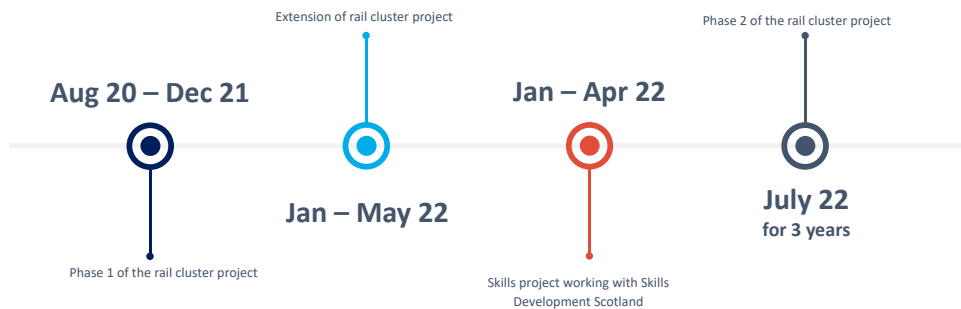# Rail Cluster Project
The Skills Challenge in the Rail sector – August 2024

1. Rail Cluster project

The Rail Cluster project was awarded to Scottish Engineering in August 2020 as an 18-month programme (phase 1) jointly funded by Scottish Enterprise and the 2014 – 2020 European Structural and Investment Fund through SPRITE (Scottish Programme for Research, Innovation and Technology Ecosystem) and supported by Transport Scotland. After a brief extension, phase 2 was also awarded to Scottish Engineering, a three-year project this time and funded by Scottish Enterprise, Transport Scotland and Skills Development Scotland.

Timeline

Extension of rail cluster project

Phase 2 of the rail cluster project

Aug 20 – Dec 21

Jan – Apr 22

Jan – May 22

July 22
for 3 years

Phase 1 of the rail cluster project

Skills project working with Skills Development Scotland

The purpose of phase 2 of the project is to:

- Continue to support the rail sector in Scotland to achieve its ambitious net zero targets and helping to create local sustainable employment and economic growth across the country
- Create even stronger relationships and a wider network, bringing a broader diversity of thought, approach and innovation
- incorporate a key skills element where capability, capacity and the skillsets required to deliver on all the opportunities are addressed.

The roots of the rail cluster project lie in the Rail Services Decarbonisation Plan in which the Scottish Government has set ambitious targets to decarbonise passenger rail services in Scotland. These targets present a real challenge to the industry and its supply chain,

requiring a massive uplift in the electrification programme, new efficient train fleets powered by electricity, battery and hydrogen to replace diesel, and innovations and efficiencies to deliver this transformation whilst keeping rail transport affordable for taxpayers and users.

This potentially presents opportunities for Scottish engineering and manufacturing SMEs with the potential creation of new skilled, sustainable employment. The Rail Cluster Builder supports SMEs in establishing their presence in rail and is helping develop Scotland as a leader in the innovation and manufacture of net zero rail products and services. Decarbonisation of our railways is not the end of the story, but it is the key to unlocking the potential of the future "world class" rail transportation network envisaged by Government, offering greater connectivity and accessibility, better service, and faster travel times the length and breadth of the UK, and encouraging modal shift from road and air transport.

2. Rail Cluster - Skills Leadership Group

The establishment of a Rail Skills Leadership Group with key Scottish industry leaders, the National Skills Academy for Rail and Skills Development Scotland is a key element of phase 2 of the rail cluster work. The group was formed to address the recommendations in a Rail Skills Report 2021 compiled in Phase 1 of the project by external consultants, Optimat.

The recommendations are as follows:

1. Commitment from Government to a time-bound and detailed plan of sector improvements backed by ring-fenced funds – to provide greater certainty of the scale and timing of opportunities for the supply chain
2. Planning within the wider education, skills and training sectors regarding how to build capacity for the expected increase in demand, bearing in mind that this may still be a few years away. This should include apprenticeships, further and higher education courses and shorter/modular courses to allow up- and re-skilling. Given the potential overall scale of demand, it should also include at least a Scotland and potentially a UK-wide joined up approach – to build resilience
3. More effective promotion of the different types of jobs and career opportunities across all age groups – to encourage school pupils and those already in further and higher education to consider careers in the rail sector, and to raise awareness of opportunities for those in other sectors that have skills that are required in the rail sector – to prime the talent pipeline
4. More effective promotion to members of society that are underrepresented in the rail sector, specifically women, but also people from non-white ethnic backgrounds – to increase the pool of individuals entering the rail sector
5. New ways of funding the expected demand for greater numbers of skilled people in the rail sector, as well as new skills, which shares risk more effectively between public and private sectors.

