Skills planning to drive sector productivity

Strategic Plan Update
Winter 2018
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1. Government Foreword

The UK is embarking upon a new, exciting stage in its 60-year nuclear history.

The construction of the first new nuclear power station in a generation, an ongoing and growing decommissioning programme, research and development into new types of advanced reactor and the continuing requirement to refresh and maintain our nuclear deterrent are driving an enormous investment in nuclear, both public and private.

Our modern Industrial Strategy and the Nuclear Sector Deal build on the historical partnership between Government and the nuclear industry to deliver innovation, productivity, growth and sustainable clean energy to ensure the UK continues to be a world leader in nuclear. The future success of the nuclear sector is central to achieving our Clean Growth Grand Challenge, but will also require addressing the considerable task of reducing costs across the life cycle, from new build to decommissioning and disposal of waste.

We are therefore delighted to welcome this refreshed Nuclear Skills Strategic Plan, which reflects the considerable work and thinking that the members of the Nuclear Skills Strategy Group (NSSG) have undertaken in developing the People commitments in the Deal. The Government is proud of its partnership with industry through the NSSG. The Sector Deal recognises the strong leadership provided in addressing skills challenges facing the nuclear sector.

We are pleased to see that this plan sets out a clear commitment to developing an ongoing pipeline of necessary skills required for the future ambitions of the industry, through investment in Apprenticeships, and programmes to inspire young people and encourage the take up of STEM subjects. This includes significantly improved diversity across the nuclear sector, drawing in expertise from other sectors and growing our subject matter expertise.

The nuclear sector provides tens of thousands of highly skilled jobs, is set to provide many more and is central to growth in a number of key regions across the UK. The sector needs to continue to maximise the socio-economic benefits that the nuclear industry brings to these regions, which are often remote and frequently among some of the more disadvantaged areas of the UK. This NSSG Strategic Plan recognises that this is only possible through the pursuit of a number of clear objectives around skills and education so that we can develop a UK workforce that combines the necessary experience, skills and thought leadership.

We look forward to working with the NSSG and its partners to implement the People commitments in the Nuclear Sector Deal, which will in turn deliver good jobs, greater earning power and prosperous communities throughout the UK.

Richard Harrington  
Minister for Business and Industry  
Department for Business Energy & Industrial Strategy

Stuart Andrew  
Minister for Defence Procurement  
Ministry of Defence

Anne Milton  
Minister of State for Apprenticeships and Skills  
Department for Education
Alongside these developments, we successfully continue to run existing UK power stations and undertake the challenge of decommissioning our legacy fleet, while at the same time maintaining a clear focus on retaining our place as a world-leader in research and development. The UK’s Defence Programme also manages submarines powered by nuclear energy. Working across Civil and Defence to maximise skills and talent opportunities - in areas from initial design and manufacturing, through operations and support in service, to decommissioning - will be crucial in meeting future skills requirements for the sector.

The nuclear sector has continued to progress a number of programmes since we launched the NSSG Strategic Skills Plan in 2016. It is timely to reflect on what we and our partners have achieved, developing and nurturing a committed workforce and putting in place clear career paths, the right qualifications and standards, and accessible, fit-for-purpose, training and support.

Over the last two years we have also been regularly refreshing our understanding of the skills needed. We produced a new Nuclear Workforce Assessment in 2017, alongside a number of other more focused Labour Market Information (LMI) research projects including regional analyses and an examination of fragile skills.

There is significant scope for collaboration across the civil and defence nuclear sector where there are a number of shared technologies and challenges on the skills agenda – and NSSG work has begun on programme cross-fertilisation in a range of key areas.

While a national approach is fundamental, we also recognise the importance of the ‘Place’ element of the Nuclear Sector Deal. The key nuclear regions are going to be critical in delivering the nuclear skills agenda, and place is a key part of our overall delivery plan.

2. Chair’s Introduction

The members of the NSSG are pleased to launch this report, which significantly augments our Strategic Plan launched in 2016 and provides an important status report of the progress achieved so far.

This update reflects NSSG member insights, as well as new intelligence, risks and evidence that have arisen since our 2016 Strategic Plan was initially published. It has been developed with input not only from our members, but also governments, delivery partners and our key stakeholders. A significant recent development is the Nuclear Sector Deal.

As well as positioning the sector as being at the heart of the UK’s Industrial Strategy Clean Growth “Grand Challenge”, the Nuclear Sector Deal sets out to boost productivity, reduce costs, and grow both domestic and international business on the road to clean, sustainable energy.

All of this will only be delivered through the contribution of the sector’s most valuable resource – our people. The highly skilled individuals who are joining, transferring into and who make up our sector are fundamentally vital to our continued success.

Underpinning this will be a diverse skills base that provides thought leadership across our sector and beyond. Our Nuclear Sector Deal recognises that the sector must promote what is a major culture shift through its actions and must be prepared to show continued leadership in making this happen. Our industry is fortunate to have ambassadors for change in supporting this endeavour and we are committed to harnessing their energy and commitment.

Under-represented groups need better access to STEM careers, and our culture needs to change to be more inclusive in recruiting and retaining a diverse workforce. The NSSG will continue to work to enable the creation of a highly productive and diverse workforce.

We worked closely with the Nuclear Industry Council (NIC), Department for Business, Environment and Industrial Strategy (BEIS) and other key partners on implementing a Deal with a significant focus on people.

This update embraces the five main themes with respect to people within the Deal, namely: enhanced skills leadership, local apprenticeships, staying at the cutting edge, sector transferability, and exciting the next generation.

The backdrop to all of this is the exciting renaissance period the nuclear sector is currently experiencing. Over the next two decades the country will be investing in a new generation of nuclear technologies to meet its energy needs, while at the same time reducing greenhouse gas emissions.

We know that these projects will be complex, innovative and will offer huge opportunities for the sector itself and also our construction and engineering industries.

