



United Kingdom
National Nuclear
Laboratory

Strategic Plan 2026



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Cover image: Preparing to treat materials at the Uranium Research Centre

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Becoming the Lab of the Future

In December 2024, the Department for Energy Security and Net Zero (DESNZ) published its Strategic Review of our laboratory. It was the most thorough external examination of this organisation since our formation, and it asked what, as a public sector research establishment, our mission should be, and what role we should play across the UK’s civil and defence ecosystem. Behind both sat a harder question. What does the UK government and nuclear sector need from the UK’s national nuclear laboratory to achieve its nuclear fission ambitions?

This Strategic Plan is our answer.

We are proud of what this laboratory has and continues to achieve on behalf of the nation. Our people have kept the UK’s reactor fleet running safely, underpinned the continuous at sea deterrent, supported the cleanup of the country’s nuclear legacy, and pushed at the boundaries of nuclear science, from novel medical radioisotopes to the reactors that will power Britain for the rest of this century.

Our scientific expertise supports the UK fulfilling its obligations as one of five permanent members (P5) of the United Nations Security Council, and the nation’s ability to influence standards on safeguards and support non-proliferation. We are now on the cusp of a golden age of nuclear in this country. Conditions have aligned to set up the sector to succeed, and to make a huge contribution to our economy, to our national security and to a secure, low-carbon energy system.

The Review confirmed what our partners have told us for years. Our scientific capability is world-class, and we are custodians of skills and infrastructure this country cannot afford to lose. It was equally honest about where we must improve. We own a portfolio of assets and infrastructure that is ageing, and sector-wide skills shortages have created a real challenge for us, as well as others. And demand for our work continues to grow. This plan sets out in practical terms how we will close the gap over the next five years and beyond, working with DESNZ and UK Government Investments, as well as with the wider nuclear sector.

The government has been clear about our future. We will remain a government-owned laboratory. What will change is the clarity of our relationship with government, and our focus on national priorities. Our name, United Kingdom National Nuclear Laboratory, reflects that closer relationship, as do our purpose, mission and roles set out in the pages ahead.

Our mission is twofold: to enable and deliver nuclear outcomes for government, and to support growth of the UK nuclear sector. Everything in this plan exists in service of it, from our five Science Missions to the transformation programme we call the Lab of the Future.

My thanks go to our 1,300 colleagues, whose expertise and commitment make this laboratory what it is, and to the partners across government, industry and academia who have shaped this plan through the Strategic Review and beyond. The transformation ahead of us will take the best part of a decade. What follows are our first deliberate steps.

Julianne Antrobus
Chief Executive Officer

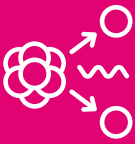


Nuclear science for the nation

The UK is building nuclear again at a scale not attempted in a generation. Large scale reactors are in construction and small modular reactors are under development, as are advanced reactors and fuels. The nation is keeping the current civil and defence fleets operating for longer, and dealing with the legacy of previous generations of nuclear power – in some cases by reusing the valuable materials in storage.

All of these programmes require science. Researchers need to experiment and gather data to understand the challenges, then develop new technologies to solve them. As the UK's lead civil national laboratory for nuclear fission, UKNNL is the beating heart of that scientific endeavour.

That is why UKNNL's strategy is structured around five Science Missions. These are the key areas of scientific need which we have identified as crucial for the success of the UK's nuclear ambitions - the areas where investment in research, innovation and capabilities will have the biggest impact across the nuclear sector.



Future Energy will ensure that we can support whatever reactor technologies will be deployed in the UK. As next-generation reactor designs are developed, we will help turn new ideas into reality, quicker. We will also retain the independent expertise to advise government, its agencies and regulators, and help them to make informed decisions.



Reactors need fuel, and advanced reactors will need advanced fuels. Our **Fuel** Science Mission will build on our long experience and deep knowledge of nuclear fuels, to ensure that the UK has the domestic capability it needs, not only to secure its own fuel supplies, but potentially to export to others, too.



Technical support is fundamental to all nuclear operations, and our **Fleet Support** Science Mission will focus on keeping our current fleets operational – both nuclear power plants and submarines – to ensure they are safe to continue running for many years to come. We will be working with others to ensure that the UK has the expertise it needs to understand and defend itself from radiological threats and to support our international obligations regarding the security and safeguarding of nuclear material.



The UK is one of the few countries to have implemented reprocessing of used nuclear fuel at scale and, as a result, is now the custodian of a significant inventory of separated plutonium. Last year, the government made the decision to immobilise this material ready for disposal in a Geological Disposal Facility. That programme depends on **Plutonium Science**: a sophisticated understanding of this exotic material, how it behaves and how it can be prepared for disposal, safely and securely.



The rest of the UK's legacy sites and materials need to be decommissioned and managed responsibly. As our scientific understanding increases, we are finding opportunities to deal with the challenges more efficiently, or even to bring material back into use, for example as valuable radioisotopes that could be turned into future cancer treatments. This is what our **Environmental Restoration and Health** Science Mission is all about.

