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NIRAB Response to Parliamentary Inquiry on People and Skills in UK Science, Technology, Engineering and Mathematics.

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RE: Nuclear Innovation and Research Advisory Board (NIRAB) Response to Parliamentary Inquiry on People and Skills in UK Science, Technology, Engineering and Mathematics.

To the House of Lords Science and Technology Committee,

I write on behalf of the Nuclear Innovation and Research Advisory Board (NIRAB) in response to your inquiry and request for evidence on the People and Skills in UK Science, Technology, Engineering and Mathematics. NIRAB is a group of independent experts who work in partnership with the Nuclear Innovation and Research Office (NIRO) to advise Ministers, Government Departments and Agencies on issues related to nuclear research and innovation in the UK. This response to the consultation has a focus on nuclear skills. While the Board has not had the opportunity to meet to discuss the inquiry questions, I offer my thoughts on the topic, based on NIRAB's previous discussions.

The nuclear industry currently employs around 85,000 people in the UK. As in other countries with a sizeable nuclear industry, the UK nuclear workforce is ageing, and attrition rates are high as a result. In particular, the UK has suffered long periods where the need for nuclear was not a major factor in energy policy, and it is only in the last decade that the ability of nuclear to produce low carbon energy has become valued. Skills and talent continue to be a topic of interest and significant discussion across many sectors nationally and internationally. Nuclear is no different and with ageing of key infrastructure over the last decade combined with the need for clean, secure and reliable energy the need for nuclear energy and the associated skills has only increased. In the UK, future skills are recognised as being critical with the 'war for talent' being identified as critical among major nuclear organisations. HMG should continue to actively reinforce clear long-term policy in support of nuclear and, in partnership with industry, have a clear communications strategy to encourage careers in nuclear from an early age via schools.

The Nuclear Skills Strategy Group (NSSG)¹ has identified through its biannual review of the Nuclear Workforce that there is a significant challenge in addressing future skills needs for the nuclear sector. This has led to several workstreams looking at mobility of skills across various sectors, driving local apprenticeships, enabling greater diversity of talent, exciting the next generation about nuclear jobs, and ensuring that our subject matter experts remain at the cutting edge of their technical areas.

Skills for Nuclear or Nuclear Skills

The skills required for the nuclear enterprise can be broadly separated into "skills for nuclear" and "nuclear skills". Skills for nuclear relate to the experience and expertise

¹ [Skills Strategy and Sector Deal | Nuclear Skills Strategy Group \(nssguk.com\)](https://www.nssguk.com)

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that can be found across a variety of sectors and can include roles such as project managers, construction workers, builders, joiners, electricians etc. A significant majority of the nuclear sector workforce requires these skills but there is significant demand for this expertise across multiple sectors engaging in large infrastructure projects. The challenge in bringing these skills to the sector is therefore one of competition from other sectors.

Nuclear skills on the other hand relate to skills that are particular to the nuclear sector and require training and a certain amount of time working within the sector to gain this expertise. These skills can include some of the skills already mentioned above but with nuclear specific applications (e.g., nuclear welder). Nuclear skills can be further broken down into nuclear skills and nuclear experts. Nuclear skills relate to roles such as operators of reactors and other types of nuclear infrastructure, safety professionals, welding technicians etc. To develop these nuclear specific skills can take time as on the job experience is typically required. Nuclear experts make up the smallest component of the sector but are crucial for its success. These experts are the people who have years of knowledge and experience and are typically the people to go to when problems and challenges require resolution – like the consultants of the medical sector. Although Nuclear Skills make up a smaller component of the requirement there is a significant challenge to maintain capability due to the time taken to get to the level of experience required. There is a challenge to ensure that the industry has a strong talent pipeline of higher-level skills in addition to ensuring there is a fundamental drive to accelerate experience. Further exacerbating this challenge is the number of people with nuclear skills who can retire, should they choose to, within the next five years. The challenge is on to strengthen the talent pipeline for higher level skills and accelerate speed to competence.

There are currently several government and industry initiatives to supply a skilled nuclear workforce, although there is a need to gear up current levels of activity to enable delivery of HMG targets of 24GW of new nuclear by 2050. This includes:

- Maximising the pool of potential nuclear skills, e.g. by attracting currently underrepresented groups (including females and people from underprivileged backgrounds) to maximise the pool of potential nuclear skills.
- Developing an industry wide, pragmatic knowledge retention programme given the age profile of the civil nuclear workforce.
- Attracting workers in scarce disciplines including from declining industry sectors (e.g. fossil fuel power stations, oil and gas etc.); and provide technology conversion training.
- Providing flexible learning opportunities for STEM students.
- Geographical considerations. For example, locations where the resource is needed and nuclear career options in areas not near nuclear facilities.
- The need for skills to be driven by the industry but supported by government to allow market forces to drive growth.
- Continuing to create opportunities to develop subject matter experts.
- Continuing to raise the profile of STEM subjects in education; incentivise apprenticeships; and ensure adequate investment in further education.
- Raising awareness of career opportunities in the nuclear sector.

