Doctoral focal award: nuclear skills

List of Intentions to Submit

	Project Lead	Organisation of Project Lead	Details of proposed focal award
	Name	Institution Name	Summary
1	Andreas Kyprianou	University of Warwick	EPSRC Nuclear Doctoral Focal Award: Core Mathematical Skills (CoReMath) Nuclear technologies are, by definition, based on the principles of how subatomic particles interact with complex physical environments. Modelling such interactions lies at the heart of how we manage and regulate existing nuclear technologies, as well as imagine, design and create future nuclear innovations. From microscopic atomic-level behaviour to human-scale macroscopic considerations, building accountable models that that integrate inhomogeneity and uncertainty is central to our nuclear capabilities. To name but a handful of examples, one may think of modelling for: large- and small-scale energy dispersal, radiation containment, contaminants in groundwater, multiphysics in reactor design, propagation of uncertainty from nuclear data and radiation damage to materials. Current workflows here depend on massive computation, often constrained by run-time and scalability. Central to these modelling demands lies the need for physically informed mathematical formulation that unlocks smarter models and more efficient algorithms, blending analytic and computational prowess. Positioning Mathematical Sciences as a critical enabler of nuclear innovation, CoReMath will play a pivotal role in delivering the UK's 2050 Net Zero ambitions alongside its sovereign energy and security strategies. By driving a renaissance of Mathematical Sciences within nuclear engineering, it will strengthen the rigour and reliability of predictive models across advanced and small modular reactors, future fuel cycles including HALEU, fusion development, waste, decommissioning, shielding and safety, material design, environmental monitoring and protection and nuclear security. This will reduce uncertainty, accelerate innovation cycles, and provide the confidence needed for the timely deployment of next-generation technologies. At its heart, CoReMath is committed to training the next generation of mathematical nuclear scientists who will carry forward this capability, ensuring the UK sustains a self-reliant and world-leading position for decades to come.

			Delivered the Universities of Warwick, Bath and Newcastle, CoReMath training will focus on the mathematical engine-room of nuclear science: advanced transport theory, scalable multi-physics modelling, variance-reduced and interacting particle Monte Carlo, constrained optimisation and inverse problems, uncertainty quantification, interdisciplinary statistical modelling, data assimilation, physics-based AI and stochastic-deterministic differential systems. These topics will be introduced through a blend of assessable taught courses, the co-creation and co-delivery of cohort-based interdisciplinary projects in collaboration with industrial partners in energy, defence, decommissioning and regulation, individual PhD research and partner internship. Cohort training spans more than just the first year and is enacted through a student-led industrial symposium, peer-to-peer mentorship and an integrated delivery including coding and HPC experience, entrepreneurship, sustainability, responsible innovation and EDI. CoReMath has a broad footprint across the nuclear sector, where the inflow of mathematical talent has significantly lagged demand for decades. Its delivery puts students centre stage among internationally recognised academics and sector practitioners. Co-created projects and theses with industry, government and regulators will keep research relevant and secure partner investment through cash and in-kind contributions. CoReMath's geographical span across the UK, its accessibility for part-time study and enhanced stipends will be used to attract high quality home students with a diverse a regional appeal. CoReMath's capacity to deliver is evidenced by its members delivery of a £7.3M EPSRC programme grant, MaThRad, focusing on disruptive advances in radiation transport modelling, supporting 11 PAs and 12 partner-leveraged PhD scholarships. CoReMath's leadership team has also been part of the creation and delivery of the £15M EPSRC CDT in Statistical Applied Mathematics at Bath, which has generated over 45 industry co-funded scholarships from industrial partners since 2014.
2	Joel Turner	The University of Manchester	TRAINING & education in INNOVATION, science & TECHNOLOGY for ADVANCED NUCLEAR (TITAN) The SATURN CDT is a partnership between the UK's 6 leading nuclear universities and is currently the only fully-funded nuclear CDT within the UK. In various iterations it has operated successfully for the past 15 years, delivering over 200 nuclear PhD students. Most recently SATURN has delivered significantly larger cohorts of students (more than 50 in the Oct 2025 intake), funded by a top-up from DESNZ, to work to address the nuclear skills gap within the UK. Through TITAN we are proposing to both extend and expand upon SATURN, to reflect the emerging DFA landscape within the UK and recognise that the increased cohort size must be a new baseline if the nuclear skills agenda is to be delivered. Specifically TITAN will: Train at least 80 PhD / EngD students and potentially as many as 120 students over the four-

			year DFA period. Engage with new civil and defence sector industrial partners and renew commitments from SATURN partners to reflect the new DFA landscape. Introduce colleagues from new partner Bangor University into the consortium. Offer enhanced student stipends in order to attract the best candidates and to bring stipends into line with the expected funding for the current round of DFAs established under this call. Effectively extend the current Saturn CDT by one year to align the end date with these centres. Further develop and build upon the highly successful "nuclear bootcamp" approach of the SATURN training programme to include focused training opportunities in areas highlighted as most important by industrial partners. Establish key partnerships with emerging DFAs to engage on specific training programmes where a SATURN-funded studentship would benefit from such training, and vice versa. Through this extension and expansion of SATURN, TITAN will be positioned to continue SATURN's success in delivering the high volume of skilled PhD graduates required to serve the civil and defence nuclear landscape over the next four years.
3	Michael Henshaw	Loughborough University	DOCTORAL FOCAL AWARD IN LIFECYCLE MANAGEMENT SKILLS FOR DEFENCE AND CIVIL NUCLEAR CAPABILITY VISION To contribute at least 80 doctoral graduates with π-shaped CVs to the nuclear sector. • Graduates will be equipped with a thorough understanding of the nuclear domain, a deep knowledge of an aspect of nuclear technology or enterprise, and an understanding of integrative methods and appreciation of the transdisciplinary nature of nuclear energy and deterrence. i.e. domain knowledge and deep specialism are the legs of π and integration/transdisciplinary is the horizontal element. • Doctoral students will research key topics through ambitious projects co-created with industry, and pursued with leading academic institutions for manufacturing, lifecycle management, Systems Engineering, and nuclear technologies, to support an innovation pipeline in UK nuclear capability. • The DFA Centre will be integrated with the wider nuclear ecosystem, linking directly to the Nuclear Skills Academy and two of the regional hubs (Midlands and North-West) to support the endeavours of employers and stakeholders in the creation of solutions to deliver the skills plan targets. Applicants Project Lead LOUGHBOROUGH UNIVERSITY Michael Henshaw – Professor of Systems Engineering (M.J.d.Henshaw@lboro.ac.uk),

