scheduled to be complete this will be 99%.

Likely impact on the workforce – operations and skills

5.4.4 The ENA's scenarios for the future of safety and emergency that will impact on workforce operations and skills are:

- Managing gas assets – to efficiently manage the risks associated with ageing assets, solutions are needed that allow gas network operators to better understand their true condition. Then they can prioritise and target measures to reduce the risks, or in some cases replace pipes and fittings where the likelihood of failure is highest and/or the potential consequences of failure most severe.
- Safety competence – the current age profile of the gas network workforce means there is a significant challenge to maintain competence levels into the future. Innovative ways of passing on knowledge to new gas engineers and appropriate ways to plan the successful succession of personnel who are approaching retirement need to be found. Gas network companies are also carrying out projects in automation and the creation of decision support tools, to aid the workforce in safely carrying out their duties. The move toward lower-carbon energy supplies will probably bring changes in the composition of the gas being transported through the distribution (and potentially the transmission) network. We're likely to see an increased use of hydrogen either as an additive to natural gas or as a replacement for it. To maintain or reduce safety risks, new approaches to emergency response will need to be developed. This may involve developing new instrumentation for detecting leaks on the distribution network. Operatives will need to be trained to use new detection equipment, and to adopt new or adapted procedures for responding to leaks from a network transporting gas with a lower carbon content, whether it is added hydrogen or even pure hydrogen.
- Protecting against third party interference damage – gas network operators use four general methods to protect pipes and associated equipment; innovative solutions could be developed in any of the following areas, which could impact on workforce operations and skills:
- Avoidance – preventing potentially damaging activities taking place near our pipelines, for example: through liaison schemes to increase awareness that a pipeline is present and the potential consequences of damaging it; improved third-party access to records of where pipelines are located or methods for detection of non-metallic pipes;

30 Energy Networks Association 'Gas Network Innovation Strategy' (2017)

- Prevention – solutions that stop a damaging activity from reaching the pipeline may include different types of surveillance or in-ground indicators such as marker tapes;
- Barriers – physical protection against the damaging activity such as slabs, increased wall thickness or increased depth of cover; and
- Damage detection – solutions to identify that damage has occurred before the pipeline fails; examples could include CP monitoring for metallic pipelines or acoustic surveillance.

Likely impact on the workforce – volume

5.4.5 The likely impact on the workforce in terms of volume is unclear – a review of literature in this area appears to indicate that the key impact on the workforce would be the need to undertake updated training in these areas in line with any technological advances, rather than an uplift in the numbers of employees recruited specifically for this purpose.

Timescale

5.4.6 Although up-to-date information has yet to be found with regard to timescales, the 2016 Committee on Climate Change Carbon Budgets[31] laid out timescales with projected technology landmarks, namely:

- 2020 – 'Facilitating Change':
- Better pipeline location records easily available to third parties;
- Development of digging techniques using robots to reduce accidental damage to buried pipelines;
- Validation of new techniques for detecting releases from the network transporting gases with added hydrogen;
- Development of safety cases for transporting gas with reduced carbon content.
- 2030 'Carbon Decreasing':
- Widespread use of robots for undertaking digging activities near buried utilities;
- Extensive use of hydrogen in gas network with appropriate equipment and procedures used for managing the risks associated with loss of containment from the gas network or from the equipment used to generate hydrogen;
- Carbon capture and storage to support hydrogen production;
- Remote monitoring of entire gas network to provide early warning of the potential for interference damage.
- 2050 'Decarbonised Energy System':
- A complete set of emergency response procedures for the gas network operating with hydrogen.

31 Carbon Budgets

Difficulty in acquiring new skills

5.4.7 The most up-to-date reference available on this aspect appears to be the ENA's 2017 Gas Network Innovation Strategy Draft Consultation Report, which refers to the increasing use of hydrogen-blended or pure hydrogen in the gas networks over time. It says that in order to maintain or reduce safety risks, new approaches to emergency response would need to be developed, which may involve upskilling/retraining existing employees in relation to:

- Developing new instrumentation for detecting leaks on the distribution network;
- Training operatives to use new detection equipment;
- Adopting new or adapted procedures for responding to leaks from a network transporting gas with a lower carbon content, whether it is added hydrogen or even pure hydrogen.

Summary

Figure 11: Summary of RAG status by category

Category	RAG status
Impact – operations and skills	High
Impact – volume	Medium
Timescale	Medium-term
Difficulty in acquiring skills	Medium

5.6 Growth in heat networks

Industry context

5.6.1 Heat networks supply heat and hot water from a central source to consumers, via a network of pipes. There are two types of heat networks:

5.6.2 Communal heat network – a heat network supplying heat and hot water to a number of customers and premises within a single building. This is the most common form of heat network in the UK.

5.6.3 District heat network – a heat network that supplies heat to more than one building. District heat networks can cover a large area and support many buildings, hence avoiding the need for individual boilers or electric heaters in every building.

5.6.4 Heat networks have the potential to decarbonise the supply of heat in built-up areas and are a key part of government's net zero policy. The government appointed Ofgem as the Heat Networks regulator for Great Britain to ensure that customers receive a fair price and reliable supply of heat as the transition to net zero is undertaken.

5.6.5 The benefits of heat networks include offering significant carbon savings compared to conventional heat systems and the source of heat can be from indigenous sources such as water, geothermal, solar, biomass, biomethane and combined heat and power.