“

Together, these Science Missions set the direction for the laboratory. They identify where we will lead, working at the cutting edge of nuclear innovation. They are the subjects where we will have authoritative expertise, to be able to advise government and others. And they are the areas where we will work with our partners in academia and industry to develop UK capability as a whole, ensuring that our sector can thrive, nationally and internationally.”

Dr Gareth Headdock
Chief Science & Technology Officer and Deputy CEO



Introduction to our Strategic Plan

UKNNL is a public sector research establishment, custodian of some of the UK’s most critical nuclear skills and capabilities. This is our Strategic Plan for 2026 to 2031, our roadmap to ensure we continue to be the laboratory that supports a truly prosperous UK nuclear nation.

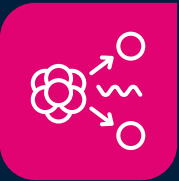
This plan is framed by the Strategic Review of the laboratory that the Department for Energy Security and Net Zero (DESNZ) published in December 2024. The Review set out to answer three questions. What should the mission of UKNNL be? What role should UKNNL play in the UK nuclear civil and defence ecosystem? And what does UKNNL require to enable the success of the government’s nuclear fission ambitions?

Its findings reaffirmed our standing as a laboratory deeply valued by the sector, with scientific capability repeatedly

praised as world-leading, and particular strengths identified in capability, flexibility, thought leadership and convening power.

The 2024 Strategic Review set out our mission in two parts. We are here to enable and deliver nuclear outcomes for government, and to support growth of the UK nuclear sector. It defined six roles setting out how and why we will achieve that mission, and the position we occupy within the UK’s nuclear ecosystem.

At the heart of our Strategic Plan sit five Science Missions, which outline what we are doing to be of most value to the nation: Future Energy, Fuel, Fleet Support, Plutonium Science, and Environmental Restoration and Health. The nuclear sector is evolving, and through these Science Missions we will drive research and build capabilities which ensure we evolve with it.



Future Energy



Fuel



Fleet Support



Plutonium Science



Environmental Restoration and Health

The 2024 Strategic Review was just as clear about what holds us back; becoming what the sector needs also means changing how we work. The final section of this plan sets out the path to being the Lab of the Future. We already know that investment comes first, in our capabilities and facilities and in the Laboratory Directed Research programme that sustains them. Partnerships are also crucial, with academia and industry at home, and with our international peers. We are also looking inward, nurturing an ambitious transformation programme with a renewed focus on our people, culture

and inclusivity, as well as commitments on sustainability, social value and to strengthening our supply chain. Our transformation will make our processes more efficient, the way we manage our data more digitally connected and secure, always striving to make things easier and quicker for our people to do what they need to do.

This Strategic Plan is ambitious, realistic, and importantly, grounded in the findings and recommendations of the 2024 Strategic Review, and built around the science that matters most to the UK.

UKNNL: working in a UK nuclear ecosystem

The future success of the UK’s nuclear ambitions will depend not only on individual organisations, but on the strength of the system that connects them.

UKNNL occupies a unique position within that system, playing a critical role alongside other national laboratories and public bodies, industry and academia, in creating, sustaining and renewing capabilities upon which future nuclear programmes depend. Our facilities complement the wider UK research infrastructure, which excels in early-stage discovery and academic innovation. We provide a national-scale, high-activity, sovereign and industrially focused environment, a foundation on which the UK can deliver its nuclear mission with confidence and pace.

Our heritage has its roots in the earliest stages of nuclear in the UK, and with that comes an expertise across the nuclear fuel cycle that cannot easily be replicated. As a public sector research establishment we are independent, not driven by profit or to disrupt the commercial market. We are the scientific integrator for the UK nuclear sector, combining world-class expertise, nationally important facilities and strategic partnerships to solve the most complex challenges facing the nation. Our science provides evidence and understanding that derisk our customers’ programmes, and enables us to speak authoritatively on safety, security and non-proliferation matters on a global stage.

Rather than replicating capability, we create value by enabling others to access, apply, and also build upon our science. We build pilot scale capability because we have the experience and pedigree in doing that, but also because it is a key part of our role as a scientific integrator, taking technical solutions into the real world and helping them scale. Our laboratories are located in the north-west of England, but our reach and connections extend throughout the UK and internationally.

The UK’s civil and defence nuclear capabilities, which share many requirements for technology, expertise and infrastructure, are the bedrock of the country’s energy and national security. Our work spans the civil and defence nuclear fission landscape, underpinning the sectors through science that helps to keep the lights on and submarines at sea. Our science also helps to clean up the legacy of past generations and provides material that could become new treatments for cancer.