3. Introduction to Skills Report

The UK rail industry is facing a huge shortage of workers which is expected to grow over the next decade. The age of the current workforce plays an integral part in this culminating in an expected large scale retirement wave, as well as increased investment creating thousands of new jobs every year and decarbonisation and technological advances creating a need for new skills.

When businesses struggle to find employees with the right expertise, it is commonly referred to as a skills gap or shortage. Skills gaps have negative effects on the economy through reduced productivity, delays to new product/service development and difficulties introducing technological change (Scottish Government, 2019).

Skills gaps can have the following effects on businesses:

- Increased workload for other staff
- Difficulties meeting customer service objectives
- Increased operating costs
- Delay to developing new products/services
- Loss of business to competitors
- Difficulties meeting quality standards
- Difficulties introducing new working practices
- Having to outsource work
- Difficulties introducing technological change

Apprenticeships are one of the solutions explored in this report, but with fewer than 2,000 new apprentices currently hired per year in the rail sector, a major increase in uptake is required to meet the expected demand of 479,000 posts to be filled by 2030 (NSAR, 2022a, 2022b)(WR, 2023).
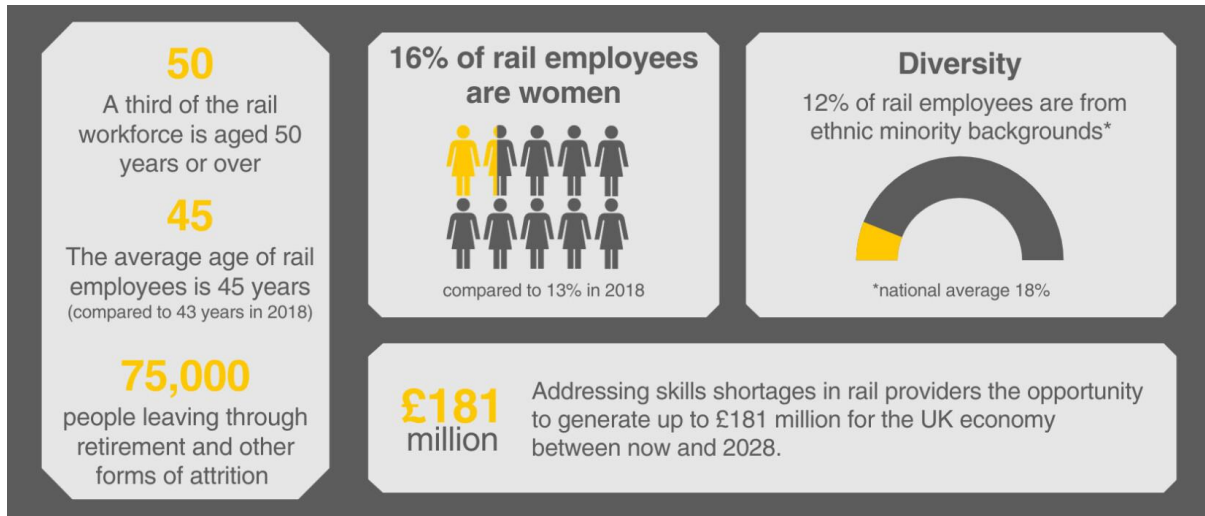
This report will examine the characteristics of the UK rail sector, the skills in demand now and over the next decade or so, what can be done to address the issues, and how the rail sector is faring compared to the wider engineering sector.

In its Annual Workforce Survey Report released in October 2023, the National Skills Academy for Rail (NSAR) states that:

"The [rail] industry faces a significant challenge in developing and maintaining a skilled workforce that can keep pace with rapid technological changes, demographic shifts and evolving market demands. As the industry continues to expand, it must focus on attracting and retaining skilled workers who can adapt to these changing market conditions."