5.6.6 According to an Energy UK article/blog in March 2023[32], there are currently around 480,000 heat network customers in the UK, including 446,517 homes, being serviced by 14,000 heat networks and 3,000 different providers. This technology meets around 2% of current total heat demand for the UK, with almost all using a fossil fuel-based primary fuel source. As part of the UK's trajectory to decarbonise buildings and reach Net Zero carbon emissions by 2050, as well as the recently announced target to reduce energy consumption from buildings and industry by 15% by 2030, heat networks are set to play a growing role in the supply of low-carbon heat to homes, non-domestic buildings and the public sector. Heat networks can also support system flexibility where they have centralised thermal storage attached or use multiple heat sources, allowing them to shift demand. Together with opportunities to utilise waste heat, this can help achieve efficiencies across the power system and reduce emissions.

Likely impact on the workforce – operations and skills

5.6.7 The 2022 'Mission Zero, Independent Review of Net Zero' (from Net Zero Review Chair Chris Skidmore MP) calls for more support for heat networks, potentially using innovative technologies such as mine water heat projects or geothermal energy, and a particular focus on re-using waste heat. Recruitment and training in these areas would need to be offered to existing employees as well as new recruits.

32 Towards a roadmap for heat networks

5.6.8 An example of a current initiative in this area is The Midlands Net Zero Hub[33]. The Heat Training Grant scheme is being managed by the Midlands Net Zero Hub on behalf of the Government's Department for Energy Security and Net Zero. Training opportunities for heat pumps and heat networks will be supported from Spring 2023 to at least March 2025. Moving away from traditional gas boilers to low-carbon heat pumps and heat networks is critical to decarbonising how we heat buildings. In order to meet the UK's target to be net zero by 2050, thousands more engineers will need to learn how to install and maintain these technologies. It is estimated that 80% of people who will be working in the UK in 2030 are already in the workforce. The courses through the Heat Training Grant are aimed at trainees with existing heating, construction or building services experience rather than apprenticeships or new entrants to the sector.

Likely impact on the workforce – volume

5.6.9 According to Energy UK's predictions, the roadmap between existing heat network infrastructure and this ambitious vision for 2050 could attract between £30-£50 billion investment into the UK. This in turn would directly create between 20,000 and 35,000 jobs, while also supporting local regeneration and levelling up. This indicates that a significant impact on the workforce volume needed to deliver heat networks is likely in the longer-term.

Timescale

5.6.10 The 'Balanced Net Zero Pathway' set out in the Climate Change Committee (CCC)'s Sixth Carbon Budget[34] estimates that 19% of low-carbon heat installations in 2030 will be heat networks. By 2050, 20% of heat could be distributed through heat networks, but only if the uncertainty in the market is addressed.

Difficulty in acquiring new skills

5.6.11 At this stage, because thousands more engineers will need to learn how to install and maintain technologies linked with heat networks, the key difficulty is likely to be actually being able to upskill the existing workforce at the rate that may be required to keep pace with the ambitious growth path outlined for heat networks.

Summary

Figure 12: Summary of RAG status by category

Category	RAG status
Impact – operations and skills	Medium
Impact – volume	Medium
Timescale	Long-term
Difficulty in acquiring skills	Medium

33 New training scheme launches to upskill heating professionals
34 The Sixth Carbon Budget

Next steps

The key findings from this research were presented to members of the National Skills Academy for Gas. It was agreed that subsequent 'deep dives' would not provide any additional value at this point but that an action plan would be developed with these employers to address the skills issues highlighted by this report.

Workforce resilience could feature in business case submissions for the RIIO-3 price controls for gas transmission and distribution. In light of this, there are plans to initiate development of workforce resilience metrics for the gas industry, as is currently being done as part of a project with power transmission and distribution companies.

The rationale for the Power industry was to develop a set of metrics that could provide an 'at a glance' quantitative assessment of workforce resilience, focussing on attraction, skills development, and retention. Members of the National Skills Academy for Gas will have the opportunity to discuss whether such an approach could yield benefits and, if so, explore an appropriate way forward for their own industry.

The second element likely to feature in discussions around an action plan is the emerging occupational mapping initiative. Currently in its very early stages, this initiative will create a "proof of concept" for an occupational mapping tool which details, for critical job roles across the energy and utilities sector, their core tasks, skills requirements, and routes to competency.

The aim of this is to support subsequent development of industry standards, as well as efficient upskilling and reskilling of individuals into essential roles. Effective occupational mapping also facilitates collaboration around workforce development and paves the way for greater equality of access to funding and training.

The future skills demand will need to be addressed through supply of new entrants as well as experienced workers transferring from adjacent industries. To achieve this, we need a clear sector attraction and retention strategy to attract the new workforce and then retain them for the future. As part of our commitment to supporting industry to develop a safe, skilled sustainable workforce Energy & Utility Skills has collaborated with industry to implement an action plan to deliver the Sector Attraction and Retention Strategy.

This includes:

- Targeted Activity for Priority Roles where known shortages have been identified
- Repurposing of routes to market to include industry and careers advice
- Targeted partnerships to maximise the impact of the strategy
- Developing the career pathways and information to support new entrants and advisors
- Collaboration and sharing of best practice to improve attraction and retention

turquoise

ENERGY & UTILITY SKILLS

Skills for a greener world

Part 2 – Qualitative Research Report

Workforce Renewal and Skills Strategy: Workforce resilience workstream

Horizon scan of technologies and issues likely to affect the gas networks workforce

Version 1C

EUSR

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ENERGY & UTILITIES jobs

ENERGY & UTILITY SKILLS PARTNERSHIP

NSAP

NATIONAL SKILLS ACADEMY FOR GAS

Part 2 – Qualitative Research Report

1. Context

We spoke to a total of ten respondents in December 2023 / January 2024

- National Gas x 2 (separate interviews)
- Phoenix x 2 (1 paired depth)
- Centrica x 1 (single interview)
- Northern Gas Networks (triad)
- Cadent (single interview)
- Energy & Utility Skills (single interview)

1.1 Roles and responsibilities ranged from Academy Leader to Head of Force Planning, People Director, and Regional/Project Managers including working in Energy Futures. Some had more of an engineering background and others more HR / Training. They were all senior management.