			Project Co-Leads LOUGHBOROUGH UNIVERSITY Moataz Attallah – Professor of Advanced Materials Processing, and Dean of School or Aeronautical, Automotive, Chemical and Materials Engineering (M.M.Attallah@lboro.ac.uk) UNIVERSITY OF BIRMINGHAM Arunodaya Bhattacharya – Professor of Fusion Energy (a.bhattacharya.1@bham.ac.uk) UNIVERSITY OF DERBY Chris Bussell – Professor of Human Systems, and Pro Vice-Chancellor / Dean, College of Science and Engineering (C.Bussell@derby.ac.uk) UNIVERSITY OF MANCHESTER Tim Abram - Professor of Nuclear Fuel Technology (Tim.Abram@manchester.ac.uk) UNIVERSITY OF NOTTINGHAM David Branson - Professor of Dynamics and Controls (David.Branson@nottingham.ac.uk), PARTNERS AND CO-CREATION Through a series of three online workshops of industry and academic partners, the areas of research priority have been identified, and the model of how the centre will work has been defined. The opportunity for doctoral students to be located at the industrial sponsor and the availability of Professional Doctorates (i.e. employees researching on a part-time route) have been emphasised by many partners. There is a recognition from industry of the challenges associated with recruiting sufficient students with home fees status, and the need to attract students with varying levels of previous experience. The link to the Nuclear Skills Academy as a pipeline for recruiting doctoral students and appropriate enhancements to stipends are accepted as mechanisms through which these risks will be mitigated. We have engaged fifteen industry and NGO partners, so far, in the creation and subsequent support of our programme, with a plan to expand prior to and following submission of the proposal. SCOPE AND STRATEGIC OVERVIEW Programme structure

			The centre will offer Engineering Doctorates (EngD), PhDs, and Professional Doctorates. All students will undertake a substantial amount of training that is front-loaded in terms of the four-year programme. This will encompass a broad range of nuclear skills, leveraging existing programmes from the Skills Academy and partners, systems engineering, and a range of transferable skills related to business, doctoral training skills, inclusivity and media. Resources developed in C-DICE (Centre for Postdoctoral Development in Infrastructure, Cities and Energy), the UK's largest postdoctoral development programme, will be leveraged. The partners have a range of Masters provision in nuclear energy, systems engineering, and manufacturing, together with existing CDTs in Nuclear Energy and Formulation Engineering, that will provide extensive in-depth training in areas specialist to particular doctoral projects. The doctoral student will, therefore, have an individual training programme that supports the development of a π-shaped CV thereby providing the breadth and depth necessary to succeed in nuclear engineering. The development of themes and integration across the nuclear supply chain will ensure that the centre delivers outcomes that are greater that the sum of the parts (individual PhD/EngD). Furthermore, the programme will include activities to attract engagement and investment from organisations that do not form part of the recognised nuclear supply chain, but have similar or closely aligned, skills and capabilities. Opportunities for secondment overseas will be included to access facilities and expertise that are not fully represented in the UK. Overseas partners are aligned to facilitate this. A certain proportion of PhD/EngD will be made available in each of the four intake years of the centre for associate partners on a competitive basis. Technical scope A key feature of the centre will be the opportunity for crossover skills between defence and civil nuclear: i.e. advanced materials performance, nuclear safety and security, safety critical systems, digital science, and regulatory matters. The new investment in nuclear provides a perfect opportunity for the deployment of model-based systems engineering as a part of a fully digital approach to future development and operation of nuclear capabilities. Full lifecycle considerations include disposal and planning for disposal will be a feature that includes not just the materials and engineering aspects, but also environmental and political science. Thus, decommissioning and waste management are included. The manufacturing associated with complex and hostile environments will be part of the scope, including advanced robotic systems. Supply chain management will be an area of significant challenge in the short and medium term and will form part of the research agenda.

			CONCLUSION The geographical and technical alignment of the five partner universities will ensure that a talent pipeline delivering doctoral level capability is provided to support the UK nuclear ambitions.
4	Joe Smerdon	University of Lancashire	Our doctoral focal award will equip 40-60 professionals with the skills and experience to navigate the nuclear future. Drawing on the experience of the John Tyndall Institute within the University of Lancashire, we will deliver a taught first year, followed by three-year research projects in partnership with external companies, labs or government agencies. We will continue to deliver cohort-based teaching throughout the programme, to maximise the skillset and opportunities for building strong professional networks. We will support diverse applicant circumstances, to support those already in the industry or with non-traditional educational backgrounds. Our focus areas are small modular reactors (SMRs), materials science, (nuclear and construction) decommissioning, advanced coatings and nuclear regulatory frameworks, safeguards, security, cyber resilience and operational technology.
5	David Jenkins	University of York	This statement of intent concerns a Doctoral Focal Award (DFA) application focused on the discipline of applied nuclear physics. It has been conceived to range across both the necessary subdisciplines, i.e., theory, modelling, experimental methods and validation, and their application across the entire nuclear technology domain. Nuclear technology can strongly contribute towards the UK's prosperity and growth agenda, with applied nuclear physics providing both key underpinning and fundamental insight to strategic national priorities across defence, energy and national security. In this respect, applied nuclear physicists play a critical role since they understand all elements of the nuclear data pipeline i.e. the process of generating, validating and applying nuclear data. Their grounding in relevant nuclear theory allows them to design and

			customise instrumentation and perform validation experiments. Such physicists also understand how to carry out data evaluation so as to present the results of their work in a format immediately useful to relevant stakeholders. In the UK, such key stakeholders include nuclear fission energy and defence but there is also relevance to medical isotope production and fusion energy. Over recent decades, however, the UK workforce with skills in applied nuclear physics has reached a critically low level. The sensitivity of the topic means that such work cannot be outsourced. Indeed, it is widely recognised that the UK must have sovereign capability in this critical area. We propose a DFA which will deliver doctoral graduates with the expertise to bridge the vital skills gap between nuclear physics and nuclear engineering, specifically in applied nuclear physics, where no formal training pathway currently exists. Our aim is to train a workforce in applied nuclear physics to serve the UK's needs into the next decades. We will achieve this through establishing a doctoral training centre providing excellent training and research projects in key topics such as nuclear theory, nuclear data, neutron and radiation transport, modelling, and instrumentation development. We will achieve such a broad and joined-up programme through a consortium of five academic partners: three Nuclear Physics research groups (Edinburgh, Surrey and York) and two Nuclear Engineering research groups (Cambridge and Lancaster). Historically, interaction between these pure and applied areas of nuclear science has been more limited than it should have been due to how universities are structured. Moreover, Nuclear Physics and Nuclear Engineering traditionally receive support from two different research councils – STFC and EPSRC – resulting in an applied nuclear physics funding and training chasm, which this DFA is designed to directly address. We will deliver high-quality interdisciplinary training designed to equip graduates with the skills to address a diverse range of challenges within the UK nuclear landscape. The breadth of our consortium will be exploited to produce a curriculum that encompasses nuclear science, hands-on computational and instrumentation training as well as transferable skills (including public engagement and the presentation of scientific results). Particular emphasis will be placed on building a cohort of students through bespoke training schools. We will also exploit the consortium's networks to develop high quality industrially-relevant PhD projects. As well as key partners at UK national laboratories and in wider UK industry, the consortium has strong ties to relevant international facilities such as CERN. Placements within industry and at prestigious national/international facilities will be highly attractive to prospective students. Indeed, our cohorts of PhD students will draw on a different pool of applicants from traditional nuclear engineering training programmes since the training we offer will be attractive to those from a physics background which we believe is key to growing the nuclear workforce trained through this DFA model. EDI will be at the heart of our DFA from the membership of the management team, to supervisory teams, project selection, our recruitment and selection process and the on-