The report's key findings for the UK rail sector are illustrated below:

50
A third of the rail workforce is aged 50 years or over

45
The average age of rail employees is 45 years (compared to 43 years in 2018)

75,000
people leaving through retirement and other forms of attrition

16% of rail employees are women
compared to 13% in 2018

Diversity
12% of rail employees are from ethnic minority backgrounds*
*national average 18%

£181 million
Addressing skills shortages in rail providers the opportunity to generate up to £181 million for the UK economy between now and 2028.

and the following conclusions can be drawn from the 2023 Rail Workforce Survey data - NSAR collated the information received directly from employers, in addition to data from the Sentinel database and from the Office of Rail and Road to produce a workforce profile covering 243,387 individuals.

- We have a workforce that is older than before (the average age of the workforce has
- risen from 43 years in 2018 to 45 years currently).
- We have fewer younger people (the proportion of people under the age of 30 has decreased from 16% in 2018 to 10% currently).
- We have a third of our workforce aged 50 years old or over.
- We are facing a critical loss of experience and knowledge in the next seven years (the
- number of people leaving through retirement and other forms of attrition could be 75,000 workers by 2030).
- We remain a male-dominated industry (the proportion of women in the industry is 16%).
- We remain a predominantly white workforce (87.5% compared to a national proportion
- of 81.7%).

NSAR's Workforce Survey 2023 states that 'there are clear and key areas where consistent workforce deficits exist – which include Signalling & Telecoms, Systems Engineering and Electrification & Plant – where the gaps typically range between 1,000 and 2,000 people per annum. These deficits are creating premiums for skills – for Electrification 12% and for Signalling 10%, evidenced through increased salary demands.

For some context in terms of what is predicted to be needed in the next five to ten years, City & Guilds and the National Skills Academy for Rail (NSAR) in 2020 stated that the rail industry will need between 7,000 and 12,000 additional workers each year for the next five to ten years.

The key findings of the report were as follows:

- Skills shortfall: up to 120,000 additional people will be required over the next 5 - 10 years, with demand for skills peaking around 2025

- An ageing workforce: over 28% of workers in the current rail workforce are over the age of 50
- Failure to attract a diverse workforce: Only 16% of the rail workforce is female and nearly one in four women (24%) would consider a career in rail

4. Current figures

UK Rail Sector Characteristics

There are approximately 240,000 workers within the UK rail industry, which is 2% fewer than in 2021 (WR, 2023). Around 13,000 work in Scotland (Network Rail).

Distribution of the rail workforce across the country in percentages.
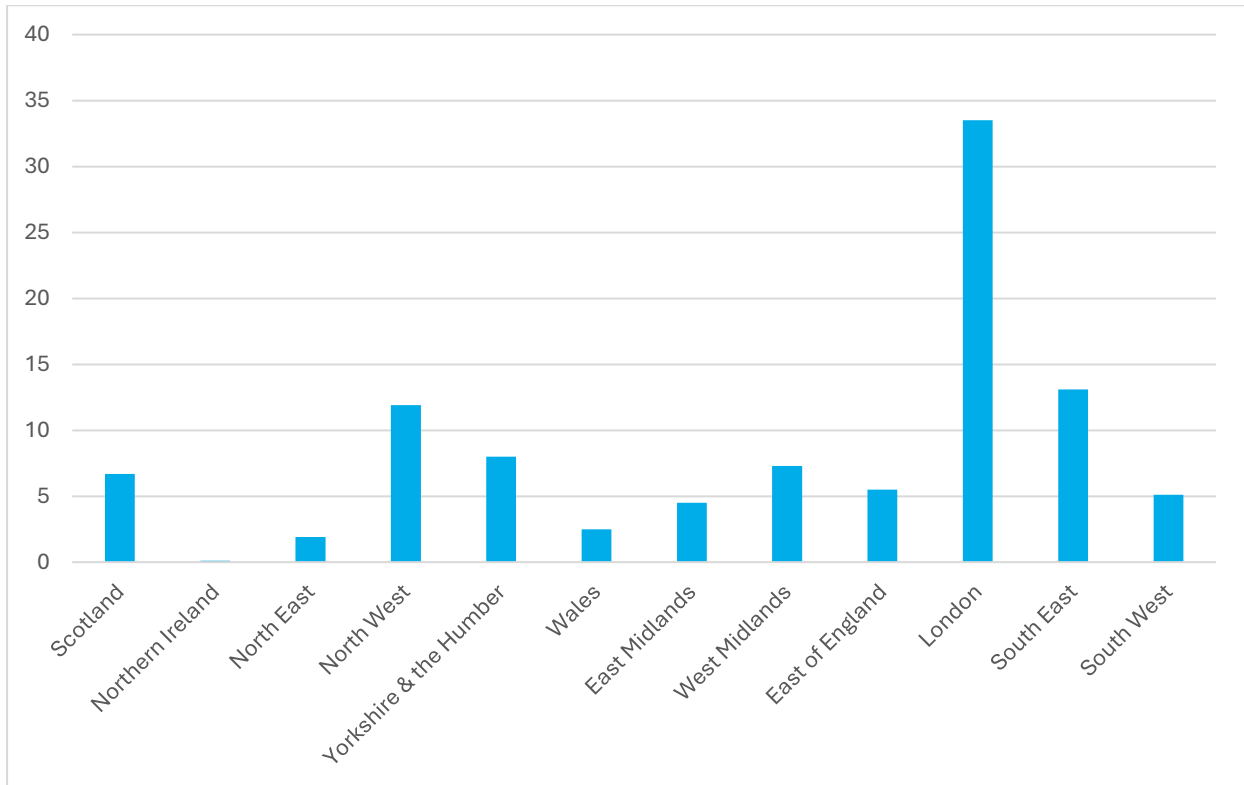
Shortages by specific skill types are identified as follows:
- Within signalling and telecoms, there will be a deficit nationwide for project managers, engineers and technicians between 2024 and 2030
- Within electrification and plant, there will be a shortage for operative, technicians and engineers in particular in the West Midlands, East Midlands and Yorkshire and the Humber between 2026 – 2030.