1.2 All had a view on the future of the gas industry and all were positive about the future to a greater or lesser degree. Common themes emerged across the interviews.

1.3 Horizon Scan Desk Research project was conducted alongside the qualitative research as reported earlier in this document. There is much consistency between the two pieces of work. As mentioned in the desk research 'a transition away from existing natural gas infrastructures and technologies will still mean that gas engineers will be in demand and existing skills will still be valuable' and this view or standpoint was apparent in the qualitative research.

1.4 However, the respondents struggled to see further than 10-15 years into the future which was due to the lack of leadership within the industry and from Government. But all felt that the UK needs to stop burning methane and agreed with the drive to net zero by 2050. How the UK would get there was 'another matter'.

1.5 The other salient issue was that all felt that their industry had lost many skilled and knowledgeable people, due to the combination of staff reaching retirement age and a lack of recruitment in the past 10-20 years. In other words, a large amount of skills and experience had been lost in a relatively short period of time.

1.6 The challenges were unique to the gas industry and they were a massive skills shortage combined with the need to invest in skills for the future whilst at the same time increase efficiency for the consumer and drive down costs.

"I haven't got a crystal ball so I can't predict the future. It depends on political will"

"It's making sure that we are best placed to facilitate the role to make the most potential of the existing gas infrastructure and knowledge that we have"

"I look after collective bargaining with trade unions, litigation but I'm quite 'Opsy' and look after change and transformation"

2. Key Issues

2.1 Technological Advances

2.1.1 The advances in tech were seen as happening in a gradual way and were perceived to have been mostly internal and were related to improved efficiencies. Examples given were equipping engineers with the right tools such as laptops with advanced diagnostic abilities. All engineers' laptops now contained every manufacturer's manual.

2.1.2 Technology such as Hive has been evolving over the last few years. In addition, there have been new ways of using data and analysing that data to increase customer satisfaction. With the advances in technology there have been more competencies required for individuals.

2.1.3 There has also been innovation in smarter ways of working with buried assets so that roads do not have to be dug up, which can be both hazardous and time consuming.

2.1.4 There have been advances in gas detection, using a car that drives down streets and can detect gas leaks and prioritise them. It is on trial in London and the West Midlands.

2.1.5 New technology could show customers where their driver is in terms of arrival time, like Amazon does with delivery information.

2.1.6 The issue that kept emerging was that there is little point of technological advancement if the 'plug is pulled' on the gas industry.

"There have been some changes but no dramatic changes. There are more conversations about the expected landscape, electrification etc but it is the future direction rather tangible things on the ground"

"We have an innovation department which we didn't use to in the past. New tech brings the benefits of efficiency"

"I don't think we will be able to recruit tech staff, because we are all fighting for the same resource, so we need to grow them"

2.2 The drive towards net zero

2.2.1 Across the sample, aiming for net zero carbon by 2050 driven by Government targets was the key priority for the gas industry. It was seen as the biggest challenge since the change from Town Gas to Natural Gas. It is likely to affect every aspect of the business.

2.2.2 There is an understanding that the move to net zero will cause some 'commercial pain' but it is felt that if the transition is done at a sensible pace then it will not cause major upheavals such as power outages.

2.2.3 Most felt that the drive towards net zero would be about the industry moving towards hydrogen. But if it was not hydrogen, given the lack of Government support, and the pulling of the Whitby hydrogen trial, it would be electrification. There is the thought that heat pumps would solve part of the problem, i.e. the base load, but there would be a need to access gas during colder weather. It was thought that relying on wind and solar is not sufficient currently.

2.2.4 There is a consensus that it will be a huge challenge to electrify everything, whether through the National Grid, the storage of electricity and managing the peaks and troughs due to the winter and the weather. Currently, GNDs feel that the UK's energy would not be secure.

2.2.5 The other issue around electrification is that some industrial customers do not want electrification. Kellogg's for example say that that cooking cornflakes on an electric flame is very different from cooking it on a gas flame, because the product is not toasted in the same way. The electric heat gives the cornflakes a different flavour, and therefore electrification jeopardizes their product.

2.2.6 The internal perspective was similar to the GDNs in that net zero by 2050 was unlikely to be fully achievable and that it was a huge challenge to electrify the UK by that deadline.

"We are aiming for zero carbon but we have to figure out ourselves how to get there by 2050"

"It's the biggest change and we wouldn't have dedicated teams working on it if it wasn't the highest priority"

2.3 The belief that the future is hydrogen

2.3.1 Most felt that the future of the gas industry was in green hydrogen. There will be a gradual increase in hydrogen in the mix along with upgrading the infrastructure (most of which will be paid for by the consumer). A minority want to lobby Government and get the law changed with regards to how much hydrogen is allowed in the gas mix i.e. introducing 2%, 5% and 20% hydrogen. In the current network, the safety case has been tested and the GNDs can deliver 20% blend as it stands within the network. Another issue was that whilst the gas industry does not want to use blue hydrogen, it currently allows the industry to test the safety of hydrogen and prove the concept.