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Nuclear Sector Approach to the Development of Nuclear Skills and Recommendations

1. Apprenticeships or part – time higher-level education

Degree and Masters apprenticeships have been successful for the nuclear industry due to the diverse skills that the approach has enabled. There has been a greater uptake of female STEM students into degree apprenticeships by the sector. To further drive the higher-level skills talent pipeline approaches should be taken to enable early career professionals to study on a day release basis whilst working. This will further strengthen the talent pipeline and drive further diversity into the sector. Key postgraduate programmes that will enable industry based educational research include professional doctorate, engineering doctorate and centres for doctoral training. Masters degree (L7) and degree (L6) apprenticeships continue to drive value for the sector. Expansion of Nuclear Graduate schemes will also support development of the talent pool.

2. Mentoring

Through focused mentorship programmes people with significant nuclear experience and expertise can help transfer knowledge to people with less experience and expertise in a way that increases learning in an accelerated timeframe. Organisations engaging in nuclear and in particular ones with governance through HMG should establish mentoring programmes pan sector to drive acceleration of speed to nuclear experience.

3. Centres for nuclear skills development

Several centres and apprenticeship academies have been created to enable graduates and postgraduates to further develop their skills and experience whilst working in nuclear industry facilities and with nuclear organisations. Examples include:

- National College for Nuclear
- The Nuclear Commissioning Excellence Forum (NCEF)
- Centre for Innovation in Decommissioning (CINDe)
- Advanced Nuclear Skills and Innovation Campus (ANSIC)
- Oxfordshire Advanced Skills Training Facility
- Sellafield Ltd. Centres of Expertise
- Rolls Royce Nuclear Academy

4. Centres for Doctoral Training (CDT's)

Developing nuclear skills begins with the development of a strong nuclear talent pipeline. To drive this pipeline in an accelerated manner it is an imperative that graduates can work on current and future nuclear challenges in partnership with industry. Centres for Doctoral Training (CDT's) were implemented to enable this and have been very successful in creating this talent pipeline. However, more is required to create an enhanced talent pipeline of higher-level skills into the Nuclear sector.

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5. Nuclear innovation funding

The HMG funded Nuclear Innovation Programme (NIP)² from 2016-2021 made some headway in supporting the development of the nuclear sector's skills and capability for development and delivery of small and advanced modular reactors including supporting the nuclear regulators. However this funding stream was stop-start which had a negative impact on the ability to provide continuity in skills development. NIRAB have previously advised HMG that continuous support for advanced nuclear technology skills and capability should be maintained to ensure that this capacity is retained and built upon in order to ensure that the sector is in a position to deliver proposed advanced and small modular reactor programmes that will contribute to decarbonisation of hard to reach sectors, including heat and industry. Any hiatus in funding will inhibit delivery to the required timescales and the UK's ability to meet net zero by 2050 targets.

6. Nuclear fusion – an exemplar

HMG has invested significant research and development funding in domestic and international nuclear fusion programmes, including the Joint European Torus (JET) and Mega Amp Spherical Tokamak (MAST) projects, both based in Culham in Oxfordshire, along with their associated technology infrastructures. In addition, the Spherical Tokamak for Energy Production programme (STEP) is proposed to demonstrate the ability to generate net electricity from fusion. These long-term national commitments, coupled with the UK's support of the global collaboration of the International Thermonuclear Experimental Reactor (ITER) project, provides a level of certainty which in turn has provided confidence to encourage people to pursue careers in nuclear fusion. Nuclear fusion R&D attracts significant international talent to come to the UK to work on these first-rate programmes. The nuclear fusion model of R&D funding and skills development, which is clear and consistent, could be replicated in other areas to attract people into STEM subjects and careers.

I am at your disposal to address any further points or clarifications and attend the inquiry on behalf of NIRAB.

Yours sincerely,

Professor Francis Livens

Chair, Nuclear Innovation & Research Advisory Board

² [Nuclear Innovation Programme Brochure.pdf \(nirab.org.uk\)](https://www.nirab.org.uk/Nuclear-Innovation-Programme-Brochure.pdf)