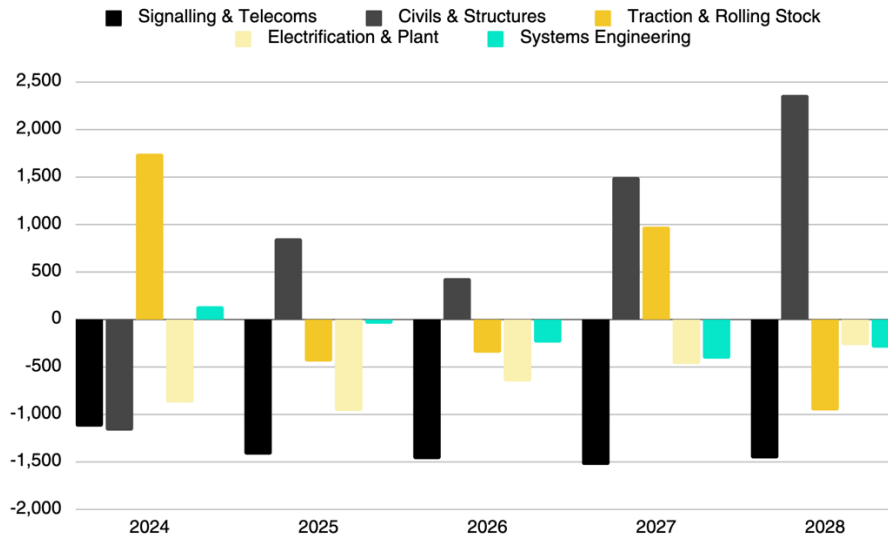The NSAR report also shows the shortages gaps by asset in the graph shown below.

Figure 5: Key shortages gaps by asset type

As new technologies are introduced in the sector, there will be an increased demand for digital skills and sustainability is becoming more important with decarbonisation targets linking to a need for a greater number of skilled people in green roles such as electrical engineers, high voltage engineers and systems engineers.

Gender diversity

The NSAR survey states that in 2023, 16% of the workforce was female and 84% was male. While this percentage is increasing (it was 14.6% in 2022), there is still much work to do to attract women into the sector. Initiatives such as flexible working, part time working and job-shares are seen more prevalently across the sector which could be helping to improve the gender balance.

Ethnicity

Form the NSAR survey report, 12.4% of the respondents are from ethnic minority background, compared with a UK national average of 18.3%. However, collecting data in this area is a challenge so it may not be entirely reflective of the current workforce.