2.3.2 It was felt that there has been an overreaction towards hydrogen and a negative feeling towards it from the general public. However, the gas industry see hydrogen in a more positive light. One GDN was building their first hydrogen pipe between 1.5 to 2 kilometres at a hydrogen production plant, funded by industry, to be commissioned in 2025. Legislation allows the hydrogen pipe to be commissioned from that time.

2.3.3 For a gas engineer the view is that the training required on hydrogen would be at most 2 weeks. It is seen as straightforward. Hydrogen is more volatile however; training would cover flammability and safety standards. (There is a desire that training standards would be set by IGEM and Energy & Utility Skills. We discuss this in Section 9 of this report).

2.3.4 Thus, there is the sense that hydrogen will be similar to the current situation and that there will be technology to support the engineer whatever the fuel type. The engineering skills are already in place and so they will 'pivot off' their core skills i.e. core gas heating and core electrical skills.

2.3.5 Halfway through the fieldwork the Whitby hydrogen trial was cancelled due to insufficient local support amongst other reasons, thus sending out a message that hydrogen was not 'the be all and end all'. This was largely met with dismay by the industry and a sense of a lack of leadership from the Government.

2.3.6 Some industries are now approaching GDNs asking for hydrogen, so that they can be secure for the future, rather than waiting for politicians to make up their minds.

2.3.7 The gas distributors are feeling the time pressure and want to get hydrogen right now before other countries do, otherwise industry will move their manufacturing sites to places that are up and running with hydrogen, possibly outside the UK. This presents a huge challenge for the UK, and it is political. So GDNs feel the landscape for the gas industry is difficult.

2.4 Issues surrounding hydrogen

2.4.1 There was a sense that the general population do not understand hydrogen and there is a lack of awareness. People are reluctant to transfer to hydrogen. Thus there is a need to communicate to the public that hydrogen is safe. There is a training and skills gap in that sales advisors need to properly advise customers on how to live with hydrogen. There are safety protocols and requirements for hydrogen such as bottles being 5 meters away from housing stock. There is a lack of understanding of how it will work street by street and town by town. Downstream the issue is about safety.

2.4.2 Crucially, there is a lack of consumer confidence currently.

2.4.3 There was much discussion around the need to create green hydrogen not blue hydrogen i.e. creating hydrogen from scratch not using fossil fuels to create it. Blue hydrogen was seen as 'bad for the planet', but there is a lack of understanding that only green hydrogen will solve the problem. However, in Northern Ireland there is a belief that it will be difficult to introduce green hydrogen at scale initially. So in the short term, blue hydrogen would be used.

2.4.4 The perception is that with hydrogen there will be opportunities in the commercial sector. There will be hydrogen valleys with industry situated next to the hydrogen plant in localised heat networks. In Northern Ireland they are looking at a Hydrogen Valley to power two main power stations and then have an industrial cluster within the distribution network.

2.4.5 Another issue is the technical side of introducing hydrogen, there is a belief that the engineering side needs to be 'tweaked' and new competencies learned.

2.4.6 What gas networks did not know in the long term was how much of a demand for hydrogen there be and how much of a gap would hydrogen fill. They wanted someone to predict future demands but that depended on innovation and technology such as battery storage. It was possible there would be great opportunities but due to the political situation many felt that they were in 'limbo'.

2.4.7 There is the added challenge that competencies for hydrogen are not signed off from the legislative level, ie HSE even though the gas network is commissioning a hydrogen pipe in 2025.

2.4.8 Internally, there was a belief that there is a really good argument for a blended solution for energy generation for the future.

"Switching over to hydrogen will not be straightforward as it will involve a range of costs, including the up grading of cables, and ultimately the consumer will pay"

"We've worked with Queens University of Belfast and it's proven that there is enough biomethane to supply the vast majority of our current natural gas requirements"

2.5 The transition pathway

2.5.1 There is a belief that the Government (whichever 'colour' as research took place in December 2023 / January 2024 with the belief that an election will be held in the UK in 2024 with a possible change of Government) will put requirements on the gas industry. There is a need for the Government to provide support and direction into electrification. However, currently there is little support or direction. Moreover, many feel that the Government is anti-hydrogen.

2.5.2 Some gas distributers were dismayed by the pulling of the town trial for hydrogen. The reason given was that BP did not get a further Hydrogen Allocation Round (HAR1) Government grant to build a hydrogen plant. Some were disappointed that the reason it was pulled was due to the grant not being awarded, given the huge profits that BP make. A minority questioned why BP needed government funding for a relatively small project. It was felt that the decision was therefore political and not helpful for the gas industry. There was also the issue of local opposition with residents questioning the safety of hydrogen and resenting the imposition of a change to their home heating.

"I'm not a labour supporter but with an election looming over they need to be braver. The electorate are pro green so it is easier to get greener decisions through. However, a new labour government may be more pro hydrogen and more progressive"

"There are challenges about being able to make changes and we are all kind of scrambling around because we have to do things quickly but the legislation from the HSE is not in place"

2.5.3 In summary, there is currently a perception that there is a lack of leadership in the gas industry. Environment Ministers seem not to fully grasp the issues. Thus the industry is having to come up with ideas and 'test them themselves'.

2.5.4 The preparedness for transition affects all aspects of the industry from the design, construction, and maintenance. However, the industry is aware of the challenge and most feel it is in a strong position. There are positive conversations about the future which could include hydrogen fuel cells, operating networks on behalf of hydrogen producers, transporting gases.

2.5.5 Some argue that the best approach for the future is to see energy as a whole which could then facilitate massive change. The energy industries need to come together and collaborate to run a range of assets from different energy mixtures, wind farms, solar, battery, and carbon capture and storage.