Over the next decade, this role will become ever more important as the UK pursues simultaneous goals in reindustrialisation, decarbonisation, energy and national security, and with significant challenges common to both civil and defence sectors. UKNNL will be at the centre of this effort, transforming scientific excellence into national impact.



Preparing samples for analysis at the Uranium Research Centre

The evolving nuclear landscape

Since our last Strategic Plan in 2021, the nuclear sector has changed significantly. Geopolitical events have demonstrated the need for both national and energy security, while decarbonisation of our energy system remains high on the agenda. The government recognises nuclear as part of the solution to these challenges and an engine for economic growth, and its policy has evolved to reflect that.

The existing advanced gas-cooled reactor (AGR) fleet, operated by EDF, is currently planned to shut down in the early 2030s. They have already been extended well beyond their original lifetimes, and the possibility remains of further life extensions. This would help to close the ‘energy gap’, getting the most out of these pillars of low-carbon electricity, before the next generation of reactors come online. Once they are finally shut down, they will transition to defueling and decommissioning, creating a new set of challenges, but also an opportunity to leverage the knowledge and expertise built up through years of reactor operation.

Hinkley Point C is under construction and investment in Sizewell C has been confirmed. Beyond them will come a fleet of small modular reactors from Rolls-Royce SMR, starting at Wylfa in north Wales. Planning rules have been revised to allow more flexible siting, and a framework is in place for privately led projects to deploy advanced reactors. The investment and safety cases for these technologies must be based on scientific evidence.

Interest is growing globally in advanced technologies such as high temperature gas-cooled, molten salt and fast reactor designs, and in uses of nuclear beyond electricity, from hydrogen production to industrial heat and maritime power. This drives demand for advanced fuel cycle technologies, such as high-assay low-enriched uranium (HALEU) and coated particle fuels (CPF). Advanced technologies also present new challenges in safety, security and non-proliferation that need to be overcome. Testing and qualification provide the scientific evidence base needed before anything can be demonstrated or deployed.

Additionally, government has committed to two new fleets of nuclear-powered submarines and is looking at options for a domestic nuclear fuel cycle for defence purposes, alongside the feasibility of microreactors for surface ship propulsion and remote base power. Government has stated it will continue to increase collaboration and alignment between civil and defence capabilities to maximise the benefits: driving economic growth, boosting the role of nuclear energy, and developing innovative nuclear

technologies – all while continuing to lead the way for global standards in nuclear security, safety, and non-proliferation.

The UK holds the world’s largest inventory of civil plutonium, a by-product of earlier reactor operations. Government policy is to immobilise that material and dispose of it in a geological disposal facility (GDF), putting it safely beyond reach for the long term. Decisions and progress on this depend on a sovereign capability in plutonium science, specifically the ability to understand and handle plutonium at different scales.

The Nuclear Decommissioning Authority’s mission to clean up the UK’s earliest nuclear sites continues at pace. It includes dealing with legacy storage and buildings at Sellafield, safely decommissioning first and second-generation nuclear reactor and early research reactor sites, as well as the GDF programme. Research into how legacy nuclear material can be safely retrieved, handled, and eventually disposed of remains one of the most important things this laboratory does.

The Nuclear Regulatory Review 2025 made sweeping recommendations on how the UK’s regulatory system can support the pace of nuclear deployment that is required, and government has committed to implementing it in full. We recognise many of its findings in our own challenges, and we welcome it as an invitation to be the laboratory the sector needs us to be, bringing the tempo of scientific and technological innovation into nuclear-licensed environments, without compromising on safety and security.

Together, these pressures are why government commissioned the 2024 Strategic Review of UKNNL, and why this plan sets out clearly how we will evolve to meet them. A leading nuclear nation needs a thriving and capable national fission laboratory behind its programmes, providing the science, research and data that enable its programmes to succeed.



Technicians in the pilot plant at the Uranium Research Centre



A few years ago, there was still a lot of uncertainty about the UK’s nuclear programme. Now, government policy is a lot clearer, and we know what’s happening across new build, defence and decommissioning. That changes what the national laboratory has to be ready for.”

Andrew Howarth
VP Strategy



Evolution of UKNNL's mission and role

Government reaffirmed in the 2024 Strategic Review our important position in the nuclear ecosystem in delivering national priorities on its behalf, and redefined our mission, our role and our identity accordingly. Our purpose remains: nuclear science to benefit society. Our twofold mission is to enable and deliver nuclear outcomes for government, and to support growth of the UK nuclear sector.