			course support. Specifically, we aim to increase the representation of women and people of colour within our DFA. We will also aim to collect data on other protected characteristics, currently missing for the nuclear sector, so that we can identify future interventions.
6	Andrew Boston	University of Liverpool	Nuclear doctoral focal award in radiation protection and environmental monitoring (RAPTOR) The problems addressed by RAPTOR will be diverse, multidisciplinary and will be driven by scientific endeavour, national priorities and industry need. RAPTOR PGRs will pursue new, nuclear focused interdisciplinary research to address challenges in 4 key areas, • Radiation Protection including monitoring the behaviour and effects of radiation on the environment • Environmental impact assessment to evaluate the overall environmental footprint of nuclear energy • Nuclear Safety and security including safeguarding of waste material • The social and societal impact of Nuclear Energy. RAPTOR represents an exceptional opportunity for postgraduate researchers to work in a cohort to progress these critical research areas, to address interdisciplinary research challenges and to acquire nationally needed skills in cutting-edge nuclear skills that will address key strategic areas identified in the national nuclear strategic plan for skills.
7	Alan Drew	Queen Mary University of London	The UK is undergoing a renaissance of nuclear power whilst at the same time as a significant threat to security. With an estimated growth of nearly 50% in the required workforce (an additional 40k people), many of whom are high skilled, we are proposing a Doctoral Focal Award in one of the underpinning technologies, and their application, needed to support that growth: the detection of radiation. Our DFA covers critical areas of nuclear skills needed for the future, with applications including the radiation protection (for example the safe operation of nuclear power stations, safety of the workforce etc), nuclear waste management, decommissioning and the assessment of contaminated environments including the footprint in air, water, and the subsurface. Beyond the civil sector, applications of radiation detection include the security of radioactive materials, understanding the fallout and subsequent consequences of a radiological event, their transport (e.g. border security, inland transport, event and specific target security) and the safe and secure adoption of nuclear technologies in the defence sector.

			To support the many applications of radiation protection, new technologies are required, which will form a major component of our training and research. These range from the development of new detector technologies themselves (e.g semiconducting, organic, hybrid inorganic organic, new scintillator materials, quantum sensors) that are suited to specific applications or offer enhanced specifications over current available technologies. We will develop radiation-hard robotics and electronics for exploration and monitoring of hazardous environments and as delivery agents for sensors. We will work on radiation damage mechanisms and methods to reduce them in sensors, optics and the electronics or infrastructure needed to support them. We will develop sensor fusion systems (for example, combining radiation sensors with ANPR sensors on the motorway network for tracking materials), as well as big data and artificial intelligence to both improve the detection of radiation and handle large quantities of data produced by them. We will model both the environmental and detector responses of the detectors developed in the context of their specific applications as well as more broadly, to assess other potential applications of the different technologies. Our proposal goes beyond just the science and technology of detectors, and the subsequent application of them. We will train students on the ethical issues, societal risk perception from a nuclear perspective, the wider defence and security contexts, governance and geopolitical risks. We will also train the students in the materials, technologies and applications associated with radiation detection, to provide a broad knowledge and understanding of the nuclear sector, and of the many topic areas with which radiation detection will be required. This link between the fundamental scientific, ethical, societal and environmental factors and their application will be a fundamental thread linking all themes of this DFA. This will enable the students to understand the contexts in which radiation detection is needed and applied, as well as the broader nuclear sector, setting them up for a future career in the wider sector. Our DFA offers both depth and breadth, with an assessed taught programme in the 1st year of the PhD. We will offer a flexible approach to doctoral research – both full and part time with both PhD and EngD routes offered. The training programme will involve internal taught courses, a summer/winter school with external speakers from a wide variety of application sectors, industrial partner and nuclear site visits and field trips, transferrable skills and the opportunity for peer-to-peer learning. The research projects that are aimed at solving real-world problems will be diverse, and include physics, chemistry, materials science, electronics, computer science, engineering, geosciences and environmental sciences, and may involve an element outside of these hard sciences where applicable. Our consortium comprises three leading universities in the radiation detector development and applications field (Queen Mary University of London, Sheffield and Sheffield Hallam), synergistically offering expertise in all of the major areas

			covered here. We anticipate training at least 60 PhD students over the DFA, achieved by matched funding from external partners.
8	Michael J.D. Rushton	Bangor University	The Bangor-led Doctoral Focal Award, Programme for Accelerating Nuclear Development and Applications (PANDA) will accelerate the transition from cutting-edge research to licensed industrial deployment across the UK's civil and defence nuclear sectors. PANDA makes accelerated qualification and reactor design its central priority, producing graduates to turn breakthroughs into technologies for industrial use. The UK has entered an ambitious new nuclear era. Meeting national energy and security goals requires innovation in fuels, materials, reactor systems and methods. All under compressed timescales set by rising demand, climate commitments and geopolitical uncertainty. Currently, promising approaches to fuels, materials, manufacturing and modelling may remain confined to the laboratory because traditional qualification and licensing pathways often take decades. Without changing approach, these innovations may not make a difference in a meaningful timescale. PANDA will train more than 85 doctoral researchers across four cohorts. Students will be embedded with both academic and industrial partners from the outset, ensuring projects are aligned with operational needs and generate the evidence required for regulatory acceptance. Most will follow a professional doctorate pathway alternating between academic research and extended industrial placements, while some will take a traditional PhD with shorter placements. All students will benefit from a structured training programme combining core modules in nuclear science and engineering with professional skills, challenge events and visits to major UK and international facilities. This will ensure every graduate has both the expertise and cultural awareness to operate effectively in a highly regulated, safety-critical environment. The award is led by Bangor University in partnership with the Universities of Birmingham, Bristol, Cambridge, Derby, Manchester, Imperial College London and the UK National Nuclear Laboratory. This consortium spans the breadth of UK capability in nuclear science and engineering, with strong links to industrial partners who will host students whilst providing guidance and access to world-class facilities.

			Research projects will address three priority themes, linked by a cross-cutting aspect on methods for innovation: • Nuclear reactor and system design: reactor physics, neutronics, thermal hydraulics and integration into wider energy and industrial systems. • Fuel cycle and performance: advanced fuels, HALEU, novel fuel kernels and secure supply chain development. • Nuclear materials and manufacturing innovation: advanced manufacturing and the rapid qualification of cladding and structural alloys for deployment. • Methods for innovation (cross-cutting): uncertainty quantification, probabilistic methods, core optimisation, digital material design, AI, machine learning and digital engineering approaches to shorten the time and cost of bringing new technologies into licensed environments. The applications and benefits of this approach are significant. In the civil sector, it will enable advanced reactors, fuels and materials to be licensed and deployed within the timescales needed to support the UK's transition to net zero and to secure robust supply chains. In the defence sector, it will provide the qualified technologies and skilled personnel needed to sustain the UK's nuclear capability. Across both, PANDA will reduce the gap between research and deployment and lower costs through proper understanding of safety margins providing tools to ensure innovation survives regulatory scrutiny. PANDA will deliver not just research but people: a highly skilled, industrially experienced workforce ready to lead programmes of national importance. It will strengthen UK leadership in nuclear science, bringing universities, industry and government into closer alignment thereby ensuring the UK has the capability and depth to deliver on its civil and defence ambitions in a timely fashion.
9	Panagiota Angeli	UCL	UCL, in collaboration with King's College London (KCL), intends to submit a proposal to lead a Doctoral Focal Award (DFA) in Nuclear Skills funded by UKRI. Our vision is to deliver a nationally connected, academically co-led doctoral training programme that builds sovereign capability and future leadership across the UK's nuclear sector. The programme will be co-designed and delivered in partnership with national laboratories, government agencies, and industry leaders across the nuclear lifecycle. Together, we aim to establish a distinctive, cohort-based doctoral centre aligned with the UK's strategic priorities in energy security, clean power, sustainability, and critical infrastructure renewal. A unifying theme of the proposal is the digitised, sustainable lifecycle for HALEU (high-assay low-enriched uranium) fuels. Such fuels are important for advanced and for small modular reactors. This includes optimised fuel production and enrichment technologies and their