2.5.6 Internally, there is a sense that the transition will take 'a long time', ie at least 10 years. Carbon capture skills will be required.

"We need to work out what the transition path will look like and have faith and confidence in it. It's a problem that the industry has to come up with ideas themselves and test them"

"We need a de-coupling of what we are allowed to do. Change the way we do things. At the moment we operate are own networks but are not connected"

2.6 The future of the gas industry

Mostly positive

2.6.1 Attitudes towards the future of the gas industry were mostly positive. Most claim that they are 'agnostic' as to which technology is used to achieve net zero for customers and the gas industry within the UK. The respondents argued that they are not wedded to one technology or one power source. But they see a move towards electrification but they believed the UK was not ready for the mass move over to heat pumps and electric cars because of a lack of investment in the infrastructure to support it.

2.6.2 On the whole, gas networks are flexible in how they see the future and see their workforce being able to 'pivot' skills required because they have a solid foundation in core skills such as gas hydrogen, air source or renewables.

2.6.3 Some were told that gas would have 'run out by now' but the sense is that gas will be around for 'a bit longer' due to the Government's plan to issue annual gas extraction licenses in the North Sea. The future is low carbon heating but the view is that the UK is a long way off from full electrification.

2.6.4 Alternative heating such as air source heat pumps are thought not to meet the UK's heating demands. The issue with heat pumps is that they do not work well in badly insulated properties (which is almost half of the UK housing stock). Indeed, the UK is home to the some of the worst insulated housing in Europe. In addition, many flats and houses have no outside space for a heat pump. There is also the issue with noise as the fan noise can be intrusive for neighbours. Many cannot afford a new heat pump, especially given the cost of living crisis in the UK.

2.6.5 There was some awareness of localised heat networks and a few large commercial business owners who want to investigate this as a power source. For example, there may be a large commercial process which has a lot of waste heat so localised heat networks can move hot water around to other potential users. E.g. Tawd Paper Mill in Skelmersdale.

2.6.6 In Northern Ireland, with larger biomethane producers, it was felt that it would make sense for farmers to come on board and set up cooperatives where multiple farmers come together to get the economies of scale to create a large biomethane plant. The gas distributor sees their role as facilitating the commercial environment so that it can happen. Farmers will need help, such as consultancy, that they can engage with to manage and run this part of their business. The first grid injection of biomethane happened a few weeks ago (21st November 2023) in Northern Ireland in Co. Tyrone which marked a milestone in the effort towards decarbonisation in the region.

2.6.7 Despite the talk about the future being about electrification, there was a strong sense they will still be 'burning gas for the next 10-20 years'. This was mainly due to the electric grids already struggling to meet additional capacity and demand. There was a belief that it would take enormous investment to support the infrastructure.

2.6.8 In the future, it was argued that there was likely to be a need for carbon off setting, to increase green assets, to sell carbon credits and to ensure energy security.

Less positive

2.6.9 All feel that there is a lack of investment. Moreover, there is not enough recognition of the unique challenges in the gas industry. Ofgem are focusing on supporting vulnerable customers, and keeping the bills down.

2.6.10 If the Government makes a policy decision on hydrogen for home heating in 2026 there may be no future in the gas network. That suggests the industry will have to start de-commissioning, which means that the gas industry will be left with stranded assets. However, an alternative to de-commissioning is re-purposing. The pipe networks can be used by other industries including telecoms and potentially other energy companies (carbon capture, utilisation, and storage).

2.6.11 De-commissioning could lead to establishing small scale hydrogen for industry. The infrastructure would already be there. This would be far more 'palatable' to the taxpayer than leaving stranded assets. Re-purposing could mean running pipes within the pipework such as electric cables. It would not be possible to use the gas pipes for water because of contamination.

"The biggest concern with the gas industry is that we will be left out"

"There is a fork in the road and no one knows which way the industry is going"

"I believe gas will be around a long time yet. That is until 2050 and beyond"

3. Skills requirements

3.0.1 As highlighted in the desk research the workforce requires upskilling and retraining. This qualitative research provides part of the picture but not a complete one as respondents could only comment from their own knowledge and personal experience. The following is an overview rather than a complete picture of skills requirements.

3.0.2 There is an issue with the gap in what the providers in the sector were doing and that has been the case since Covid. Some GDNs felt that the approach within the colleges was too traditional and has not met the needs of the customer.

3.0.3 It was felt that the gas industry has the same skill challenges as other utility companies, i.e. an ageing workforce and a workforce that is predominantly male and a lack of BAME. Enticing women into the workforce is a challenge given the rota requirements (evenings and weekends) that clash with childcare responsibilities. Also, there is view that if you are more academic you go to university but if you are not so good at school you do an apprentice (something that can be seen as the 'last resort' for those who are not good enough to go down the academic route). The feeling is that unless the industry start with the education system there will be a massive skill shortage which will be felt within society and in the economy as a whole. On top of that is technology and digitisation challenge and how to create digital natives within the organisation.

3.0.4 Some GDNs had an increase in the last year in applications across the graduate, apprentice and Endorsed Training Programmes (ETP) and an 33% increase in application from women and BAME due to changing the entry criteria.

"We want good people with the right behaviour who can help us get the right culture in our organisation"

"Men will apply for a role that needs 10 things when they've only got 7 and women will only apply if they have 10 things. Training is easy if the attitude is right. It's about the person, everything else we can teach you"

"We have people in their 30s and 40s, who bring diverse thought and skills and different techniques which is fantastic for us"

3.1 Short term skills requirements

3.1.1 Assuming a move towards more hydrogen blending, there is a need to up skill existing staff. There is a belief that Energy & Utility Skills need to describe what the new qualification is and to define the standards and training so that engineers have accreditation (to go into houses and convert boilers to hydrogen for example). This would give customers confidence.