NSSG - why are we here?
• To bring together major employers, government, regulators and trades unions to address the sector’s skills challenge
• To ensure we can meet the demand for more than 100,000 skilled jobs needed in the UK by 2021
• To build a more diverse workforce – including 40% female representation by 2030
• To grow our pool of Subject Matter Experts, to replace those retiring

The nuclear sector has continued to progress a number of programmes since we launched the NSSG Strategic Skills Plan in 2016. It is timely to reflect on what we and our partners have achieved, developing and nurturing a committed workforce and putting in place clear career paths, the right qualifications and standards, and accessible, fit-for-purpose, training and support.

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There is significant scope for collaboration across the civil and defence nuclear sector where there are a number of shared technologies and challenges on the skills agenda – and NSSG work has begun on programme cross-fertilisation in a range of key areas.

While a national approach is fundamental, we also recognise the importance of the ‘Place’ element of the Nuclear Sector Deal. The key nuclear regions are going to be critical in delivering the nuclear skills agenda, and place is a key part of our overall delivery plan.
There are also opportunities for benefit from international collaboration in addressing the nuclear skills challenge. The sharing of best practice through international outreach is a developing theme for us. A recent example is the NSSG-facilitated UK/France bilateral agreement on nuclear skills, addressing the skills required by our respective nuclear sectors.

Above all, the NSSG is committed to ensuring the UK is positioned to deliver the future increase in workload without an over-reliance on overseas labour, that the sector can respond to domestic and international opportunities, and to collaborating with partners to develop the UK’s nuclear capabilities.

Dr Fiona Rayment OBE
Director, NIRO (National Nuclear Laboratory)
Chair, Nuclear Skills Strategy Group

NSSG Key Programme Outputs

- Issued latest LMI report – 2017 Nuclear Workforce Assessment
- Developed the People element of the Nuclear Sector Deal
- New Nuclear Gateway platform: matching talent surplus to nuclear jobs across the sector www.nucleargateway.co.uk in collaboration with NSAN and ECITB
- Apprenticeship Standards Map published for the nuclear sector
- Bursary scheme launched for transferees into the sector – via NSAN
- Data sharing mobilisation project – to ensure construction skills for peak demand
- Accelerated Experience and Learning Programme to support sector transferees (e.g. Oil and Gas)
- Subject Matter Experts Working Group: accelerated time to expertise being developed
- Knowledge Management Programme, in partnership with YGN
- Tomorrow’s Engineers STEM Outreach programme with EngineeringUK launched at Big Bang Fair
3. Background and Context for NSSG Strategic Plan Update

The NSSG story so far

It has been two years since the issue of our first Strategic Plan. At that time, our newly-formed group was united by a recognition of the need to address more effectively the future skills needs of our sector through a programme of activities and initiatives to address the skills needs, short and long term. Our focus has shifted from strategy and operating structures to delivering tangible benefits, that are realised more efficiently than by organisations operating independently.

Much has been delivered in the two years since the issue of original Strategic Plan. We understand better than ever the skills issues that we are trying to address. The sector is much better coordinated in delivering its skills initiatives, with common themes being reflected and addressed at local, regional and national levels. Organisations’ own skills strategies are aligned with the NSSG, enabling a sharing of effort across the sector. A nuclear bursary has been launched to encourage a wider range of people and companies to upskill for a nuclear career. A bespoke nuclear recruitment platform for apprentices and graduates has gone live, and a number of new nuclear Apprenticeship Standards have been developed with apprentices enrolled. Work is underway to develop standardised role profiles and career pathways to help transferability, and the sector are leading the way in developing the UK’s first PhD level apprenticeship, to give people the opportunity to achieve the highest level of technical expertise whilst working from the sector, providing an alternative solution to the sector’s higher level skills needs.

However, there is still much more to do to excite the next generation about nuclear, to maximise opportunities in apprenticeships and graduate schemes, to support sector transferability, and to ensure that our nuclear skills stay at the cutting edge. The sector is committed to becoming more diverse in terms of the characteristics, background and sector experiences of its employees. It commits to this because diversity builds better businesses. This future direction is reflected in a revised and updated Delivery Plan, linked to specific outcomes, and clearly identified benefits.

A summary of our progress to date and the planned future areas is illustrated in Section 5.3. The updated Industrial Strategy, with its associated Nuclear Sector Deal, is one of a number of developments that need to be reflected in our strategic approach, hence the need for this Strategic Plan update. The next section will cover these developments and how they impact on our approach to nuclear skills development.

3.1 Industrial Strategy and Nuclear Sector Deal

The UK Industrial Strategy (2017) aims to ‘create an economy that boosts productivity and earning power throughout the UK’. Five foundations of this productivity have been identified, namely: ideas, people, infrastructure, business environment, and place. Four grand challenges have been set to put the United Kingdom at the forefront of the industries of the future:

- Artificial Intelligence and Data Economy
- Future of Mobility
- Clean Growth
- Ageing Society

Whilst all of these challenges apply to the nuclear sector, we clearly have the most significant impact in the ‘Clean Growth’ challenge, which aims to maximise the advantages for the UK industry from the global shift to clean growth.

The UK is one of only a few countries with a nuclear industry covering the full life cycle of fuel production, generation, decommissioning, waste management and research. The government’s commitment in 2016 to the first new power station at Hinkley Point C marks the resurgence of new nuclear power in the UK. Industry has set out proposals for several new reactors to follow Hinkley Point C, to replace stations retiring from the system and to help meet the greater demand for electricity from new technologies. This update recognises the importance of extending our focus beyond the 16 Gigawatt new build scenario model that was included in the NSSG’s 2016 Strategic Plan – we have included the new build programme at Bradwell in Essex, and also planned for alternative technologies, understanding their impact on the number and types of skills required. This includes the potential opportunity of a digital revolution for the way that work is carried out in the nuclear sector.

At the same time, the defence element of our sector is meeting challenges related to a new submarine programme, developing reactor designs, and decommissioning the existing fleet as it is replaced.

In summary the nuclear sector is facing a considerable challenge in meeting the skills requirements for the range of civil and defence nuclear programmes. Through these various programmes, the industry will build up a pipeline of talent that will meet its own needs, and also build a skilled workforce exportable to other UK sectors and beyond. By 2021, we will need over 100,000 people working in our sector with a large proportion of highly skilled STEM jobs in often remote regions, providing local economic benefits. As well as increasing the number of people in the sector, work is required to increase the nature and diversity of the skills...
that we employ, to bring innovative approaches that will ultimately lead to improved productivity and cost savings.