Age

As mentioned above in the key findings of the NSAR report, the rail sector has a workforce that is older than before (the average age of the workforce has risen from 43 years in 2018 to 45 years currently). It has fewer young people (the proportion of people under the age of 30 has decreased from 16% in 2018 to 10% currently) and a third of the workforce is aged 50 or over.

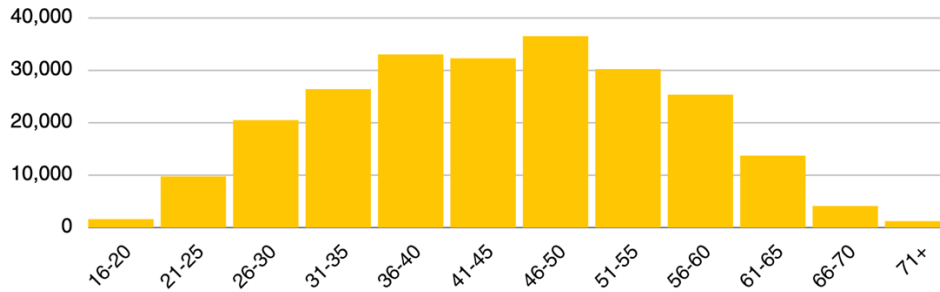The graph below illustrates the age profile of the current workforce.

Figure 15: Age profile of current workforce

Focus on early attraction is developing but needs to gather momentum to halt the downward trend of the proportion of employees aged 30 and under. This figure is currently 13.5%, as illustrated in **Figure 16**, a reduction of nearly 50% in seven years.

5. Rail Sector Skills Shortages

According to research by Optimat (2021), the skills which are currently in demand in the rail industry are:

- Engineers:
- Mechanical
- Electrical
- Electronics
- Software
- Design
- Systems
- Civil
- Signalling
- Data analysts
- Telecommunications
- Project management
- Overhead lines specialists

6. Engineering Sector and Wider

The skills shortage is not unique to the UK's rail sector. According to Skills Development Scotland's Sectoral Skills Assessment for Engineering (2022), 44.5% of Scottish businesses experienced a shortage of workers in August-September 2022, and 42.4% reported difficulty recruiting new employees. It also reported that labour shortages are affecting businesses across engineering sub-sectors, notably fabrication, welding and photonics. This is in part linked to reduced EU migration after Brexit. The gender imbalance is even stronger in the engineering sector, with only 8% of practising engineers being female (Engineering UK, 2018).

Across all sectors, the Department of Education's Employer skills survey (2017) reported that 16% of Scottish businesses faced lacking skills within their workforce, which is higher than the UK figure of 13%.

7. Predictions

Retirement

According to figures from Women in Rail (2023) the rail sector is expected to face a huge labour shortage in the coming decade, and the retirement of current workers will be a major factor in this. 50,000 workers will reach the retirement age of 65 by 2030, comprising 89% male and 11% female.

This will particularly impact London and the Southeast with 54% of these retiring workers based there. 39% of retiring employees work in capital projects and 38% in operations, so these functions will be significantly impacted. The job roles expected to be most impacted are technician with 6,500 expected retirees, followed by 3,600 drivers, 2,800 customer service personnel and 2,000 engineers.

To put this in a Scottish context, Scotland's population is ageing and the number of people of pensionable age is expected to increase by 20.6% by 2045, whilst the working-age population is expected to decline by 2.4% (Skills Development Scotland, 2022). This will see Scotland's workforce stretched thin and could see businesses competing for workers even more than they currently are.

Skills within the engineering sector are highly transferrable, so individuals within sectors such as aerospace, maritime and military for example could successfully move to the rail sector to help meet demand (Optimat, 2021). However, this also has a negative side as workers trained in the rail industry can be well suited to other sectors, meaning rail must be attractive enough to bring in and retain workers. Some issues facing the rail sector cited by Optimat are working conditions such as long and unsociable hours, working away from home, and lack of opportunity to progress. These issues should be addressed to avoid losing potential or current employees to other sectors.