3.1.2 Key skills required include

- Changing from a methane engineer to hydrogen
- Heat pump engineers
- Carbon capture, utilisation, and storage
- HR, business and finance
- Creating hydrogen from scratch i.e. not using fossil fuels to create it
- Data and technology apprenticeships (to take the industry to the next generation and to 'grow our own talent in that space'.)

3.1.3 It is not clear who the key decision maker as to what qualifications are required, is in the gas industry. Is it IGEM, Ofgem or the HSE? The distributers do not feel that they have the skills and expertise to develop courses themselves. For some distributors the majority of training is outsourced e.g. Develop Training.

3.1.4 Within Centrica, there was a Green Skills Academy training engineers on air heat pumps but the timing of it was almost too early. Householders have not been changing to heat pumps en masse largely due to the prohibitive cost, but this may change.

3.1.5 With hydrogen there is a need to up skill all staff to ensure safety, such as how to manage escapes, and how the gas accumulates. Safety is key to instil the right behaviours and to ensure there are no accidents. Staff need to have the right competencies. However, most felt that there is no point training all staff in the short term, particularly those who may retire before hydrogen is introduced.

3.1.6 That said, there was a strong feeling amongst some that training needs to start now. There was a desire to put people through training and up skilling at volume. Some gas distributers have 500 engineers and the suggestion is that they will rotate them through training in the next 2-5 years. There is an understanding that changing from a methane engineer to a hydrogen engineer takes approximately 5 days to two weeks.

3.1.7 Apprenticeships are being reviewed every three years to ensure that they are future proofed, by the Academy at Centrica. They are then signed off by the Secretary of State. However, many engineers do not go through an apprenticeship. Rather they are on a managed learning programme. It is believed that new apprentices would be hydrogen trained.

3.1.8 It was clear to Centrica that the HE colleges were not turning out well rounded candidates so the Academy was founded to provide more multi-disciplinary training.

3.1.9 One of the issues in Northern Ireland is remote working. In other words, the local workforce do not need to leave Ireland to get opportunities in the UK or Dublin as they can work remotely so the NI gas industry is having to compete with that. In other words, the local labour pool can get well paid jobs working remotely.

3.1.10 In terms of costs most GNDs believe it will be part of their operational costs as a distribution network. The costs will get spread back to the customer base and recovered. This is also a challenge because the customer, given the cost of living crisis, cannot afford to pay more. This drives the need to be super-efficient; to deliver efficiency for the customer.

3.1.11 Another issue unique to the gas industry was that it was easy for operatives to switch from gas to water from a competency perspective. But with gas, because it is an explosive substance there is more legislation.

3.1.12 An internal view is that in the short terms there will be no significant transitions but a need to maintain a safe operating network and sustain the workforce.

“With the changes in technology there have been more competencies required for individuals”

“It will still be traditional engineering skills required”

“Looking at the installation of heat pumps the current skills are 98% transferable”

3.2 Medium term skills requirements

3.2.1 The medium term i.e. the next 10 years, seems to be a more realistic timescale in up skilling the work force, given the numbers involved and the uncertainty. It is inevitable that there will be a shortage of engineers. There is a need to look at how to train engineers by these methods

- Apprenticeships
- Managed learning
- Ex-military pathways (transferable skills)

3.2.2 There will be a need for a trusted advisor to help customers in their home to give the right advice, and to help the consumer lower their energy bills. Retro fit assessors will also be required.

3.2.3 There is a need to train sales advisors on hydrogen to reassure customers. On a macro level conversations with boiler manufacturers will have to take place. With the injection of new gases there will be a requirement to up skill those in E and I, (Electrical and Instrumentation) who use tech to measure gas quality. There will be more measurement and a change to the industry codes and practices given that they are a regulated and legislated industry.

“You can’t just move people about and train them you need to add volume to the sector given the shortage coming up”

“Advanced apprenticeships are not needed, not everyone needs to be a full Level 3 heat source installer”

3.3 Long term skills requirements

3.3.1 There is a need to look at solar power, storage of green energy, fuel cells, windfarms, offshore and harnessing the power of the ocean. So the industry is looking at design, construction, maintenance, and development of hydrogen transport and also looking at storage and biomethane injection. Also, carbon capture and storage, engineers for hydrogen valley power stations for large commercial users. However, it all rested on Government policy decisions.

3.3.2 On the administrative side there will be skills gaps in HR, business and finance, for sales advisors too. Even land rights officers may need additional training if the laws change, because the pipes contain hydrogen not gas. There will be a need for up skilling across the sector.

3.3.3 In Northern Island, which has a large agricultural sector there is a need for help with silage, slurry, waste, and chicken manure co-ops to help with biomethane into the grid.

3.3.4 Internally, there is a sense that chemists will be needed for carbon capture.

3.3.5 However, on the whole, most did not know what the future would look like in any depth or detail. There was an understanding that hydrogen would only be part of the answer given that some of the trials had been recently cancelled. However, they had been told that gas would have run out by now but that has not happened.

3.3.6 Biomethane works well in contributing in a rural area geared towards agriculture with a small population such as Northern Ireland but was not suitable for England. Thus, if hydrogen is not the answer then it will be electrification. But how the electricity gets made there is little surety about that.