Timing is critical; we have an unprecedented growth in demand, alongside an ageing workforce nearing retirement. We must act quickly to ensure that the UK’s supply of skilled people largely meets the demand: an average inflow of 7,000 people per annum into the sector. This is more than double the rate that we are currently achieving. To meet this challenge requires interventions in a range of supply routes that are open to the sector. Figure 1 highlights the anticipated proportion of the skills inflow likely to be achieved by each of these routes. To achieve this inflow, we need an appropriate pool of diverse and enthused applicants to the sector through coordinated STEM and careers engagement activities.

To reflect the ‘People’ strand of our Sector Deal, the NSSG Delivery Plan will be organised along the themes below.

Aligned to these themes are targeted outcomes to achieve the required growth in a competent and skilled workforce with an increased diversity of people into the sector.

**NSSG Delivery Plan Themes.**

<table>
<thead>
<tr>
<th>Enhanced Skills Leadership</th>
<th>NSSG as the leadership community, providing the single voice for the sector (civil and defence) on nuclear skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Apprenticeships</td>
<td>Enable the supply chain to develop local apprentices, with diverse participation. Ensure that the nuclear sector has the apprenticeship Standards &amp; Frameworks that it needs.</td>
</tr>
<tr>
<td>Staying at the Cutting Edge</td>
<td>Address the required growth in subject matter expertise by enhancing the feed volume into the subject matter expert “talent pipeline”</td>
</tr>
<tr>
<td>Sector Transferability</td>
<td>Create easy access to the nuclear sector from other sectors including oil &amp; gas, armed forces(^1), manufacturing, and between the civil and defence sectors</td>
</tr>
<tr>
<td>Exciting the next generation about nuclear</td>
<td>Improve the visibility in schools of career choices in the nuclear sector, through early engagement with young people. Create state-of-the-art bespoke simulation facilities to provide end-point assessment facilities for apprentices, work placements and workplace encounters for school and college learners.</td>
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</tbody>
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\(^1\) For example, the Armed Forces Resettlement Organisation has been engaged to provide learning opportunities for those leaving the services to join the nuclear sector.
3.2 Diversity and Thought Leadership

Achieving the challenging targets for inflow of resource to the sector will require us to maximise the pools of people from which we draw our skills. The most obvious opportunity comes from the area of increased gender diversity. Currently 51% of the UK population are female, but only 22% of our workforce are female. We are therefore missing the opportunities gained from enthusing, motivating and ultimately recruiting a greater proportion of women into our workforce. Although our conversion rate from female applicant to female recruit is good, we struggle to attract and retain women within our sector. The same is true for a range of other diverse characteristics, for instance, ethnicity, disability, socio-economic diversity, diversity of supply chain, and diversity in the sectors from which we attract our workforce.

Diversity has repeatedly been found to drive innovation, creativity and financial performance\(^2\). Diversity will have an impact on each of the five foundations of productivity highlighted in the Industrial Strategy, and as such will form an overarching theme for the NSSG going forward. Our Sector Deal has agreed some very challenging gender diversity targets (including 40% women in nuclear by 2030, with 50% participation of women in nuclear sector apprenticeships by 2021). These targets will require particular focus and attention, given the complex web of contributing factors that will need addressing, and will be included under the Skills Leadership theme for our Delivery Plan. One example initiative in the Nuclear Sector Deal is the implementation of the Future Boards Scheme, specifically designed to support and encourage diversity on organisational boards across our sector.

We also recognise the contribution to ‘Thought Leadership’ achieved through increasing the transferability of skills into our sector. As our focus increasingly extends to ‘skills for nuclear’ as well as specifically ‘nuclear skills’, there are real opportunities to benefit from the experience and knowledge of those that have worked in other sectors. Traditionally the sector has sometimes favoured nuclear experience over experience in other sectors when employing people. Achieving the challenging cost reduction targets set out in the Sector Deal will require a fundamental review of the work undertaken on our sites. Working with people who have experiences of other sectors will allow us to challenge existing paradigms, particularly in the areas of construction and decommissioning, where there is as much to learn from other sectors as there is from within the nuclear sector.

A key priority is to remove the barriers (real and perceived) to joining the nuclear sector for all people and companies who have this experience. We must also recognise that expertise already exists in the geographical regions of our new build activity, as the sector’s requirements call upon a wider engineering and infrastructure skills base. The ability to support transfers into and out of our sector from other sectors within a region will help to create longer term, sustainable employment for that area, as well as helping transfer of knowledge.

Transferability also includes opportunities for those who have already had personal development and investment through working in the nuclear sector. Transferability between sites, between companies and between different parts of the nuclear lifecycle is still not common. There are too many situations where an individual’s economic activity ends with their tenure at a particular nuclear facility. There are a number of barriers to transferring individuals between sites and companies, including terms and conditions, and the ‘syntax’ used to describe jobs and roles. There is uncertainty in the early phases of new nuclear projects, and there is a significant proportion of the skills mix which is temporary and mobile – both of which increase the risk to the workforce. These barriers need removing to allow the knowledge and experience gained to benefit other parts of the nuclear sector.

3.3 The Nuclear Supply Chain

When originally constituted, the NSSG mainly consisted of the UK nuclear ‘client’ organisations, i.e. those responsible for the spend and timing of the nuclear programme. However, we have since extended our representation from the supply chain, through representative bodies. It is often the supply chain companies that work across sectors and can bring this knowledge and best practice to the table. They are required to resource a significant proportion of the activities, particularly on the construction and decommissioning programmes. They also understand specific operational factors that influence the success (or otherwise) of skills interventions.