The 2024 Strategic Review also defined how we fulfil that mission, through six roles:

Members of the residue treatment team preparing reference materials at the Uranium Research Centre

- 1

Be a custodian of national capabilities and infrastructure critical for national and energy security

Our facilities and capabilities are unique and define us as a national laboratory. Our goal is to deliver world-class nuclear research capability by transforming the UK's sovereign research infrastructure, as well as advancing innovation and developing the expertise that underpins the nation's nuclear ambitions.
- 2

Become government's lead civil technical and strategic advisor for nuclear fuels and nuclear materials

Our expertise across the nuclear fuel cycle enables government to be an intelligent customer of nuclear technologies. The advent of new, advanced fuels brings with it new scientific challenges and new safety, security and non-proliferation considerations. Our goal is to maintain and develop capability which ensures policy, investment and deployment decisions are grounded in rigorous science and independent evidence, with national capability that lasts standing behind them.
- 3

Carry out research to continue securing the safe operation of nuclear plants domestically and internationally

Our ability to handle the most highly radioactive materials at scale enables us to conduct research and provide data essential to the continued safe and secure operation of nuclear plants. This includes the UK's operating reactors and nuclear-powered submarines, and is of high strategic importance to the UK. Our goal is to maintain this sovereign capability now and in the future, strengthening the nation's resilience to arising situations.

- 4

Deliver practical nuclear research and enable decommissioning programmes

Our capabilities and knowledge developed over several decades are vital to supporting the NDA's nationally important mission to clean up the UK's nuclear legacy. Our goal is to be the UK's strategic partner for decommissioning science and innovation. The value we add is through our ability to handle and conduct scientific research at scale on hazardous legacy materials, such as plutonium, to replicate chemical processes through pilot scale plant, and act as systems integrator to translate decommissioning technologies into deployable solutions.
- 5

Provide expertise and facilities to be a platform for the private sector to accelerate the deployment of technology to market

We are at the centre of the nuclear research ecosystem, and our public, independent status means we have a duty to support industry where best we can. Our goal is to be the trusted national platform that bridges nuclear innovation and commercial deployment, unlocking private-sector investment and accelerating delivery of nuclear technologies.
- 6

Champion and nurture advanced nuclear skills

Advanced nuclear skills take time to develop, and working on research programmes in nuclear facilities is the optimal route to achieve this. Our goal, on behalf of the nuclear sector, is to develop the scientists, technical specialists and future leaders needed to achieve the nation's civil and defence nuclear ambitions.

Strategic Plan – aligning to UKNNL’s mission and role

Why	Purpose	Nuclear science to benefit society				
	UKNNL's mission Defined in the 2024 Strategic Review and building on our purpose, our twofold mission galvanises UKNNL into a nationally focused organisation.	Enable and deliver nuclear outcomes for government		Support growth of the UK nuclear sector		
	UKNNL's roles Set out in the 2024 Strategic Review, our roles position UKNNL within the nuclear ecosystem, providing direction and clarity on the nature of the activities we will undertake to deliver our mission.	Be a custodian of national capabilities and infrastructure critical for national and energy security Become government's lead civil technical and strategic advisor for nuclear fuels and nuclear materials Carry out research to continue securing the safe operation of nuclear plants domestically and internationally Deliver practical nuclear research and enable decommissioning programmes Provide expertise and facilities to be a platform for the private sector to accelerate the deployment of technology to market Champion and nurture advanced nuclear skills				
What	Science Missions How we translate our purpose and mission into a scientific programme. Each reflects a challenge or opportunity of national importance, and where the unique scientific work we will undertake will have the greatest impact.	Future Energy Fuel Fleet Support Plutonium Science Environmental Restoration and Health				
How	UKNNL's evolution We are defined by our capability: our centres and people. We will use Laboratory Directed Research to develop that capability further, and a transformation programme to ensure that everything works together. This is how we will achieve our Science Missions, carry out our mission and roles within the UK nuclear sector, and ultimately fulfil our purpose, benefiting society.	 Centres and professional hubs  Laboratory Directed Research  People  Transformation				

Our Science Missions

Our strategy is centred around our five Science Missions.

Each mission encompasses an area of national importance that UKNNL will focus on over the period of this plan and into the future. Together, they are how we align our research and capability development with government priorities and needs of the sector, and how we will be held to account for what we contribute to the nation.

These missions shape how we plan our infrastructure and where we invest in new capability. They sit at the core of our strategy explaining what we will do during the next five years for each mission, and they give us a way of judging what we are contributing nationally.

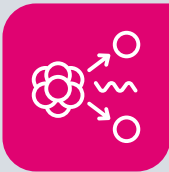
“

The five Science Missions are how we turn our purpose into a scientific programme — five clear reasons why our people get up in the morning, and five clear reasons why the UK should be glad they do.”

Dr Gareth Headdock
Chief Science & Technology Officer and Deputy CEO



The Coated Particle Fuel rig at the Uranium Research Centre



Future Energy

Accelerating the science behind future reactors and systems.

The mission

To ensure the next generation of nuclear energy systems are deployed based on scientific evidence and understanding, strengthening the UK's energy security and its clean energy ambitions, with long-term national prosperity following from both.