			digitisation, operation of reactors and materials behaviour in radioactive environments, supported by sensing, automation and digital operations. The programme will address lifecycle assessment including safety, criticality and environmental impact of the processes and the waste, and the secure handling and regulation of these fuels. These areas reflect the sector's increasing dependence on cyber-physical systems, long-term monitoring, and data-informed decision-making. Training will integrate technical, operational, policy, and societal dimensions, spanning fuel development, reactor operations, instrumentation, considering waste management, regulation, and governance. The academic partnership brings together UCL's depth in nuclear fuel cycles, digital operations, materials in nuclear environments, instrumentation, policy, and sustainability with KCL's expertise in reactor modelling, high-performance computing, advanced simulation, and fusion-adjacent R&D, encompassing multiple scales. Our interdisciplinary team spans Chemical and Electronic&Electrical Engineering, Physics and Astronomy, Computer Science, Earth Sciences, Science and Technology Studies, and Public Policy. The programme will offer a flexible structure built around core nuclear foundations, thematic pathways, group projects, industry placements, and shared cohort identity. Our partners are actively shaping the programme through co-designed research projects, placements, joint supervision, advisory roles, and direct or in-kind support. Their involvement aligns with the UKRI call's 40:40:20 funding model and reflects a shared commitment to building future capability in nuclear science, engineering, and systems operation. The proposal will meet all expectations of the UKRI call, including security clearance requirements (such as BPSS) and alignment with strategy documents including the Clean Power 2030 Action Plan and the National Nuclear Strategic Plan for Skills. Our management structure includes dedicated leads for training, industry engagement, EDI, and thematic development, supported by a supervisory pool of over 50 nuclear-focused and nuclear-adjacent researchers across the two institutions. EDI will be embedded throughout recruitment, supervision, training and governance. We will draw on UCL's Researcher Experience Strategy and King's equality and inclusion frameworks to ensure inclusive access for underrepresented groups, career changers and non-traditional candidates. A named EDI lead will support the co-design of training and engagement activities that promote inclusive research cultures and responsible innovation in the nuclear sector. This programme will produce doctoral graduates ready to lead across technical, digital, regulatory, and societal domains. They will be equipped to address high-consequence challenges and contribute directly to UK missions on energy, security, and sustainable infrastructure.

10	Alton Horsfall	Durham University	Modern electronic systems have revolutionised the world in which we live and it is possible to monitor and control almost every aspect of technology from anywhere on the earth's surface. However, modern electronics can only operate in relatively benign environments and is not capable of long term, high reliability operation in the high temperature high radiation flux found in proximity to nuclear installations. This limits the deployment technology in the nuclear sector, including the use of robots for decommissioning and maintenance activities, as well as system monitoring during operation to increase the efficiency of the reactor. The proposed focal award will address this shortcoming through the development of next generation electronic systems that er optimised for these hostile environments and training the next generation of engineers and scientists in their development and operation. The students that form the cohort will be trained in the challenges of operating electronics in the nuclear environment, along with the fundamental aspects of reliability fop electronic system and how to ensure high fidelity data from a limited number of sensors. The proposed training will cover aspects from fundamental semiconductor materials and their interaction with mixed radiation fields, the design of wide bandgap devices and their circuits to support sensors, low complexity computation, evolutionary microelectronics and sparse data statistics as well as the requirements for operating in the nuclear environment. This novel holistic vision for electronics in hostile environments will also support a range of adjacent technologies and challenges, from fusion energy to defence and from aerospace to industrial process monitoring. The cohort will be supported by a group of universities that are clustered along the East Coast Main Line, enabling easy travel and supporting the exchange of staff and students for short secondments. The project will also support companies wishing to increase their interaction with the nuclear industry, bringing new concepts and technology to offer step change in capability for the future, facilitated by the students that will graduate with the skills outlined above.
11	Bo Chen	University of Southampton	Both the civilian and military nuclear sectors face urgent challenges, including an ageing workforce, a growing demand for expertise to support emerging civil nuclear technologies, and a pressing need for highly skilled workers in the defence sector. Our DFA programme is designed to meet these challenges by focusing on Nuclear Safety and Security across the entire lifecycle from design and operation to decommissioning. We will adopt an innovative approach to facilitate intergenerational knowledge transfer between students, enabling them to upskill or re-skill for careers in the nuclear industry. The programme is founded on the guiding principles of world-class scientific research, strong industrial application, and a clear commitment to producing doctoral graduates ready to enter and lead within the UK nuclear workforce. All projects will be co-created and the training co-delivered with four Tier 1 nuclear industrial partners, ensuring alignment with sector priorities: gigawatt reactors, small modular reactors (SMRs), advanced modular reactors (AMRs), and defence-related programmes. Our Tier 2 industrial partners bring critical expertise across the nuclear lifecycle, from metrology and welding to codes and standards, non-destructive examination, and advanced materials – all of