3.3.7 The infrastructure is presumed to be the same whether it is hydrogen or gas and many boilers are now hydrogen ready.

“The issue is how to train and bring graduates on”

“We have been told we will be still replacing gas mains as part of the core network”

“There is an interdependency between the gas networks and the power networks”

4. Skills gaps and training requirements summary

4.0.1 The biggest challenge in the short term is the availability of engineers, both those with a degree and Gas Safe / domestic engineers (qualified to Level 3). There is a strong belief that there are not enough individuals. Thus the greatest issue is how the network is grown given the ageing population of engineers in both electrical and gas. The key is to attract new entrants to the industry.

4.0.2 There is a strong sense that a vast array of new skills will not be necessary in the short term. It is more nuanced than that. The core skills of a gas engineer are transferable to hydrogen.

4.0.3 The other issue is how well qualified do engineers need to be to install a heat pump. There is an argument that not all installers need to be full Level 3 accredited heat pump installers.

4.0.4 Engineers need to be trained in how to create green hydrogen and to get it into the system. Also to train engineers on gas networks, mains underground and all service layers to get them to hydrogen competency.

4.0.5 There will be new opportunities and skills required for a different landscape.

4.0.6 One issue that is unique to gas and oil is that one GDN argued that as a parent would you be encouraging your child to have an apprenticeship in an industry that may not exist, compared to an electrician or a plumber?

> **“Skills gaps are evident and exist through out the entire gas industry”**

> **“You need to train engineers on gas networks, mains, underground, all service layers to get them to hydrogen competency”**

5. What's helping?

5.0.1 Getting involved with schools, colleges and FEs to encourage young people to think about engineering as a career will help. Promoting apprenticeships will also benefit the industry. T Levels will also contribute to educating the workforce. Military pathways are also helping ex-military who already have engineering skills into the gas industry.

5.0.2 The Gas Distribution Networks e.g. Cadent and Northern Gas Networks share training facilities and have 16 regional training centres. Thus, economies of scale will help and the GDNs need to work together. There needs to be political will to make it happen.

5.0.3 New technology in training could help. Some wanted to harness augmented reality to support skills and training, enhancing training, and saving time and money.

"We need to start putting people through training and up skilling at volume. XX have 500 engineers. We will need to rotate them through in 2-5 years"

"With heat pump installers we can have people in the squad who are on a shorter programme. We need the right blend of skills and experience"

6. What's holding it back?

6.0.1 The key issue is the lack of political will and support for the gas industry. The industry needs direction because at the moment it was suffering. People are not interested in gas because they do not see a future in it. Thus there is a need for re-invigoration in order for people to buy into the future.

6.0.2 Many thought that the gas industry was underestimated. Senior figures in Government, such as Lord Callanan, are saying that there is no future in gas and that the future is all electric. He said 'the vast majority of decarbonisation of home heating in the UK will be electrification'.

6.0.3 However, electricity is not seen by gas distributors as a realistic scenario for large scale energy demands. With the election coming up in 2024 there is sense that politicians are holding off making difficult decisions about energy. There is a tendency for politicians to listen to the vocal minority.

6.0.4 The industry cannot attract talent if the general belief is that gas has no future.

6.0.5 There is a belief that customers will move over to heat pumps and that the gas market will shrink. But many customers will not be able to afford heat pumps and many households are not suitable.

6.0.6 Many felt that the gas industry got a bad press. The key reason was that it was not 'sexy' like other forms of energy but it was pivotal to the UK economy and to keeping people's homes warm. There is a reliance on wind and solar power but it cannot meet the current needs of the UK population.

6.0.7 That said, there is a lack of sharing resources. And a lack of knowledge and expertise in the new technologies. Some are looking to academia to help. The political will is holding the industry back. One respondent felt that 'half in Parliament are not backing hydrogen'.

6.0.8 Another key issue is who is paying for the training – is it the GDNs or National Gas? Also there was a sense that the apprenticeship levy did not take into account the difference in technical skills versus administrators, since technical staff need very technical skills and trained to a certain level to step out to visit a customer, however, admin staff do not. Although the apprenticeship programme is seen as a good one, it doesn't recognise the demands of the different industries.

6.0.9 Currently there are silos of training schemes but there is a need to share resources. Distributers are currently competing with each other rather than working together. There are issues with attracting and retaining staff into the industry. It is seen as 'more boring and old fashioned' than other sectors even oil. In terms of salary, gas cannot compete with the likes of BP or Shell.

6.0.10 Furthermore, energy companies are vying for the same pool of talent. Thus, there is a need to make the profession attractive to young people.

6.0.11 There is a sense that not all heat pump engineers need to be trained to the highest standard, as obviously this has cost implications. In a squad of 4 people there can be some who are on a shorter programme and others that would be on the top enumeration. It needs to be efficient to the customer so that they are not overcharged. There is a need for the right blend of skills and experience. The key challenge will be getting the right skills and the right enumeration.

6.0.12 The issue of apprenticeships is often contentious because the grant only pays a small fraction of what it costs employers. So there is an issue with affordability.

6.0.13 Currently electricians cannot do an EV charge point unless they are a Level 3. Thus, employers are more likely to employ an electrician who is already trained rather than fund the training themselves.

6.0.14 There is a demographic issue in that many engineers are approaching retirement age.

6.0.15 It also did not help that the Government invests less in skills than their counterparts in Europe. There is a need to get the right investment and skills from the Government.