3.4 Defence sector landscape and opportunities for collaboration

The defence skills demand is dominated by a submarine programme containing peaks and troughs as successive submarine classes move through their procurement cycle. Historic gaps between the Vanguard Class and Astute Class have left a lasting legacy of a loss of deep knowledge and experience, and a relatively new workforce is now meeting the skills demand. A procurement strategy subject to government decision making, funding constraints, and phased contracting are inevitably incompatible with long term investment in nuclear skills. The Royal Navy continues to suffer critical skills shortages and is routinely offering career extensions to more of its serving personnel, and for longer, to retain key skills. This is compounded by the competition from civil new build and existing operations, attracting experienced submarine nuclear operators into a second career.

The defence submarine programme is developing a new reactor design for the Dreadnought class requiring a higher demand for nuclear specific skills and subject matter experts (in contrast to the civil new build programme, which is based on proven international designs, leading to the skills challenge in the main being the “generic skills” element). The volume of work required to sustain this highly

\(^2\) e.g. McKinsey, 2017
skilled workforce will depend on an enduring submarine programme combined with future Small Modular Reactor development but this is subject to government policy on future reactor technologies.

The Ministry of Defence has recognised nuclear skills as a high priority, and a holistic nuclear skills programme to ensure the capacity, competence and professionalism to sustain the Defence Nuclear Programme is being implemented. This programme includes MOD initiatives such as the Enterprise Approach and collaborative opportunities arising from the Nuclear Sector Deal being implemented through the NSSG Delivery Plan which include:

- Closer alignment of civil and defence through regional forums such as the Centre of Nuclear Excellence in Cumbria and the Hinkley Strategic Development Forum. This has already identified potential opportunities from the cessation of current civil fleet operations.
- Membership of the Standards Advisory Group and inclusion of defence career paths in the development of a Nuclear Career Pathways online platform.
- Inclusion in the development of a sectoral Diversity Strategy.
- The development of an accelerated and bespoke development programme to replace the future SME population, and involvement in a Level 8 Technical Specialist Apprenticeship Standard.
- Bespoke programmes for the transfer of capability between civil and defence.
- Membership of the Talent Retention Scheme (TRS) Nuclear Gateway for oversubscribed applicants to nuclear sector employers.
- A collaborative approach to unlock barriers to enter the nuclear sector such as security and lengthy induction processes.
- A sectoral approach to STEM outreach to attract more young people into nuclear from all backgrounds.

3.5 National vs Regional and the role of ‘Place’

The NSSG was initially established with an implicit national remit, and there is still value in this coordinated approach. Delivery Plan themes have helped to identify the national priorities for future collaborative effort. Certain topics are by nature national, including training standards, generic role profiles, and our Equality, Diversity & Inclusivity strategy.

However it has become clear as we develop and roll out interventions that it is essential to work with the regions and nations of the UK in all aspects of implementation. Regional partners understand their local skills picture and are already working on local industrial strategies to maximise the sector’s contribution in their areas. Education and training will take place in regions, and regional partners are best placed to understand local provision capacity.

We have worked with the Local Economic Partnership Network in three priority English regions, and with the Welsh Authorities most affected by the nuclear sector opportunities. In doing so, we have been able to explore collaboration opportunities across the UK. By aligning local activities to our Delivery Plan, we have been able to see where there is overlap, duplication or gaps in efforts to address the skills challenge. There are some local initiatives that are only relevant locally, but equally there are initiatives that could benefit from being coordinated nationally. The different phases within the nuclear lifecycle mean that some regions are able to pilot or lead on certain initiatives, with the opportunity to share learning with others as they reach the same phase. There is a strong appetite across the regions to work in this way, and an agreed list of priority areas have been identified to take forward:

1. Workforce mobilisation, and understanding the local and national labour market demand from nuclear and other sectors. There are opportunities for choreographing to maximise sustainable employment, and balancing against the impact of new projects on other economic activity in local areas.
2. Group apprenticeship schemes – developing a business case for proposals to promote apprenticeship take up, especially for smaller organisations, to create a pool of trainees ahead of contract awards
3. Coordination of innovation and advanced manufacturing and engineering hubs to develop higher level skills required for innovation and productivity in the UK Nuclear Programme
4. Maximising the economic impact of the nuclear sector in rural and deprived economies
5. Regional Careers Strategies and Careers Hubs

3.6 The international dimension

We have increasingly been asked to engage at an international level. The challenges and issues that the UK faces with regard to nuclear skills are also witnessed in other countries. The UK is recognised as showing best practice in our approach to nuclear skills leadership, and we are regularly asked to share knowledge and experience in international forums. In January a UK/France Ministerial Summit was held with an ambition for closer collaboration of the two countries across decommissioning, nuclear skills and R&D, followed by a successful seminar in May 2018. It was clear from the work that there was much that could be learnt from each other, and work is ongoing.

3.7 Update on the sector’s requirement for skills

The final driver for this update to our Strategic Plan was updated labour market intelligence and the 2017 issue of the Nuclear Workforce Assessment. The data is reviewed and updated regularly and latest trends are highlighted, and this will be re-evaluated after production of an updated nuclear sector timeline. Information from the current analysis is presented in the following section.

3 RR Submarines support the SMR programme which provides the opportunity to share skills capabilities and knowledge between programmes.
4 The Enterprise Approach (EA) introduces new ways of working across organisational boundaries as potential solutions to the skills challenge.
5 An example of a bespoke transitioning and transfer programme is the ECITB Accelerated Experience and Learning Programme.
4. The sector’s requirement for skills

As the civil new build programme advances, alongside the defence submarine programme and other continuing nuclear sector activities, the increased demand for skills reinforces the need for an evidence base to inform effective workforce planning at a national sector level.

The Nuclear Workforce Assessment published in July 2017 (NWA2017) forecast a peak demand for 100,000 workers by 2021. In the report, released after the publication of the 2016 Skills Strategic Plan, improvements were made to the completeness of the data and the reliability of the modelling. They included updated demand forecasts, an increase in the range of role levels, identification of Subject Matter Experts and an improved estimate of the decommissioning supply chain. The result was a forecast of a required inflow of 7,000 FTEs per year to meet replacement and expansion demand. This figure is substantial in itself, but also incorporates pinch-points that are specific to particular regions, occupations and supply routes.