			which are essential for structural integrity assessment of safety-critical engineering components. Tier 1 partners represent organisations leading major nuclear initiatives, while Tier 2 partners are those embedded within the nuclear fission supply chain or positioned to deliver technology transfer from other sectors to strengthen the UK's nuclear future. Importantly, all partners are UK-based companies. Our DFA centre will introduce a bespoke 4-year training programme designed to combine advanced technical knowledge, professional skills development, and industrial engagement, in line with UKRI's expectations for high-quality cohort-based doctoral training. The programme comprises six core learning modules, one of which is shared with our existing Doctoral Training Centre in Complex Integrated Systems for Defence and Security (CISDnS), fostering cross-centre collaboration and wider peer-to-peer learning. The modules are: 1) Introduction; 2) Materials and structural integrity; 3) Manufacturing; 4) Radiochemistry and decommissioning; 5) Systems Thinking (shared with CISDnS); and 6) Interdisciplinary group project. Problem-based group learning, based on case studies co-developed with our industrial partners, will be embedded into each module. A distinctive feature of the programme is the translation of the UK's unique expertise in safely operating advanced gas-cooled reactor (AGR) power plants to the AMRs. To achieve this, training will address topics such as coolant compatibility with structural materials and nuclear fuel, the mechanical behaviour of graphite under high temperature and pressure, and creep and creep-fatigue cracking in high-integrity welds containing residual stresses. Furthermore, our cohorts will engage in very broad training activities including responsible research and innovation, Beyond Engineering Skills, and Frontiers in Nuclear Week, to broaden students' capability beyond technical excellence, preparing them for leadership roles. Our vision is a diverse, inclusive, and highly skilled cohort of engineers and scientists in Nuclear Safety and Security, ready to address critical skills needs in both the civil nuclear and defence sectors. The DFA centre will be led by a cross-disciplinary management team and supported by a community of 80 academics across eight departments/schools at the University of Southampton: Mechanical Engineering; Civil, Maritime and Environmental; Institute of Sound and Vibration Research; Aeronautical and Astronautical Engineering; Optoelectronics Research Centre; Chemistry and Chemical Engineering; Electronics and Computer Science; Ocean and Earth Science. This unique concentration of expertise enables the centre to develop skilled people in the following areas: nuclear and analytical chemistry; metallurgy and materials science; modelling, microscopy and spectroscopy; mechanical design and engineering analysis; data science; computer modelling and simulation of seismic and human factors; sensor technology and autonomous systems; robotics for nuclear applications. Our doctoral training model is distinctive in its three unique features: SuperCDT, Mobility, and Policy, with further details available upon request.

12	John Erkoyuncu	Cranfield University	Recognising the inter-connected nature of the nuclear sector, this consortium – the 'Nuclear Skills Yielding National Capability' (N-SYNC) programme – will foster transferable skills across both the nuclear-related sectors and associated supply-chains. Drawing on the expertise across both the Civil and Defence sectors of Cranfield, Sussex, Swansea, and Sheffield, the aim of N-SYNC is to train a cohort of doctoral level experts that will be able to deliver a key part of the UK's future national nuclear industry capabilities. Thematically, our emphasis will be on core nuclear engineering skills (such as materials in extremes, design, manufacturing & systems engineering) and industry requirements (e.g. safety cases, scalability & assurance) in the context of the increasingly important digitalisation technologies (specifically; data science, AI and digital twinning) that will shape the future of the industry. To underpin this unique offering a tailored training programme will be delivered, based on the underlying premise that in order to create an enduring, sustainable, and exciting programme, the concept of a 'Nuclear Skills Community' – linked into the wider eco-system – needs to be at its heart. This will ensure that graduates are able to build flexible career paths, moving between different segments of the nuclear ecosystem as national requirements change. As part of this, the consortium will deliver an open and inclusive approach, ensuring that research compliments and adds value to other CDTs / DFAs and that this is centred around the needs of the civil and defence related nuclear industry.
13	Paul Bowen	University of Birmingham	"Engineered materials and fuels for civil nuclear and defence." The University of Birmingham has been a leader in nuclear postgraduate research and education for several generations. One prime example is our Physics and Technology of Nuclear Reactors (PTNR) MSc course, now in its 69th year of continuous delivery. In collaboration with our core university partners of Manchester, Oxford and Nottingham, we are proposing a targeted CDT programme. This initiative will focus on cultivating specialised and transferable skills in mission-critical area of nuclear materials and fuels, which are essential for the success of the UK's next-generation civil nuclear and defence industries. These skills, along with the proposed research areas are vital for ensuring national sovereignty in nuclear materials, nuclear safety and accident risk management, energy security, and overall national security. Project Partners for this new Doctoral Focal Award (DFA) are expected to include those on our current PTNR steering group: AWE, EDF Energy, Rolls-Royce, AtkinsRealis, Frazer-Nash, Amentum, NNL, NSG, Orano, Rolls-Royce SMR, Cerberus Nuclear, Mirion, Women in Nuclear (WiN) to name but a few. These companies work across our intended consortium of universities and would be expected across many other consortia bidding for a "Doctoral Focal Award: Nuclear Skills". Thus, it is essential that both the taught and research themes of each successful DFA are complementary and provide unique opportunities for collaboration rather than

			competition. Such co-operation in research has been achieved in the highly regarded University Technology Centre (UTC) network established (since 1992) by Rolls-Royce Group. Indeed, five UTCs are represented in our bid, and all are well versed in the compromises required to ensure that the entire research output will be greater than its individual parts. Grouping cohorts around research themes is one ambition for our overall research delivery. Thus, we believe our centre will promote cohort cohesion both through training modules and individual research projects. Delivery of taught modules is intended to be fit-for-purpose: flexible and specific to cohorts of students registered on our DFA. Modules will be available in short, intensive format and across all four years of study. We note the requirement for modules to be both formal and assessed- this presents challenges across any multi-university consortium. Our approach will be to ensure that modules are equivalent to those delivered on other programmes (for example, our PTNR MSc), but we do not expect the modules to be credit bearing. Assessment for satisfactory completion of each module will reside with the university at which the research student is registered, with progress decisions reported for the DFA Steering Board (which will include university and industrial membership). The principal award for our DFA will be a PhD completed over four years of full-time study (or its part-time equivalent). Core modules from across the partners form a comprehensive set of both focused and broad training elements available from existing MSc programmes (across Birmingham, Manchester and Nottingham). Focused modules include Nuclear Materials Science, Irradiation Materials Science, Fuel Cycles, Radiation Detection & Protection, Reactor Materials, Reactor Physics, Reactor Systems, Thermal Hydraulics, Fusion and Radiochemistry. Broadening modules (applicable to our DFA bid) include those taken from MSc courses on Advanced Manufacturing and Artificial Intelligence. Examples of such modules available are those based on Additive Manufacturing (fundamentals and 3D printing), Digital Manufacturing and Big Data Learning and Technologies. With challenges of recruitment of PhDs in general within engineering, we recognise the advantages of recruiting excellent researchers from a diversity of scientific backgrounds. Here it will be appropriate to undertake an individual skills assessment (SWOIT analysis) early in year one to define essential elements of training and perhaps to anticipate specific sector needs for the future. Research projects will have the theme of achieving design led properties through life for nuclear structural components, advanced nuclear fuel forms, and their state-of-the-art manufacturing in partnership with the supply chain. The importance of design led targets for “engineered materials