“Environment Ministers don’t understand, they are not experts. I know for a fact that Ed Miliband doesn’t like hydrogen. We need to win the battle. Heat pumps are not the answer as most cannot afford them”

“There isn’t a cohesive position on the way forward, given that the Whitby hydrogen trials have been cancelled. If hydrogen isn’t the be all – it will be electrification”

7. Key priorities

7.0.1 The key will be getting the right attributes and capabilities of those entering the industry. They need technical abilities plus be good at conversing with customers and providing advice. Staff need to have the right motivation and drive in a net zero environment. They need to buy into the ethos of the company and to fit in.

7.0.2 In essence, the gas industry needs the Government to support it. The energy industry as a whole needs to work more collaboratively. People are not thought to be interested in the industry because they do not see a future in it. Thus there is a need for investment and re-invigoration so that potential recruits buy into the future.

7.0.3 It is also important to get the right blend of training going forward to include fully qualified, managed learning and apprenticeships.

7.0.4 Some GDNs wanted the process of changing apprenticeship standards and formal qualifications to be accelerated.

7.0.5 There is an ambition in one distributer to recruit 5000 in the short term.

7.0.6 There is need to sell to new recruits that there is a future for gas. In other words, to tell young people that the future with hydrogen is exciting. Crucially, the sector needs to work together and make the idea of working in gas appealing to younger people.

“We are losing talent from the senior side”

“We lose 50% of our apprentice intake and we can’t find enough mechanical engineering graduates”

8. Summary

8.0.1 The key issue is the retention of staff and attracting new staff into the industry. This is highlighted in the desk research where it states that decarbonisation challenges are exacerbated by an existing decline in skills in some sectors of the economy that are critical to the transition.

8.0.2 The key challenges below were apparent in the desk research and alluded to or mentioned in the qualitative research.

- Confidence in existence and longevity of jobs
- Access to and affordability of skills provision
- Training and retaining skills pipeline
- Parity of esteem for entrants into trade vocations
- Rate of movement of workers between jobs

8.0.4 There was a strong sense that all energy companies are vying for the same pool of talent. Thus there is a need to make the industry and engineering as a profession attractive to young people. There is also the issue that younger employees do not have the same long term outlook or staying in the same job as the previous generation of recruits.

8.0.5 On the whole, it was felt that current skills are 98% transferable and that training would be approximately 5 days to 2 weeks to transfer skills to hydrogen. There was discussion of 'pivoting off' core skills such as plumbing, heating, and electrician; the core foundation is in place.

8.0.6 There is a digitalisation 'piece' which is how to harness it and how to get digital natives into the industry so that the gas industry becomes more efficient.

8.0.7 Most feel that the future of the industry is exciting but the sector needs to come together to communicate that working in gas can be a 'fantastic career' with opportunities, variety and career progression.

"We are trying to recruit, attract and grow skills in a very competitive market and covid accelerated that"

"It is all so political. There are potential changes depending on government. I feel as if we have the sword of Damocles hanging above our heads"

9. What the gas industry wants from Energy & Utility Skills

9.0.1 The people we spoke to in the qualitative research believe Energy & Utility Skills is the perfect nucleus to unify the other parties and they should use their influence and network. One GDN asked for 'any help Energy & Utility Skills can give in terms of lobbying on behalf of the gas industry and on the unique challenges that the industry faces'.

9.0.2 Crucially, Energy & Utility Skills needs to support the entire industry, not just gas and to get their weight behind it, working collaboratively across sectors. They need to control the narrative for the gas industry, using their contacts, such as working with unions, to come together in one voice. Ideally, gas networks want Energy & Utility Skills to push hydrogen because that would help the transition to net zero facilitating the infrastructure, skills and expertise that the industry already has.

9.0.3 It was felt that Energy & Utility Skills need to engage with IGEM and the Gas Safety Register to create skills courses that prove that their staff have reached the industry standard.

9.0.4 Energy & Utility Skills will need to be ready for change, to keep abreast of the industry and to react quickly. Some GDNs such as Phoenix felt they themselves have knowledge and expertise – but are looking to academia and Energy & Utility Skills to fill the knowledge gap.

9.0.5 GDNs and National Gas businesses (National Gas Transmission, National Gas Metering and National Gas Services) want a suite of courses that their staff can attend with courses across all parts of the business.

9.0.6 It was felt that Energy & Utility Skills need to define the qualifications and the standards and training e.g. that engineers have a badge to be able to go into houses and convert boilers to hydrogen. Energy & Utility Skills also need to define and determine what is genuinely new, i.e. land rights jobs may not change.

9.0.7 Ultimately, it was not clear who is the decision maker for this, be it IGEM, Ofgem, HSE or the Gas Safety Register? But it was clear that the respondents wanted Energy & Utility Skills to take ownership of it and to take the 'headache' away.

> **"We need to work out what the transition path will look like and have faith and confidence in it. It's a problem that the industry has to come up with ideas themselves and test them"**

10. The Skills Deep Dives

10.0.1 As outlined in the desk research, the “skills deep dives” i.e. further qualitative research, will seek to answer the following questions:

- What new skills, if any, will be required by the workforce?
- Specific knowledge, skills and behaviours will be required?
- What is the likely demand for these skills over the coming years?
- Volume and timing of new skills demands
- Are current education and training provision and pathways sufficient to meet these new demands for new skills? If not, where might gaps exist? It may be helpful to speak to providers such as Develop
- Are the current apprenticeships, T Levels and other qualifications as appropriate around the UK suitable?
- How can the transition of skills around and into the gas networks industry be better achieved?
- Which other sectors might be a source of skills? A need to recruit technical and digital natives into the industry who think differently about tech and who can drive efficiency

Annex 1 – List of contributors

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