4.1 Major nuclear milestones

At the time of writing, the new build programme is gathering pace, with progress being made at Hinkley Point C, Wylfa Newydd and Sizewell C. Since the publication of the 2017 Nuclear Workforce Assessment, Bradwell has been added to the list of new plants, which will clearly affect the overall demand for construction workers and, ultimately, operations staff.

In the defence sector, the Astute-class submarine build programme continues. The government re-affirmed its commitment to the Dreadnought-class submarine programme just before the publication of the original NSSG Strategic Plan, and data relating to the programme will continue to influence our analysis of the sector’s skills needs.

Depending on the detailed timeline, demand is likely to be closely phased in some areas, with both risks from competing demand and opportunities for coordinating training and deployment on the other. How these are best managed will emerge with better understanding of the impact of different reactor technologies and construction methodologies. Apart from the mobilisation of construction workers, an accurate picture of the demand profile is critical in providing well targeted skills interventions generally. Assessment of training provision demand, preparation for the inflow from other sectors, progress on equality and diversity, and work towards long-term sustainability all depend on a realistic timeline for the entire nuclear programme. A revision of all aspects of the civil and defence timeline is a priority for the NSSG.

4.2 Place

The importance of viewing the industry from a national, regional and local level is evident from Figure 2. Nuclear sites are located in England, Wales and Scotland; from Anglesey to the Suffolk Coast, and from Plymouth to the far north of Scotland. Many of the sites are linked by their remoteness, which holds challenges for the mobility of existing staff, and the ability to attract new workers.

Figure 2 - Regional UK Demand. Percentage of demand for the existing estate

Figure 3 - GVA by local authority with civil new build sites

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6 Figures are based on returns used in the Nuclear Workforce Assessment. There may be small numbers not represented, which means that the true demand is slightly higher than shown in some regions.
The highest concentration of nuclear activity is in the North West of England, with decommissioning, current operations, national laboratories, defence and a scheduled new power plant all located there. Nevertheless, the demand in the South West and the East of England have the potential for the largest change, as four new projects begin within a few years of each other. Without a history of large local projects, the demands on the regional skill pool could be substantial despite being a fraction of the national workforce.

However, geography also promises local and regional benefits. Figure 3 shows the location of the nuclear new build sites with respect to the regional distribution of GVA output. Productivity is generally concentrated in central southern England, whereas the proposed new build sites occupy the periphery, in some cases within areas of low average economic output (for example, Wylfa) or, like Oldbury, within commuting distance of those areas. To maximise the benefit, the local workforce needs to be available with the right skills and behaviours, and training providers need to understand their own capacity ahead of time.

### 4.3 Fragile Skills

Skills gaps, with the potential to cause significant programme delays or additional cost, are not limited to immediate workforce shortfalls, or long-term volume demands. Localised specific needs may be problematic if not addressed in time. NWA2017 showed the most often reported “Fragile Skills”, where local intelligence and operational experience indicate a general risk of workforce shortfall:

<table>
<thead>
<tr>
<th>Fragile Skills</th>
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<tbody>
<tr>
<td>Safety Case</td>
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<tr>
<td>Control and Instrumentation</td>
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<tr>
<td>Generation</td>
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<tr>
<td>Regulation Site Inspection</td>
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<tr>
<td>Project Planning and Control</td>
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<tr>
<td>Commissioning</td>
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<tr>
<td>Electrical Engineers</td>
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<tr>
<td>Emergency Planning</td>
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<tr>
<td>Quality Assurance</td>
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<tr>
<td>Chemistry</td>
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<tr>
<td>Steel Fixers</td>
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<tr>
<td>Concreters</td>
</tr>
<tr>
<td>Civil Engineering</td>
</tr>
<tr>
<td>Scaffolding</td>
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<tr>
<td>Subject Matter Experts</td>
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Even where there is a large national pool from which new staff and trainees can be drawn, recruitment, attraction, and retention factor heavily in determining available supply. Remote locations, competing industries, and the lack of practical training opportunities can all affect workforce availability.

Outside of construction, some generic concerns are apparent; an age related cliff-edge loss of current skills and experience, the difficulty in recruiting to remote locations, uncertainty over demand from the civil new build programme, and the reliance on (more expensive) contract workers. Discussion among NSSG member organisations suggests that the scarcity of skills that leads to a need to outsource is often a reflection of a general shortage of the skill set in UK industry as a whole.

The lead time to develop experienced staff is also a clear concern, most notably for Safety Case authors who have consistently been identified as a critical shortage area. These combine many of the characteristics of fragile skills, taking a long time to develop, particularly in the absence of easy access to experiential learning. A restricted supply leads to the supply chain becoming a controlling factor and a source of increasing costs.

These effects are being mitigated by establishing frameworks for contract supply. Knowledge management and succession planning are used to help to ensure that vital knowledge is not lost, while mentoring and coaching are being used to reskill and upskill staff from less fragile skill areas. This makes best use of the existing supply, and is evidently good practice, but in the longer term it is likely that the overall workforce inflow will also need to increase.

For the construction sector, given the uncertainties around detailed timings for new build and the potential for projects to overlap, steel fixers, concreters, civil engineering operatives, and scaffolders remain of concern.

One area that encapsulates most, if not all, of the issues behind skill fragility is subject matter expertise, where time and expense in recruiting and training across different organisations is a significant barrier to maintaining an adequate skill base. The workforce is typically older than average, with a tendency for senior roles to be gridlocked until replacement becomes urgent.

As for the workforce generally, succession planning, mentoring and coaching, and knowledge management are viewed as useful routes to maintaining subject matter expertise. New apprenticeships at Level 8 will offer a novel further route to bring in high level skills.
4.4 Diversity and Thought Leadership

Data from NWA2017 show that 22% of the workforce are female (28% in civil operations and 12% in defence). A target of 40% by 2030 is one component of a broader diversity ambition in the Nuclear Sector Deal that recognises the importance of improving diversity and inclusion across gender, background, ethnicity and previous industrial experience. Figure 4 shows the results of calculations to forecast progress, from the current 22% starting point, for future female recruitment at three levels; 35%, 40% and 50% (average to 2030). Annual workforce replacement is assumed to be 8% in this case, with no net expansion (in effect excluding the construction workforce).