			for components" cannot be over-emphasised – ultimately this dictates nuclear power-plant safety, accident mitigation and planned future lifetime extensions. The research topics will encompass critical R&D areas for Gen-III+, Gen-IV and defence nuclear systems such as advanced/additive manufacturing, structural integrity, effects of radiation, environmental degradation due to corrosive media, high temperature synergistic effects and effects of long-term storage. A robust fuel -cycle R&D will include topics covering design, development, manufacture, scale-up and in-service performance of specialized fuels such as high-assay low enriched uranium (HALEU); exotic fuels such as microencapsulated fuels; metallic fuels; oxides; and emerging new fuel technologies. Immobilization matrices, nuclear waste disposal and materials recycling will also form a key component of the research programme to encourage circular economy in the nuclear industry. If we are to achieve our vision of a valuable source of nuclear materials expertise across the DFA landscape in the UK, then it will be important that recognition is taken of materials projects sponsored in other successful consortia to ensure that added value to the UK is achieved. The DFA will host an annual conference to bring together key strands of materials research across the new and existing DFAs (CDTs). Excitement is always generated in materials research projects by access to unique facilities. This consortium will provide such opportunities through exploiting a comprehensive set of specialist and unique facilities. For example, specialist advanced electron microscopy facilities (TEM, HRTEM, EBSD, HREBSD) exist across all partners, including unique capabilities such as atom probe tomography for radioactive materials available at Oxford. Manchester and Birmingham house the UK's premier accelerator facilities for nuclear materials & fuels testing. Birmingham is home to world-leading flux accelerator driven neutron facility and a high energy proton/helium cyclotron for irradiation experiments. The University of Manchester operates the Dalton Cumbrian facility that hosts state-of-the-art intermediate-energy heavy ion accelerators, complementing the facilities at Birmingham. In-situ irradiation characterisation facilities have been developed at both the universities, enabling high-value studies on structural integrity such as irradiation creep – that are otherwise not duplicated anywhere else in Europe. Moreover, new facilities at Birmingham have been setup in direct support of the nuclear industry – such as facilities for controlled irradiations of structural materials in pressurized water, supercritical water as well as different gaseous environments relevant for fission reactor cooling systems (CO2, Helium) and temperatures of 1000oC. Indeed, all partners have capabilities to perform a wide range of mechanical testing assessments in conditions representative of those that will be experienced in service. Some examples include: high temperature bulk & micro-mechanical testing; tribology within autoclaves simulating LWR/SMR conditions); fretting fatigue under operation -relevant conditions; high

			temperature thermo-mechanical testing; fuel cladding hydriding; high-rate mechanical testing facilities (to high temperatures and with extensive levels of instrumentation) All core universities partner with central facilities and national labs, including Diamond Light Source, UK National Ion Beam Centre, ISIS Neutron and Muon Source, and active materials handling facilities within the UKAEA to name a few, through collaborative projects which accelerate understanding and engineering of nuclear components. Students will receive stipends enhanced by at least £6000 per annum above UKRI baseline support from industry sponsors. Our DFA is intended to output 60 research students in total over four intakes and seven years from launch. Thirty-two projects will be supported by UKRI (including an ask for significantly enhanced RTSG elements). A further twenty-eight projects supported fully from university and industry will build cohort numbers progressively from launch. Of these sixty projects, eight are intended for specialist topics from outside our current four core universities, and for which individual researchers can apply. Our target will be to recruit 12,14,16, and 18 research students over four intake cohorts. If achieved, then we believe this number of PhDs will leverage UKRI input of £7.0M by 2.5 times to give a total CDT value of £17.5M. In view of the number of research projects that will be supported, at the time of this intention to submit we have not exhausted our discussions with potential university partners. We will explore whether additional core university partners (added at full bid stage) could make our research programme even more compelling. In both this research context and noting the advantages of teaming with a Nuclear Skills Academy at Derby, the regional focus for our bid would be strengthened further by links to both the universities of Loughborough and Derby respectively. We also expect that our centre will attract international attention and collaboration. We are already in discussions with several renowned organization from the US and Europe for broader and inward impact to the UK fission community.
14	Joy H. Farnaby	University of Glasgow	SCANS (Skills Centre for Advancing Nuclear Systems) Formed by effective integration of two interconnected Hubs in Edinburgh (University of Edinburgh with Heriot-Watt University, led by Prof. Mount) and Glasgow (University of Glasgow with SUERC Centre for the Isotope Sciences, led by Dr Farnaby), this user-cocreated DFA will deliver the next generation of leaders for the nuclear sector, essential to the UK creating and sustaining global excellence and driving innovation and growth Our nuclear skills training programme builds on a suite of courses successfully provided by our established signature doctoral training centres and our relationships (e.g. the combined Scotland Beyond Net Zero initiative) and has been co-designed and co-created with partners and alumni to establish a diverse cohort (PhD, EngD, PhD-in-post) with broad multi-disciplinary skills.

			The DFA will focus on the research and training required to deliver current and future advanced nuclear systems. This will build on core experimental nuclear skills (e.g. radiochemistry, sensing and monitoring, nuclear materials science, isotope and environmental science, applied nuclear physics and chemistry) and access to active and nuclear system process development facilities (available locally e.g. NEIF and PRL and those provided by partners) for hands-on skills development. We will also speed skills development by effectively exploiting training and research in numerical modelling, systems engineering, data science, AI and robotics, and leveraging our UK leading and nuclear relevant research facilities (Robotarium, CSEC, ARCHER, Lyell Centre). We will build-in systems thinking and embed the principles of sustainability (reduce, reuse, recycle, innovate) in our training programme, which will blend masters level taught courses, with upskilling (from surrogate and active work to entrepreneurship) and professional development opportunities, exploiting mobility between institutions and project partners to support bespoke nuclear skills development. We are partnering with local and national industrial partners across the civil nuclear and defence sectors, and engaging with local authorities, regulators and governments.
15	Paul Sellin	University of Surrey	This proposal outlines the establishment of a Doctoral Focal Award (DFA) at University of Surrey together with our strategic partners AWE and NPL. This 'NuclearSafe' DFA is dedicated to fostering expertise in nuclear skills with a particular focus on nuclear security and safety for the defence sector. This initiative directly addresses the urgent need highlighted in the National Nuclear Strategic Plan for Skills to cultivate a highly qualified workforce capable of supporting the UK's ambitious nuclear program, encompassing both civil and defence sectors. The DFA aims to deliver high-quality, cohort-based doctoral training commencing in autumn 2026. It will prepare graduates to address the multi-faceted challenges and opportunities within the evolving nuclear landscape. The DFA’s curriculum will centre on cutting-edge nuclear skills relevant to UK priorities in the defence sector, including nuclear security, nuclear training using augmented reality and AI, radiation detection and instrumentation, radiation protection and health physics, and radioactive waste management. The training will also emphasize national and international nuclear defence commitments, critical to national security, whilst improving the safety, sustainability and efficiency of nuclear skills delivery. Student training will be supported by lecture courses from Surrey's long-established MSc in Nuclear Science and Radiation Protection.

			The anticipated cohort size is 40 students, including 8 studentships funded by University of Surrey.
16	Robin Grimes	Imperial College London	This Doctoral Focal Award will cultivate a pipeline of subject matter experts, equipped with the technical breadth and depth, leadership, communication skills, and digital fluency needed to sustain and advance the UK's civil and defence nuclear sectors. The DFA will address current workforce needs while enabling long-term innovation, resilience, and competitiveness across the nuclear industry. The technical scope of the DFA is built on three interconnected pillars: 1. Reactor physics: which characterises the nuclear environment and informs safe reactor operation. 2. Thermal hydraulics: which determines thermal conditions and safety margins in normal operation and accident conditions. 3. Through-life structural integrity: which integrates advanced manufacturing, sensor technology, operational and monitoring data into models and simulations for reactor components. Integrated through advanced digital methods, these three pillars form the foundation of the DFA. Together they enable the development of safe, efficient, and resilient nuclear systems across large scale reactors, SMRs, AMRs, Gen IV reactors, microreactors, submarine propulsion, and other defence applications, driving innovation in system designs. The DFA will collaborate closely with key industries and will exploit synergies between the civil and defence nuclear sectors. The consortium of industrial partners provides a solid foundation for collaboration, knowledge exchange and sector wide impact. The reactor physics and thermal hydraulics pillars bring together a UK-wide academic team, drawing on the complementary expertise of Imperial College London, Bangor University, and the University of Manchester. In parallel, the development and through-life structural integrity of advanced nuclear components pillar will be a focus at Imperial, Swansea University, and the University of Bristol. This collaborative framework ensures national coverage across key technical areas, supporting the development of new nuclear engineers and capabilities across the UK.