Additional demand

The rail industry is seeing unprecedented levels of government investment, creating a need for a larger workforce to plan, manage and deliver the work. Capital investment in the rail sector has the potential to create 12,000 jobs every year over the next 5-10 years in the UK (NSAR, 2022b), translating to around 700-1200 per year in Scotland. The top 10 skills gaps will require 153,000 additional people between now and 2030 (NSAR, 2023), and this additional demand combined with the scale of retirement is expected create a shortage which will peak in 2026 with a shortfall of 10,000 workers (WR, 2023). With new digital technology, decarbonisation of the network and replacement of ageing rolling stock, approximately 80% of the current workforce will need to be retrained or upskilled within 2 decades (NSAR 2022b). This could cause huge difficulty as 40% of trainers within the industry will reach retirement age by 2030 (WR, 2023).

Departments most affected by the above additional demand will be signalling and telecoms, civil and structures, traction and rolling stock, electrification and plant and systems engineering. Job roles facing shortages are expected to be technician, engineer, supervisor, project manager and operative (WR, 2023).

In addition to the above, the industry is also seeing a higher-than-normal attrition rate at 10-15% (a 'normal' rate would be 5-8%)(WR, 2023).

Rail Workforce Demand to 2030
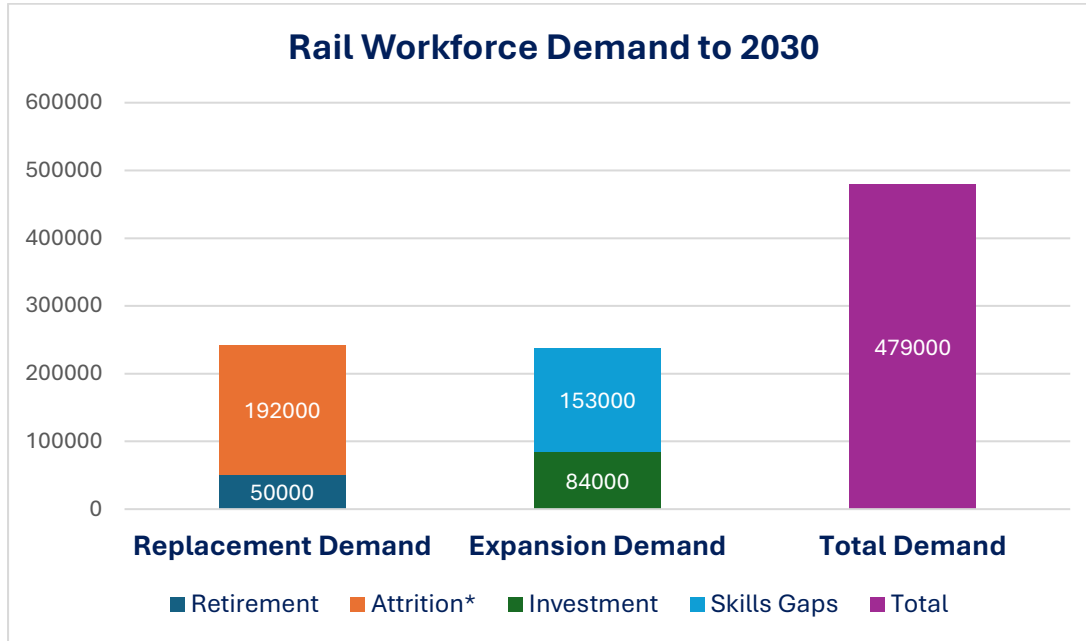
Graph: This graph shows the demand figures detailed in the above sections combined to give the total demand until 2030.

*The Attrition replacement demand was calculated using the lower end attrition figure of 10% applied to the workforce of 240,000 each year until 2030

Control Period 7 (CP7) Investment

Network Rail have been allocated £44 billion by the government for Control Period 7, which runs from April 2024 to March 2029. The funds will cover operations, maintenance and renewal of the rail network, setting out major infrastructure projects and opening these to tender. In their High Level Output Statement (HLOS), the government set out their key objectives for CP7, which include:

- improving safety of passengers, rail workers and the public
- rail freight development
- improving resilience to extreme weather and climate change
- decarbonisation
- environmental protection
- research and development.

Decarbonisation and Net Zero

The Scottish Government have set a target to reach net-zero greenhouse gas emissions by 2045. Although already a very low carbon form of transport for both passengers and freight accounting for just 1.2% of all transport emissions in Scotland in 2017 (Transport Scotland, 2020), the government aims to further decarbonise rail traction energy by removing diesel passenger trains. This will mostly be achieved by electrification of trainlines, and the use of hydrogen or batteries where electrification is not possible. This work will place further demand on the rail sector workforce and could require new skills.