![Figure 4 - Forecast gender balance](image)

The following table summarises the progress in the gender balance that could be expected by the target date of 2030, including the effect of an enhanced replacement rate.

<table>
<thead>
<tr>
<th>Average female recruitment per year</th>
<th>Workforce replacement per year</th>
<th>Female workforce in 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 %</td>
<td>30.10%</td>
</tr>
<tr>
<td>35%</td>
<td>12%</td>
<td>32.10%</td>
</tr>
<tr>
<td></td>
<td>8 %</td>
<td>33.20%</td>
</tr>
<tr>
<td>40%</td>
<td>12%</td>
<td>36.00%</td>
</tr>
<tr>
<td></td>
<td>8 %</td>
<td>39.60%</td>
</tr>
<tr>
<td>50%</td>
<td>12%</td>
<td>43.90%</td>
</tr>
</tbody>
</table>
Monitoring progress will be important both as a measure and a stimulus. The NSSG will look to the experience of other sectors to learn the most effective approaches.

This gives a feel for the size of the challenge and the urgency in redressing the balance, although a number of additional factors will determine the final outcome, including the gender differences in age distribution (Figure 5) and any expansion of civil or defence projects that would increase the opportunity to recruit with a more equitable balance.

Figure 5 - Male and Female age distributions for the decommissioning estate

NWA2017 showed improved female participation for the current generation of trainees (Figure 6), but the challenge is still significant.

Figure 6 - Female Trainees (%) for the civil and defence sectors

Monitoring progress will be important both as a measure and a stimulus. The NSSG will look to the experience of other sectors to learn the most effective approaches.
4.5 Balance of supply

During periods of significant increase in demand, there are two dominant supply pipelines to provide additional skilled workforce:

- Apprentice Training
- Engagement of experienced workers from other sectors (Industry Movers)

The balance between the two is an important consideration since availability, training resource requirements and the impact of strategic skills considerations differ. For apprentices, there is a training overhead, in terms of teaching facilities and experiential learning opportunities that need to be provided in a sustainable way. Teaching capacity in particular is not able to expand and contract rapidly, which places a constraint on how recruitment takes place. Nevertheless, there may also be broader reasons for maximising apprentice training.

Figure 7 is an example of two illustrative recruitment scenarios calculated with the NSSG System Dynamics supply-side model. In both cases the strategies do a good job of matching demand (panels C and F), however, the training consequences in the two cases (panels B and D) are quite different.

The top row represents the first strategy, with the algorithm using apprentices and industry movers (experienced people) freely to match demand (panel A). The resulting accumulated stock of apprentices in training (panel B) rises rapidly to a peak and then falls at a similar rate. Clearly this does not correspond to sustainable training provision. In the bottom row, the number of apprentices is constrained, with the shortfall being made up from industry movers. The number of workers transitioning from other sectors is (naturally) greater, and the peak in recruitment occurs later. Most importantly the training stock (panel D) represents a sustainable training option.
The supply-side offers competing opportunities to be balanced. Improved diversity of gender and ethnicity is more likely with a greater emphasis on training young people, while the benefits of ‘diversity of thought’ is maximised by encouraging transferees from analogous industries to bring their experience.

4.6 Future technologies

The main body of the workforce demand is forecast on the basis of past experience and established technologies. However, new technologies - both nuclear and non-nuclear - will challenge the bases for these forecasting mechanisms. The Nuclear Sector Deal references significant funding for research and development of Advanced Modular Reactors along with a framework to support the development and deployment of Small Modular Reactors and the innovative technologies that support them. Funding has also been identified to support a Fusion Technology Platform in Culham. These developments, along with a commitment to demonstrate and embed advanced manufacturing and construction techniques, will undoubtedly have an impact on the number and nature of skills required for the future. For instance, developments in robotics, machine learning and general applications of modern electronic process control are likely to change the skill profile and the working practices of the nuclear workforce.

More work is required to be able to quantify the demand and to qualify the impact of the nature of skills required. A first stage will be to identify the technologies that will have greatest impact. To explore this, the NSSG will work with partners in the Nuclear Innovation Research Office, and others, to develop an understanding of the likely impact for skills as new technologies become established.

4.7 The importance of the Nuclear Workforce Model for the nuclear sector

It is important that the nuclear sector has a clearly articulated requirement for the skills supply and demand across the nuclear sector, and the Nuclear Workforce Model is the data that the NSSG use to underpin the whole range of its activities. It is important that the sector uses consistent data, and aligned messages in communicating the size of our challenge. There are other surveys and labour market intelligence reports carried out locally and nationally. Some of these have a wider scope than the Nuclear Workforce Assessment, in trying to capture skills supply and demand in associated industries with whom we may be competing for skills. Others might want a cross sector picture within a particular region. We continue to work with these other data providers to ensure that there is a consistency of input, despite the different scope for the different analyses. We will work with other organisations undertaking labour market intelligence data analysis to reconcile approaches by proposing a combined methodology to reduce uncertainty in the headline figure, to describe better the geographical distribution of the supply chain, and to show some of the interfaces between the supply chains for civil and defence.
5. Delivery Mode and Implementation

The delivery model remains industry/government funded through membership contributions, which also fund the Labour Market Intelligence on which the strategic planning is based.

5.1 Skills Delivery model

Our membership has evolved and now includes greater supply chain representation, through NSAN Advisory Board, ECITB Nuclear Forum and Defence supply chain members. In addition, the delivery model now formally recognises the four key regions associated with the main areas of nuclear activities (South West, North West, Cumbria and Wales). Regional skills plans are aligned to our Delivery Plan to identify opportunities for regional collaboration in skills delivery, and to influence our Strategic Plan.

The strategic direction for the NSSG, our mission, objectives and KPIs are developed by our members from industry, trade unions, government and regulators. These are then translated into a Delivery Plan with the help of the Strategic Support Team, offering support to the sector in nuclear skills, project management, Labour Market Intelligence, policy, and communications.