			The core team therefore comprises academic leaders from Imperial, Bristol, Swansea, Manchester and Bangor, led by Prof Robin Grimes at Imperial College London. Affiliates (initially including Cambridge and Nottingham universities reactor physics and thermal hydraulics communities) can join the DFA at any time to lead studentships, ensuring flexible, expert-led supervision across the programme. This DFA will train more than 80 PhD students across four cohorts, each closely linked with an industrial partner. There will be opportunities for students to engage with both industrial and government stakeholders. Training will be delivered via taught courses, guest lectures, industrial placements, group projects, group activities and planned trips, workshops and conferences. The cohort-based training will deliver a pipeline of specialised engineers with the interdisciplinary breadth needed by the nuclear industry. The training programme will be co-developed and co-delivered between academic and industrial partners. The training courses will be organised into progressive tiers, ensuring that all students gain a broad foundational understanding of nuclear reactor technology, while also enabling the development of specialised expertise in their respective focus areas. These specialised courses will be made available to PhD students and staff in other DFAs. This Doctoral Focal Award represents a transformative investment in the UK's nuclear future, uniting academic excellence, industrial leadership, and digital innovation to provide the next generation of nuclear engineers with both deep expertise in their PhD topics and the cross-cutting expertise to deliver a UK nuclear programme over the next 50 years. Through its interdisciplinary technical scope, national collaboration, and industry-integrated training model, the DFA will deliver the skills, knowledge, and capabilities required to ensure the long-term sustainability, safety, and competitiveness of the UK's civil and defence nuclear sectors.
17	Paul Bremner	University of the West of England	This DFA will deliver 40 doctorates skilled in robotics and autonomous systems (RAS) to meet the unique challenges of monitoring, inspection, maintenance, security and logistics in a nuclear setting. Doing so will facilitate a step change in the breadth of applications of RAS within the nuclear sector, expanding from current activities predominantly focussed in hot cells to roles across the entire nuclear estate. It is essential to consider robotic solutions to these challenges to minimize human exposure to hazardous environments, and to increase efficiency and efficacy of operations. To be able to deliver on this potential it is vitally important that skills in RAS enter the nuclear sector. Doing so allows for the design of systems with a detailed awareness of the problem space and that comply with stringent nuclear sector regulations that are vital for safe and secure operation. The RAS skillset continues to be required for effective operation of RAS including adaptation to changing operational needs. Additionally, understanding of RAS capabilities is important for the design of new-build nuclear infrastructure (e.g., SMRs) such that

			they can be optimised for the deployment of RAS for operation and maintenance. Many stakeholders within the nuclear sector (a number of whom will engage with the DFA as partners) are already engaged with robotics research and its applications, demonstrating a need within the sector for the skills that will be developed in our proposed DFA. Core technical themes of the DFA will be radiation sensing, environmental perception and autonomous responses to the environment, robot platform design, human oversight of autonomy and (mixed) teleoperation, trustworthy autonomy, and verifiably safe systems. These core themes speak to topics identified in the call: 'robotics for nuclear applications' and 'sensor technology and autonomous systems'. There will also be elements of data and computer science that fit within the work our DFA will support. Training programme The programme will couple the innovative thinking of world-class research labs with a rigorous grounding in the challenges of the nuclear context. Graduates will combine cutting-edge robotics technological skills with deep insight into how the nuclear context uniquely shapes innovative solutions. The programme will promote student co-creation of projects in a collaborative and nuclear-focussed environment. PhD topics will be developed through a sandpit approach, with the student cohort working with industry partners to evince key thematic challenges and scope individual PhDs for each, maximizing opportunities for shared support, peer learning and knowledge transfer. The training programme will involve: 1. An intensive early-stage induction into the programme and its essential nuclear context a. Introduction to the programme b. Induction to ways of working in a nuclear environment c. Field trip to a nuclear site including "hot" working experience d. Secondment to nuclear industry partner e. Introductory project in nuclear robotics 2. A programme of continual development throughout the PhD, including: a. Research skills development including RRI, Open Research, managing relationships, robotics tools and methods, writing and endgame support b. Impact, enterprise and commercialization training c. Further industry problem-based study weeks d. Specialist taught content, drawing on modules from the partners' current MSc Robotics and MSc Nuclear Science and Engineering programmes e. Frequent networking opportunities within the cohort and beyond

			f. Annual showcase The early-stage induction activities and some of the continual development will be organized as formal credit-bearing taught units. Progression through these and other elements will be assured through mandatory annual PhD review process. Intermediate exit award routes will be provided.
18	Claire Corkhill	University of Bristol	The Nuclear Environments and Stewardship (NEST) DFA will develop highly numerate, interdisciplinary nuclear environmental doctoral scientists and engineers who will underpin the UK's progress towards a resilient clean energy landscape. The training package will be co-produced and delivered by a team of academic leaders, nuclear industrialists and national research institutes. It will provide subject specific and transferrable skills including radioactive waste disposal, radioprotection, climate modelling and adaptation, contaminated land remediation, radioecology, participatory governance, communication and ethics. NEST will address recruitment challenges head-on by attracting students from a pool of talent not typically targeted for nuclear skills. We aim to produce a network of 80 multi-skilled doctoral graduates – equipped, confident, with the skills and integrity to support policy and regulatory decisions and improve industrial practices – ready to secure the UK's nuclear future. Context: The UK's nuclear legacy stems from over 70 years of reactor development, energy generation and defence programmes, and has left complex contamination and disposal challenges. Legacy sites with persistent radiological hazards require decontamination, remediation, sustainable management and community engagement to safeguard the settlements, people and sensitive ecosystems that surround them, often taking decades to release from regulatory control. Government policy requires that the ~700,000 m^3 of radioactive waste from legacy and future nuclear operations be managed in a way that ensures environmental safety without human intervention for up to one million years. Disposal options – including geological, near-surface, and in-situ approaches — demand detailed understanding of the subsurface, robust engineering to limit groundwater ingress, prediction of radionuclide migration and governance requirements. At the same time, to achieve net zero, the UK Government is supporting construction of new nuclear power stations that will operate well into the next century. Plans include four GW-scale reactors and a programme of small modular reactors, sited in coastal regions vulnerable to flooding and sea-level rise and often near sites of conservation. Changes in global security have also prompted additional focus on growth in nuclear energy in the defence sector. The effects of