Future Skills Requirements

In their research conducted for SDS, Optimat (2021) identified a host of new skills that will be required to develop, manufacture and/or maintain alternative traction technologies, digital systems (e.g. signalling) and new rolling stock.

These skills include:
- Testing & diagnostics – for the new equipment and systems in use
- Procurement – understanding changes in delivery and business models associated with different traction technologies, in particular hydrogen
- Some specialist technical skills, e.g. to work on future hydrogen powered trains, such as high-pressure gas systems, and the health, safety and environmental (HSE) skills to accompany this

These skills are in addition to the increased workforce numbers required to deliver decarbonisation targets and improvements to infrastructure.

8. Solutions

Invest in people and skills

Workforce planning is essential to mitigate the impacts of the skills shortage in rail. It allows companies to understand their current workforce and determine future needs. Proper workforce planning can reduce wage inflation, improve diversity in the industry and lead to enhanced social value (NSAR, 2022b).

It is also vital for companies to invest in training and in particular apprenticeships in order to fill the impending skills shortages. As well as the wider economic benefits of apprenticeships which will be detailed later in the report, they also provide individual benefits, opening doors to individuals from different backgrounds and creating tangible opportunities for career progression. Barriers to training must be eliminated in order to facilitate the necessary growth in the industry (NSAR, 2022b).

The rail industry could also take advantage of retraining individuals from other sectors which are in decline. There is a workforce across Scotland of around 250,000 individuals who have manufacturing, engineering, IT and management skills which could be relevant to rail (Optimat, 2021).

Apprenticeships

As previously mentioned, high levels of investment in the rail industry could see thousands of jobs created in the next 5-10 years, many of which are at levels which are often best served by apprentices (NSAR, 2023). The skills shortage will only get worse without attracting a new generation of talent and upskilling the current workforce. Apprenticeships are vital as they supply an ongoing cohort of qualified talent, and it's cheaper to train up these fresh recruits than to pay to attract already established talent (NSAR, 2023). There are fewer than 2,000 new apprentices hired per year in the industry, a figure which must double in order to meet demand (WR, 2023).

Apprenticeships are also valuable in monetary terms, known to increase returns within the company. For every £1 spent on rail skills in the UK, companies see a £3 return on their investment (NSAR, 2023). In the face of the rail sector's ageing workforce, apprenticeships will allow the systematic transfer of knowledge to the new generation of workers.

Current barriers to an increase in apprenticeship numbers include a lack of supply and a lack of support. The industry needs new ways of attracting apprentices – most avenues have been explored to deliver the primary demand for apprentices, and a new approach is needed to convert latent demand (NSAR, 2023).

Addressing the Apprentice Shortage

Addressing the apprentice shortage is twofold – promoting rail apprenticeships as a career path and supporting employers to hire and train new apprentices (NSAR, 2023). There are initiatives in place locally to attract young people to into apprenticeships which meet the skills demands of their area, and on a sector-wide scale is Routes into Rail – an initiative which aims to inspire and educate young people as well as career changers on the variety of entry pathways and careers available in rail. Training apprentices is now a contract requirement of many large rail projects, so these projects also have resources dedicated to attracting and supporting apprentices.

As for the support needed by companies within the rail sector, some employers are more knowledgeable or have experience with apprenticeships and therefore need less support, whereas others may need more comprehensive support with workforce planning, apprentice sourcing and apprenticeship management among other areas (NSAR, 2023).

An organisation providing apprenticeship support to employers in the rail sector is the National Skills Academy for Rail (NSAR). Their Apprenticeship Services can support employers with levies, programme planning and assessment, and they've introduced a new apprenticeship brokerage service that provides more intensive apprenticeship support with workforce planning, apprentice recruitment, programme development, training provider sourcing and relationship management.

Other Education Routes

According to Optimat (2021), apprenticeships (at all levels) and college education are the means by which the sector favours entry, regardless of whether the individual is a new entrant or an existing employee looking to be upskilled. Based on their research they advise that more emphasis should be placed on vocational routes into the sector. As well as apprenticeships, this means individuals completing HNCs and HNDs at college and supplying the technician roles that are severely lacking

compared with graduate level engineers, although it should be noted that more of these will be needed too. Hands-on practical skills complemented by education is required the most.