The Nuclear Industry Council has confirmed that the NSSG will lead implementation of the People section of our Nuclear Sector Deal, and this is now firmly embedded in our planning.
<table>
<thead>
<tr>
<th>Sector</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation/Operators</td>
<td>EDF Energy</td>
</tr>
<tr>
<td>Defence</td>
<td>Ministry of Defence/Royal Navy</td>
</tr>
<tr>
<td>Research &amp; Development</td>
<td>National Nuclear Laboratory</td>
</tr>
<tr>
<td>Legacy, Decommissioning, Waste</td>
<td>Nuclear Decommissioning Authority</td>
</tr>
<tr>
<td>New Build</td>
<td>EDF NNB, Horizon Nuclear Power, NuGen, CGN UK</td>
</tr>
<tr>
<td>Government</td>
<td>DFE/BEIS/Welsh Gov</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>Chair of NSAN Employer Advisory Board, Chair of ECITB Nuclear Forum</td>
</tr>
<tr>
<td>Defence Suppliers</td>
<td>Rolls-Royce AWE</td>
</tr>
<tr>
<td>Regulation</td>
<td>ONR</td>
</tr>
<tr>
<td>Trade Unions</td>
<td>TUC</td>
</tr>
<tr>
<td>Young nuclear professionals</td>
<td>Nuclear Institute Young Generation Network</td>
</tr>
</tbody>
</table>

**NSSG Sub-groups**

- Labour Market Intelligence/Nuclear Workforce Assessment
- Equality, Diversity and Inclusivity
- Higher Level Skills Group
- Standards Advisory Group and nuclear Trailblazers
- Next Generation Nuclear
- Regional Groups

**External Stakeholder Links**

- NIRO/Dalton Institute/CDTs
- Defence Enterprise Nuclear Senior Oversight Committee
- NSAN Employer Advisory Board
- ECITB Nuclear Forum
- National College for Nuclear
- External STEM Working Group
- EngineeringUK
- Nuclear Institute – W1N/YGN
- LEP Organisations/Regional Groups/Regional Provision
- Cumbria LEP/CON, HoSW LEP/HSDF, Welsh Gov/NWEAB, East/SECDB

**NSSG Strategic Support Team**

**NSSG Organisation**

**External linked group**
## 5.3 Delivering the NSSG Strategic Plan: the why, what and how

<table>
<thead>
<tr>
<th>Plan Outcomes</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional and national nuclear skills plan integrated maximising impact</td>
<td></td>
</tr>
<tr>
<td>Future nuclear sector demand and supply defined taking into account innovation needs and expected production in related manufacturing and related fields</td>
<td></td>
</tr>
<tr>
<td>The nuclear sector is attracting, developing and retaining a diverse workforce</td>
<td></td>
</tr>
<tr>
<td>Improved transformation into and into sectors in the current and future workforce requirements</td>
<td></td>
</tr>
<tr>
<td>NSSG Delivery Plan Outcomes: The How</td>
<td></td>
</tr>
</tbody>
</table>

### Benefits – The Why

1. Attract and develop highly skilled people to meet future nuclear sector needs and support workforce supply.
2. Regional and national economic benefits for the nuclear sector to improve productivity and contribute to a UK skilled workforce.
3. Future nuclear sector workforce to be increased by 25%.
4. Diversify the scope of job roles and improve productivity and contribute to a UK skilled workforce.
5. National and regional nuclear skills strategies are implemented and embedded.
7. An online platform for nuclear career pathways and standards, providing credibility and access.
8. NSSG creates new nuclear workforce pathways and standards.

### Achievements – The What

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased transformation into and into sectors in the current and future workforce requirements.</td>
<td></td>
</tr>
<tr>
<td>NSSG Delivery Plan Outcomes: The How</td>
<td></td>
</tr>
</tbody>
</table>

### Supporting the Next Generation

1. A coordinated schools outreach programme for nuclear careers.
2. Enhanced skills for Level 2 STEM students.
3. Nuclear sector engagement with schools and universities.
4. Education for High Nuclear Industry Career (HNIC) and Level 3 STEM.

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19 Strategic Plan Update. Winter 2018
5.4 Risks and Challenges

We have reviewed our risks and challenges with key stakeholder organisations and aligned them to NSSG objectives associated with capacity, diversity and increased productivity as follows:

<table>
<thead>
<tr>
<th>NSSG Objective</th>
<th>Risk Title</th>
<th>Risk Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The workforce demand is met to the required timeline</td>
<td>Insufficient and/or uncertain work to train the workforce</td>
<td>Lack of (paid) work or uncertainty prevents employers and the supply chain from maximising economic benefit from nuclear</td>
</tr>
<tr>
<td></td>
<td>Sufficient training infrastructure</td>
<td>Training provider base may not have the capacity or capability to deliver training required</td>
</tr>
<tr>
<td></td>
<td>Robustness and use of Labour Market Intelligence</td>
<td>Industry’s decisions are not informed by accurate Labour Market Intelligence. This also includes the potential lack of firm supply-side data leading to a lack of confidence in the LMI findings. Lack of clarity over an agreed timeline</td>
</tr>
<tr>
<td>2. A diverse talent pipeline</td>
<td>Inability to meet the talent pipeline</td>
<td>The nuclear industry cannot recruit a sufficiently diverse workforce to meet its demand requirement</td>
</tr>
<tr>
<td></td>
<td>Lack of workforce transferability</td>
<td>Poor workforce transferability, flexibility and mobility between nuclear facilities and from other sectors</td>
</tr>
<tr>
<td>3. A skills mix to meet future technologies</td>
<td>Supporting industry to embrace technology advances</td>
<td>Industry fails to respond to changing reactor technologies, innovation or advanced production and manufacturing techniques</td>
</tr>
<tr>
<td>4. Contributing to Nuclear Sector Deal cost reduction objectives</td>
<td>Retention of SME knowledge/ expertise</td>
<td>During demographic transition of the industry, key fundamental knowledge and operational experience in employers and in education will be lost</td>
</tr>
<tr>
<td>Cross Cutting</td>
<td>Leaving the EU</td>
<td>Uncertainty of access to labour which may impact on quantity (access to numbers of workers from the EU) and niche research associated with subject matter expertise</td>
</tr>
<tr>
<td></td>
<td>Leadership of the sector</td>
<td>The nuclear sector at all levels, does not engage on the Nuclear Sector Deal through the lack of a common goal and voice</td>
</tr>
<tr>
<td></td>
<td>Integration of the People section with other sections of the Nuclear Sector Deal</td>
<td>Activity to develop skills will be necessary in supporting other elements of the Nuclear Sector Deal, including innovation and advances in manufacturing and production techniques</td>
</tr>
<tr>
<td></td>
<td>Regional implementation</td>
<td>Inefficient and disjointed skills development implementation.</td>
</tr>
</tbody>
</table>
6 Government skills policies

Our sector operates and draws upon skilled people from across the UK (and beyond), primarily focused in England with lesser numbers in Wales and Scotland, and very few in Northern Ireland. We are therefore affected by multiple policies devolved across the UK nations, and the following developments are important to us.