			climate and environmental change on civil and defence nuclear infrastructure are already being realised and will continue to impact the long-term operation, decommissioning, and end states of new and existing nuclear sites. The ability to model, monitor, evaluate, and mitigate these impacts — and to understand the overall environmental footprint of nuclear energy, technologies, and waste within their societal contexts — is critical to securing a resilient clean energy future. Challenge: The tension between the multi-generational timescales of the nuclear lifecycle and the short-term horizon of decision-making lies at the core of the challenge. Nuclear facilities must endure far beyond human lifespans, requiring resilience to environmental and geological processes as well as societal upheaval. Addressing this requires high-fidelity modelling and monitoring, robust material and environmental characterisation, innovative disposal and decontamination solutions, novel frameworks to comprehend socio-technical change, and careful, ethically based consideration of uncertainty to predict impacts on people, ecosystems and the geosphere. The solution is to develop custodians who can provide long-term oversight, ensure nuclear sites are protected, remediated and resilient to climate and environmental change, and to see that radioactive waste is safely disposed. This new generation of nuclear environmental scientists, engineers and social scientists will be required to communicate uncertainty to policymakers and stakeholders, engage effectively with local communities, and drive sustainable site stewardship from design, through operation, to end states. Aim: The aim of the NEST DFA is to train those nuclear custodians. Our DFA will address three key themes: (1) sub-surface radioactive waste disposal; (2) stewardship of radioactive environments and ecosystems; and (3) ensuring nuclear sites and end-states are resilient against climate change with minimal impacts on people and ecosystems. Cohorts will work across the full NERC remit, bridging into EPSRC and ESRC, becoming scientifically skilled, ethical, data-savvy, confident in communicating with a wide range of partners and audiences, and thus fully equipped to meet the needs of nuclear employers.
19	Eugene Shwageraus	University of Cambridge	Focus area: Nuclear Safety, Security and Safeguards Training and Research (NuSTAR) The UK Government has set out ambitious goals for expanding nuclear energy share in the future carbon-neutral economy. It is envisaged that nuclear energy will be used in both the conventional electricity generation sector as well as for powering energy-intensive industrial processes. It is also keenly aware of the significant costs of the decommissioning of legacy facilities and final disposal of radioactive waste.

			This training centre will focus on research and training in radiological and nuclear safety, security and safeguards. It has been suggested that safety is one of the key cost drivers for nuclear power, with extensive regulatory overview and complexity of safety systems in modern reactor designs. Mounting concerns over the efficiency of current approaches to nuclear regulation and radiological risk management have culminated in establishing the UK Nuclear Regulatory Taskforce to develop recommendations for streamlining regulatory oversight. The International Commission on Radiological Protection (ICRP) is simultaneously undertaking a review of their recommendations in light of the latest scientific evidence and understanding of radiation effects on biological systems. Furthermore, numerous nuclear newcomer countries are in the process of selecting technologies for their future power grids and fuel cycles. It is acknowledged by UK Government that this represents a unique opportunity to revive the UK nuclear industry and make it ready for exporting nuclear technologies (such as Rolls Royce SMR) and providing global nuclear fuel cycle services in a safe and societally responsible way. Newcomer countries are also working on establishing their regulatory infrastructure. While the UK's regulatory regime was founded in the early years of the nuclear age and is tightly bound up with longstanding safety law, newcomer countries have more freedom is selecting their regulatory approach. History has taught the lesson that nuclear accidents anywhere are a threat to nuclear power everywhere, so it is in the UK national interest to ensure that these new regulatory regimes work to enable the utilisation of nuclear technology while ensuring safety and security. Contributing to either the evolution of the UK system or to the creation of new regulatory systems requires nuclear professionals with a deep appreciation of the fundamentals of radiological and nuclear safety and security. This training centre will directly assist in addressing these challenges by training such professionals and conducting key enabling research. It also embraces a multi-disciplinary approach, acknowledging that a regulatory regime and its real-world outcomes can only be understood as a complex socio-technical system. The centre will build on ongoing research in participating institutions and revolve around the understanding and evaluation of risks from technical, ethical, legal and social perspectives. The proportionality of resource allocation to mitigate these risks across the nuclear fuel cycle, including waste, decommissioning and transportation will be addressed through a series of projects with involvement of nuclear safety practitioners from industry and academia. Examining alternative approaches for risk assessment and comparisons of risk management and regulatory practices across different hazardous industries will help in streamlining and harmonising these approaches, potentially leading to substantial cost savings and faster deployment. The understanding of risk management across industries is also vital for the proposed use of nuclear

			for powering industrial processes, where sites may have unprecedented combinations of high-hazard activities. The safety and security of evolving electricity grids, with smaller, more distributed generation, often dominated by renewable power producers will require new approaches for ensuring their reliability and cybersecurity. Operating reactors in micro-grids or “behind the meter” private networks for industrial clusters or data centres will have similar concerns. Equally importantly, the research and training will focus on the engineering of safety systems across the fuel cycle, including waste, decommissioning, transport and reactor design. The areas to be addressed are criticality safety, shielding and materials performance in safety-critical applications. The proposed centre will be complementary to the Nuclear Threat Reduction network which is led by the University of Bristol. The focus of our centre in this area is the integration of ‘safeguards by design’, in the concept, operation and decommissioning of nuclear facilities across all stages of civil nuclear fuel cycle. The training component will build upon already established graduate teaching infrastructure at participating institutions, including the long-running Nuclear Energy MPhil at Cambridge and the curriculum developed for NEF CDT. We intend to collaborate with other successful training centres on delivering relevant training while contributing new modules to be developed on nuclear safety regulation, risk assessment and management. We envisage training four cohorts of 10 PhD students across the participating institutions, with an EPSRC contribution of 16 full studentships.
20	Charles MacLeod	University of Strathclyde	Facing an ever more volatile and uncertain world, the UK is embarking on a growing, multi-decadal programme to realise new nuclear products, platforms and infrastructure as a national imperative. Training a new generation of Doctoral level experts, specialised in nuclear science and engineering, will be key to making this mission succeed. In addition to developing core technical and scientific expertise, success will depend on the UK’s ability to develop and translate new innovations into real-world impact, at pace. STAND UP will address these areas of urgent and strategic national importance by recruiting, developing and training the next generation of researchers, scientists and engineers in Nuclear Skills for the UK Defence Nuclear Enterprise (DNE). STAND UP will cultivate talented engineers in specialist disciplines that are essential to the mission of the DNE and, critically, provide them with a multi-disciplinary mindset and awareness that will underpin lengthy and fulfilling careers in the sector. This approach will establish a community of professionals who are capable of, and committed to, supporting the full life cycle of the nuclear deterrent and nuclear-powered submarine fleet, with a particular focus

			on enhancing through-life availability. Importantly, STAND UP will reinforce our Continuous at Sea Deterrent (CASD) and will provide underpinning capability to enable the UK to deliver the AUKUS partnership. The University of Strathclyde will collaborate and partner with the Universities of Cumbria, Derby, Lancaster, Nottingham and Surrey, the DNE and the wider supply-chain to shape and deliver internationally leading DNE focussed doctoral training. An industry shaped cohort embedding and operating model, will focus on key engineering & science topic areas across Design, Manufacturing, Operation and Decommissioning.