Most of Scotland's universities provide qualifications that are relevant to the rail sector, primarily in engineering and in computer science.

Universities and Colleges who provide training/qualifications specific to the rail sector are:

- Glasgow Caledonian University – BSc in Railway Operations Management (in partnership with the Institution of Railway Operators (IRO)
- Edinburgh College – City and Guilds SCQF Level 5 in Railway Engineering
- University of Aberdeen - MSc in Transport and Intelligent Mobility
- University of Edinburgh – MSc in Infrastructure and the Environment
- Edinburgh Napier University – MSc in Transport Planning and Engineering

Diversity

Opening up the rail sector to underrepresented groups such as women and non-white workers would greatly increase the supply of talent and skills. With women making up 14.6% of the workforce and non-white workers accounting for 12.5% (NSAR, 2022a), there is a wealth of talent being missed.

The lack of female presence in the rail sector and indeed wider across STEM subjects is deeply rooted in society's views on gender, what makes a suitable career for girls, and a lack of understanding of the breadth of roles available. A report by the Scottish Government's Just Transition commission (2019) found that a persistent feature of the school, college, university and apprenticeship systems is the highly gendered nature of study for subjects relevant to digital skills specifically and STEM subjects more generally.

A change in perception is required. A publication by Fife College on Overcoming the Engineering Skills Gap in Scotland (2018) called for schools to be better informed and equipped to inspire and encourage a new generation of engineers. They also urge universities and colleges to work much more closely with schools and have approached this themselves by hiring 2 full time STEM education officers who run an Engineering for Girls programme in schools across Fife, for girls in P6-S6.

Primary Engineer

Primary Engineer is an organisation which since 2005 has developed an engineering curriculum to engage children and young people and promote engineering careers through inspiring programmes and competitions. It aims to address the inequalities in the engineering field.

Primary Engineer have also set up their Primary Engineer Rail project which was pioneered with Hitachi Rail and is now supported by a number of partners in the rail sector and Department for Business and Trade, and the Rail Cluster Builder supported ScotRail to partner with the project in 2022. The project aims to inspire pupils and help create a diverse future workforce for the rail sector.

In the five years since its launch has grown to reach around 14,000 pupils in 276 schools across the UK (Primary Engineer, 2024), training hundreds of teachers whilst engaging with young learners, and so helping to raise the profile of the rail sector with fun and interactive activities.

To be open to a potential career in Rail, the earlier that possible career path is introduced to young people the better the chance there will be of them seriously considering that. The Primary Engineer Rail Programme aims to do just that, and finding ways to fund continued growth in its reach in Scotland would help 'prime the pump' to ensure a talent pipeline of young people who are at least open to a career in Rail.

9. Summary and Conclusions

In conclusion, the UK rail sector is facing several workforce challenges. The industry is grappling with an aging workforce, with a significant proportion of workers nearing retirement age, as well as large scale investment requiring a larger workforce to carry it out, and new technology and Net Zero targets creating the need for new skills. The representation of women and non-white workers remains an area of concern, with efforts needed to improve diversity and inclusivity within the industry, ultimately extending the talent pool.

To ensure a sustainable and skilled rail workforce, it is crucial to focus on attracting and retaining talent, promoting apprenticeships and vocational training, enhancing diversity and inclusion initiatives, and encouraging individuals from other sectors to consider careers in rail.

There is already a lot of great work being done around the skills agenda by individual organisations across the rail sector in Scotland, such as the launch of the Rail Skills Academy as part of the Levenmouth Rail Link project, equipping young people in Fife with the competencies, skills and work experience needed to develop a career in the rail sector. There are many other examples too.

However, a collective industry approach to the skills agenda from companies right across the sector with a set of combined actions will help to accelerate addressing the current workforce challenges. The combined focus from the industry would support the development of a sustainable workforce representative of the society the industry serves and a pool of people with the required skills and competencies to meet the efficiency and decarbonisation targets. The collective power of organisations coming together would help to create a stronger voice for the rail sector as a key destination for developing a career.

By addressing the skills issues proactively and collectively, the rail industry in Scotland can build a resilient and thriving workforce that meets the demands of the future.

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