Sector challenges and why our science matters

The UK's ambitions for energy and national security, clean power and economic growth rely on new nuclear power coming online, from large-scale plants to next-generation technologies. A wide range of advanced nuclear technologies such as small modular reactors (SMRs) and advanced modular reactors (AMRs) are being developed globally, and the UK's Advanced Nuclear Framework provides the private sector a route to deploy these in the UK. Government and its agencies such as Great British Energy - Nuclear will need to decide which proposals to support, and regulators such as the Office for Nuclear Regulation (ONR) will need to assess the safety and security of the technology and specific projects. Evidence and knowledge is what allows informed decisions to be made.

However, the knowledge and capability behind these reactors currently sits within the private sector companies developing them, and the biggest barrier to their deployment is uncertainty. A sovereign national scientific capability in reactors can facilitate their deployment by reducing the uncertainty with science, supporting both government and industry.

By providing independent knowledge and evidence, UKNNL can reduce the risk in these programmes, solving technical challenges for developers and enabling them to deploy sooner than they otherwise could. This includes advising on the full nuclear fuel lifecycle, from fuel that goes into a reactor, its operating performance, and crucially how to safely and securely manage and dispose of fuel once it is used.

What we will do over the next five years

Action 1.	Retain and develop an independent, sovereign UK capability across a range of reactor technologies
Action 2.	Put scientific evidence and advice behind the decisions that government and the private sector take on safely and securely deploying advanced nuclear technologies in the UK
Action 3.	Enable the next generation of nuclear technologies by supporting innovators and developers as they progress through the Advanced Nuclear Framework, accelerating the route from scientific discovery to operational deployment

The outcome in the next five years

Regulators and operators make informed decisions, and future reactor systems are on the pathway to deployment on a robust scientific basis. Advanced nuclear technologies that meet the UK's requirements move faster from concept to deployment, across civil and defence alike. Reduced uncertainty and derisked deployment pathways enable developers to attract private-sector investment into the sector, and economic growth follows for the UK. UK supply chains are strengthened, with new products and services reaching commercial markets.

Priority initiative: the Advanced Nuclear Framework

DESNZ published the Advanced Nuclear Framework in February 2026 to accelerate privately led advanced nuclear projects, from SMRs and AMRs through to microreactors. It names our capabilities among the enablers government can offer, and encourages developers to come to us for R&D and analytical work such as post-irradiation examination. Our recent Memorandums of Cooperation with Rolls-Royce and the Japan Atomic Energy Agency (JAEA) are one example of what that looks like in practice, and as an independent national laboratory we can support any developer and any technology.

<https://www.gov.uk/government/publications/advanced-nuclear-framework>



Working in partnership with our customers matters to us. When we build relationships around a shared outcome, both sides get more from them."

Dr Paul Nevitt
VP Science & Technology, Vice Chair
Generation IV International Forum





Fuel

Leading the R&D to secure a sustainable fuel supply for the UK’s reactors, today and tomorrow.

The mission

To ensure that the UK has a secure and sustainable domestic nuclear fuel capability, to power the reactors running today and the ones in the future, as well as create the potential to export to allied nuclear nations.

“

We’re developing nuclear technology that is cleaner, safer and helps the UK achieve its energy ambitions. I’ve been given the opportunity to develop my skills to take the potential of nuclear energy even further, for an even greater benefit to society in the future.”

Michelle Bond
Materials Scientist

Sector challenges and why our science matters

The supply of fuel for the UK’s nuclear reactors is a question of national energy security. It is imperative to have an enduring sovereign capability in fuel manufacture, fuel performance, and spent fuel management. Our role includes being the government’s technical authority on nuclear fuels. Fuel cycle capability is at the heart of our organisation, built on decades of experience supporting UK fuel programmes, including manufacturing, reprocessing and waste management.

We provide quality assurance services to Springfields Fuels Limited, and operate one of the most advanced fuel development laboratories in the world, housing the UK’s only IAEA Collaborating Centre on Advanced Fuel Cycles. Through our science we sustain and develop the expertise, facilities and technical leadership behind sovereign fuel cycle capability, so the country depends less on overseas capability for its fuel supply chain.

The advanced gas-cooled reactor (AGR) fleet operating today is expected to retire in the early 2030s. The UK will then, at least for an interim period, only be operating pressurised water reactors (PWRs), with fuel imported from abroad. Developing a sovereign capability in PWR fuels will close that gap.

Looking further ahead, as advanced reactors are developed and deployed, they will need advanced fuel cycles and fuel technologies, including a supply of high-assay low-enriched uranium (HALEU) fuel. Developing a domestic advanced fuel industry will enable us to avoid problematic international supply chains and create export opportunities to allied

nations. Meeting that challenge will take full-scale commercial manufacturing capability, underpinned by science.

It will need irradiation facilities to test and qualify new fuels and materials, and active handling facilities to verify how fuels have performed once they leave a reactor. Civil expansion and defence fuel requirements will mean skills and learning moving between the two sectors, with parts of the supply chain integrated across them, which strengthens the case for sovereign front-end fuel cycle capability.