6.1 Skills policy in England

The UK government’s overall skills policy (for England) is currently following the direction set in its Post-16 Skills Plan of July 2016, with the aim of a competitive system meeting employer-led skills needs. Since we published the Strategic Plan, for example, the Institute for Apprenticeships has had Technical Education added to its remit and will be responsible for the roll out of T Levels from 2021.

6.2 T Levels

The NSSG submitted a response to the government’s T Levels consultation, recognising that our sector sees them as a potentially useful way to improve technical skills for young people as alternatives to A Levels or apprenticeships. The sector is interested in shaping the curriculum design and in offering industry placements, if support can be given to the sector’s particular needs.

6.3 Regional skills implementation in England

Local Enterprise partnerships (LEPs) – the capacity and structures of these are being strengthened to reflect increasing reliance placed on them to develop and deliver Local Industrial Strategies in England by 2020. Not all LEPs hold the nuclear sector to be a priority, but issues such as STEM skills are often included. Local focus is increasing since our original Strategic Plan, and we are working with relevant local partners on appropriate use of resources such as the Local Growth Fund.

Combined Authority Mayoralties are to receive devolved adult education resources from 2019, on the basis of regional Skills Deals. We will review their impact on our priorities, although they notably tend to be based on urban areas, while the nuclear sector is more concentrated away from population centres.

Skills Advisory Panels will be piloted in seven areas, working with Mayoral Combined Authorities and LEPs and providing lessons for further roll out. Following the closure of the UK Commission for Employment & Skills, these will be a key route to analysing the local impact of sectoral skills needs.

6.4 Institutes of Technology

We are monitoring with interest the proposals for IOTs from 2019. Although they are not sectoral in nature, their focus on Level 4 & 5 STEM skills, like the National College for Nuclear, has the potential to provide a welcome boost to the sector’s skills needs – particularly in the area of skills for nuclear, and construction and engineering construction skills requirements.

6.5 Careers Strategy

The government’s December 2017 Careers Strategy fits with our sector’s drive to reach out to young people in schools and colleges to attract new entrants to the sector. There will be governmental support for Careers Hubs, Career Leader teachers, and increased frequency of students’ contact with employers. Our interventions in this space will influence and align to these activities.

6.6 Skills policy in Wales

The Welsh Government’s skills policies continue to be based on the “Policy Statement on Skills” and the accompanying Skills Implementation Plan published in 2014. Their 2017 “Prosperity For All” holds Skills & Employment as one of the five key themes, shaped through their three Regional Skills Partnerships.

They have recently published the “Nuclear Arc”, setting out the employment and skills benefits linking Wylfa Newydd with supply chain companies across North Wales and into Northern England.

6.7 Skills Policy in Scotland

Since the publication of our Strategic Plan, the Scottish Government has held its Enterprise & Skills Review, and now has its Strategic Board which published “Working Collaboratively for a Better Scotland” (2017) to streamline Scotland’s strategic bodies for skills delivery.

6.8 Apprenticeship Levy

Eighteen months on from the introduction of the Levy, there is still more than can be done to encourage employers to maximise its use through increasing their uptake of apprenticeships in England. There has been a shift towards higher level programmes, and to older apprentices. The Chancellor has announced an increase from 10% to 25% in the amount that Levy-payers can transfer to other companies. We are gathering data and intelligence from the nuclear sector to see how it compares to this national picture, and to develop initiatives to better utilise various funding mechanisms to enable organisations to take on apprentices. This particularly applies to small and medium sized organisations.
6.9 Apprenticeship Standards and Frameworks

The replacement of Apprenticeship Frameworks with new Apprenticeship Standards in England is now well advanced, with the nuclear sector starting to use sector-specific and more cross-sectoral Standards. The Standards Advisory Group has published a map of occupations in the sector, aligned to the Nuclear Workforce Assessment, showing the available relevant Standards and Frameworks in England, Scotland and Wales. We are using this to highlight new apprenticeship developments needed for our sector.
It will ensure that the UK is positioned to manage the substantial increase in skills demand that is on the horizon - with many different and often new specialisms - and that we build a nuclear legacy of highly competent people.

This update to the Strategic Plan sets out how we are continuing to build such a sustained pipeline of trained employees; people who are flexible across nuclear sector employers to support the UK in continuing to secure its position as a world-leading expert in nuclear projects, products and services.

It reflects the ambition of the Industrial Strategy and associated Nuclear Sector Deal, which recognise that a powerful UK nuclear capability, increased productivity and the ability to respond to international opportunities are all delivered through people.

We recognise the importance of ensuring a more diverse, flexible and mobile nuclear workforce. We place a clear focus on the provision of opportunities for the continuing professional development of the existing workforce, the transfer of skills between sectors, and the need for a healthy pipeline of talented apprentices and graduates – all aligned to regional skills priorities.

We are also looking to the future – one that will see us more fully embrace digital technologies. The demand for digital skills, which goes hand in hand with the Fourth Industrial Revolution, will continue to drive the need for highly digitally skilled entrants to the sector, as well as the upskilling of the existing nuclear workforce.

Our industry is open to people from every kind of background, and this means we need to do more to boost our “brand”. As low carbon industry, we have a strong story to tell a younger generation that recognises the urgent need to address climate change and protect our planet for future generations.