What we will do in the next five years

- Action 4.

Work with government to define and deliver the technical authority role, benchmarking against other examples of technical authorities nationally and internationally, and agreeing with government a clear mandate, capability roadmap and long-term vision for UKNNL as the UK’s technical authority for nuclear fuels and materials
- Action 5.

Enhance our PWR fuel capability to support safe and reliable operation of the nation’s reactors, exploring with government the need for an underpinning PWR fuel cycle R&D programme as the UK transitions to a PWR fleet

- Action 6.

Enable a national HALEU capability by 2031 through the deconversion research we are undertaking for DESNZ
- Action 7.

Qualify a process for manufacturing CPF at pilot scale, working with industrial partners on a sovereign design
- Action 8.

Maintain capability in advanced fuel cycles, so the UK’s future civil and defence requirements have options standing behind them

The outcome in the next five years

The UK will have a strategic sovereign capability across the entire nuclear fuel cycle for its operating and future planned reactors, enhancing its energy security. Our domestic HALEU supply chain means the UK and western nations can access this material without relying on Russian supplies, and our leading position on CPF manufacturing gives us a chance to compete in emerging global markets for advanced fuels. Industry will also have a clearer route to deploying advanced reactors relying on these fuels. The UK is recognised internationally for its fuel-cycle expertise and R&D capability, giving government and regulators the evidence to underpin the UK’s fuel cycle options, and moving the country closer to energy security and independence.

Priority initiative: the HALEU programme

DESNZ is investing £300 million in a HALEU programme to establish a domestic supply of uranium, enriched to between 5 to 20%, to power the next generation of advanced reactors in the UK and overseas. Supporting this ambition, we are developing a demonstration facility for HALEU deconversion: an important step in the process, following enrichment, where the HALEU is turned into a form suitable for fuel manufacturing. This work is currently in the design stage, addressing the technological and engineering challenges of producing material with the required quality at scale.

High temperature gas-cooled reactors (HTGRs) are one of the advanced reactor technologies that will use HALEU, in the form of CPF. This novel fuel type, which involves multiple layers of protective coatings around tiny uranium kernels, requires very precise engineering and manufacturing. Supported by DESNZ, we have established a pilot scale facility at our Uranium Research Centre at Preston, demonstrating the process and aiming to improve manufacturing and quality assurance methods and to produce fuel ready for irradiation testing.



Fleet Support

Keeping the UK's nuclear systems running safely and securely, through rigorous science and understanding.

The mission

To make sure the UK's nuclear assets, along with its infrastructure and programmes, are supported by the science and evidence needed for safe and reliable operation.

Sector challenges and why our science matters

Public confidence underpins the nuclear sector, and confidence is built on evidence. The AGR fleet enabled the UK to shut down its coal-fired plants and is still reliably generating low-carbon electricity. Its continued operation depends on the condition of the graphite in the reactors' cores, which cannot be observed in-situ. Instead, highly radioactive samples must be taken and examined in UKNNL's specialist active handling facilities. The data and analysis we provide have enabled life extensions of four stations to 2030, and possibly beyond if the evidence continues to support it.

The same questions arise in defence, with the UK's nuclear-powered Vanguard submarines safely operating beyond their initial service life until Dreadnought enters service in the 2030s. Scientific examination and analysis of irradiated fuels and materials keeps the fleet at sea and is therefore of strategic national importance. In the longer term, we will have a critical role in developing an enduring, resilient active handling capability.

In an increasingly hostile world, the UK faces potential threats of a nuclear or radiological nature, and must have the ability to understand, mitigate and respond to them. Our scientific expertise across the nuclear fuel cycle, coupled with our ability to handle, investigate and understand nuclear materials, means that we can provide strategic and technical advice on security, safeguards and non-proliferation to the UK government and international organisations to support global threat reduction efforts. For example, UKNNL currently leads the UK's support to the IAEA's safeguards programme, working with others in the sector to ensure effective global safeguarding measures.

What we will do in the next five years

Action 9.	Continue providing post-irradiation examination (PIE) and other services to enable EDF to extend the lifetime of its AGRs for as long as they remain safe and economic to operate
Action 10.	Provide PIE and other services to the Ministry of Defence (MOD), supporting the current fleet of nuclear-powered submarines
Action 11.	Work with partner organisations to provide the UK with an effective and efficient nuclear forensics capability, enabling an emergency response that can handle and identify radiological materials
Action 12.	Provide trusted leadership on nuclear security, safeguards and non-proliferation, supporting government and industry in meeting national and international obligations

The outcome in the next five years

The UK keeps its remaining AGRs operating for as long as they remain safe to do so, as validated by UKNNL's examinations, contributing to clean UK energy supply. Additionally, defence reactor programmes remain supported, and the current submarine fleet continues to operate successfully while the new platforms are being constructed. The UK has an enhanced ability to respond swiftly and efficiently to any incidents involving radiological material on UK soil, and is highly respected for the support it provides to the IAEA's safeguarding mission. The requirements to maintain these capabilities are understood and planning is underway to invest in the next generation of infrastructure to provide them.

Priority initiative: post-irradiation examination

UKNNL is enabling critical national missions, by providing post-irradiation examination (PIE) capabilities that support AGR fleet operations and the UK submarine fleet, as well as the NDA's decommissioning mission. Every extension to an AGR's lifetime depends on evidence that only PIE can produce. We examine irradiated fuel and materials taken from reactor cores for EDF and for the MOD, in the Active Handling Centre at Windscale - a unique and specialist facility that is the only place in the UK that can do this work. The evidence gathered by this work is what lets regulators and operators decide whether a reactor is safe to keep running. As part of our partnership with these organisations, we are also continually enhancing our capability, upgrading the facility and developing new examination tools and techniques, to provide an improved service and even better data.



Being part of a team that helps ensure the fleet operates safely is a real source of pride, especially so early in a career. The data we produce directly feeds into whether a station can keep generating low-carbon electricity safely."

Ruby Greis
Graduate Materials Scientist



Plutonium Science

Developing and sustaining the UK's sovereign scientific capability for plutonium management.

The mission

To enable the safe, secure and sustainable stewardship of the UK's plutonium inventory and other nationally important nuclear materials.

Sector challenges and why our science matters

The UK has previously reprocessed spent fuel from older reactors, and fuel from overseas, separating uranium to return to the fuel cycle. This also resulted in an inventory of around 140 tonnes of plutonium with no planned use for it. The material is hazardous to health and difficult to handle. Managing it safely and securely is a long-term national responsibility and deciding what to ultimately do with it is a question of strategic importance.

Government answered this question in 2025: the inventory will be disposed of underground in a Geological Disposal Facility (GDF) which has yet to be built. Before that can happen, the material has to be immobilised: converted into a stable form that will not degrade over time and that would be extremely difficult to turn back into a usable state. Two options are being considered for this: hot isostatic pressing (HIP) and disposal mixed oxide (DMOX). Both need developing and testing before they can be implemented at scale, and we will work with the NDA to support this R&D programme.

In the meantime, the inventory must remain safely and securely stored. This requires specialist facilities and the ability to monitor the material and repackage it where necessary. Our work with the NDA and Sellafield has already saved the UK hundreds of millions of pounds in plant costs and operational efficiencies, by developing and applying a fundamental understanding of plutonium behaviour in long-term storage.

The decisions taken about the plutonium inventory now will shape the options open to the UK for decades to come. Our role is to maintain and develop the scientific capability behind

those decisions, retaining sovereign expertise in nuclear materials management, reducing long-term risk and keeping future strategic choices open.

What we will do over the next five years

Action 13.	Continue to support current Sellafield Ltd programmes (funded by the NDA) ensuring safe interim storage of plutonium through a deep understanding of its bulk properties and behaviour
Action 14.	Support the NDA's vital plutonium mission by conducting the R&D underpinning the two immobilisation options, HIP and DMOX, providing the scientific basis for the NDA to select the best option and to inform future plant design
Action 15.	Work with the NDA, Sellafield Ltd, AWE, academia and government to implement the recommendations of UKNNL's Plutonium Technical Strategy, aiming to ensure a UK sovereign capability in plutonium science and further develop plutonium handling and analysis capability to support future programmes

The outcome in the next five years

The UK holds the capability and expertise to steward nationally important nuclear materials safely and securely for the long term. Its inventory remains safe in interim storage, and the evidence behind the immobilisation decision is in the NDA's hands, so that it can make the right choice between HIP and DMOX. With the decision made, the design work is well underway on the plant that will carry out the process at scale, again informed by the data collected during the development and testing of the process.



Plutonium is a fascinating element to work with. There are very different challenges at different scales, small samples versus big samples. We have the only civil laboratory in the country that can do the science at scale."

Anthony Banford
Chief Technologist and Senior Fellow

Priority initiative: the plutonium immobilisation R&D programme

Government has decided that the UK's plutonium inventory will be immobilised and disposed of underground. The NDA has the responsibility for this programme, and its first task is to choose how, selecting a suitable technology and process for immobilisation. The NDA's £154 million R&D programme, announced in August 2025, is developing and testing both options, HIP and DMOX, so that the decision can be made based on solid scientific evidence and data. UKNNL is a key partner in the programme, using the significant capabilities we have in plutonium management and R&D at Central Laboratory (which we are renaming the Nuclear Materials Research Centre) to develop and test the processes, and working with industrial partners and academia to develop the wider knowledge and capability that will be needed to scale the chosen option to an industrial solution once it is selected.



Environmental Restoration and Health

Leading on the science to safely manage, decommission and clean up the legacy of the past, including reusing valuable materials for new purposes.

The mission

To reduce the UK's nuclear liabilities and protect the people and places around them, with science guiding how that work is done.



Our scientists and engineers investigate new methods to remove radioactive contamination, reduce waste volumes, recover valuable materials and improve the efficiency of waste treatment processes.”

Genevieve Boshoff
Capability Leader

Sector challenges and why our science matters

The UK was a pioneering nation in nuclear research, reactors and fuel cycles. The legacy of that is a diverse estate of historic sites, facilities and materials requiring long-term clean-up and remediation. The NDA and its subsidiaries have the responsibility to clean up old sites and facilities, reduce hazards, and manage and dispose of waste. This multi-decade programme is one of the most technically complex in the world, and must be done as efficiently and cost-effectively as possible, while protecting people and the environment.

Our role is to deliver practical nuclear research, in partnership with the NDA and its subsidiaries, to enable and enhance their decommissioning programmes. We apply science and innovation to the stewardship of those liabilities, from waste management through to hazard reduction, finding technical solutions to understand and reduce the risks, safely and securely.

Our facilities include ‘chemical twins’ of processes that operate on the Sellafield site, replicating them in a laboratory environment. This allows us to develop a deep understanding of the complex chemistries that must be managed, and design and test improvements. The insight from this work helps Sellafield Ltd to keep making progress, even when the nature of the challenges change.

What was once regarded as waste is increasingly understood to contain materials of real value: rare radioisotopes that could become targeted cancer treatments, or power space exploration missions. Accessing these materials is scientifically demanding, requiring them to be separated and purified to a rigorous standard that allows reuse. Our technical capabilities, developed through decades of experience in handling nuclear

fuels and materials, gives us a unique opportunity to develop the methods needed. Solving this challenge has a double advantage: reducing the volume of waste, and turning a liability into an asset to benefit the nation.

What we will do over the next five years

Action 16.	Further strengthen our partnerships with the NDA and its subsidiaries such as Sellafield Ltd, improving our collaboration and ways of working to support their mission
Action 17.	Support safe hazard reduction across the NDA estate, providing essential scientific advice, research and technical services that underpin current operations, remediation and the design of future plants and processes
Action 18.	Provide the scientific evidence underpinning the safe storage of spent nuclear fuel at Sellafield, allowing the current reactor fleet to operate for longer
Action 19.	Unlock new value from the nuclear sector, by developing scientific processes to recover high-value radionuclides from nuclear materials and waste streams, supporting industry plans for commercial-scale production of novel cancer treatments

The outcome in the next five years

The hazards at Sellafield and other NDA sites are reduced significantly, using more efficient and cost-effective methods, saving the taxpayer millions of pounds per year. Nuclear operators are able to continue generating cheap, low-carbon electricity for the UK, confident that spent fuel can be stored safely at Sellafield. A circular economy has emerged where valuable materials are being harvested from waste inventories and put to better uses. A vibrant radiopharmaceutical research community is growing in the UK, developing new targeted cancer treatments using radioisotopes provided by UKNNL.

Priority initiative: NDA Group Strategic Partnerships - Sellafield Technical Services Agreement & NDA Group Lab Related Services Framework

We have established strategic partnerships to provide long-term support to the NDA Group's missions and strategic outcomes (including Nuclear Restoration Services, Nuclear Waste Services, Nuclear Transport Solutions and Sellafield Ltd). Examples of how we will support Sellafield Ltd in line with its commitments to the UK to be achieved by 2030 are:

- **Spent Fuels** - including the Post Storage Examination / Active Corrosion projects which support Sellafield's spent fuel storage programme
- **Nuclear Materials** - including the safe storage and disposition of plutonium (included in our Plutonium Science Mission) and uranium
- **Site Decommissioning and Remediation** - including waste exports from Magnox Swarf Storage Silo and support to the Sellafield Site Ion Exchange Effluent Plant (SIXEP) and the future SIXEP Continuity Plant
- **Integrated Waste Management** - including the continued operation of the Vitrification Test Rig to support the Waste Vitrification Plant, and support to the Box Encapsulation Plant

Our strategic partnerships across the NDA Group enable us to foster close working arrangements between national bodies, and to develop shared outcomes aligned to national missions.

Achieving our Science Missions

Our Science Missions set out what we will do as a national laboratory to support the UK’s current and future nuclear programmes. The following pages explain how we will achieve those Science Missions.

We are defined by our capability, and our capability combines two things: unique facilities and world-class people. The achievement of our Science Missions will therefore be driven by continued investment in facilities and people.

Our laboratories will be upgraded, turning them into mission-driven research centres, and we will also attract and develop great scientific talent, empowering our scientists to work at the cutting edge of nuclear science through internal investment in our Laboratory Directed Research Programme.

Behind them sits the organisation itself, supporting the important and impactful scientific work they do through a programme of transformation which is already setting us out on the first steps of a journey towards being the Lab of the Future.

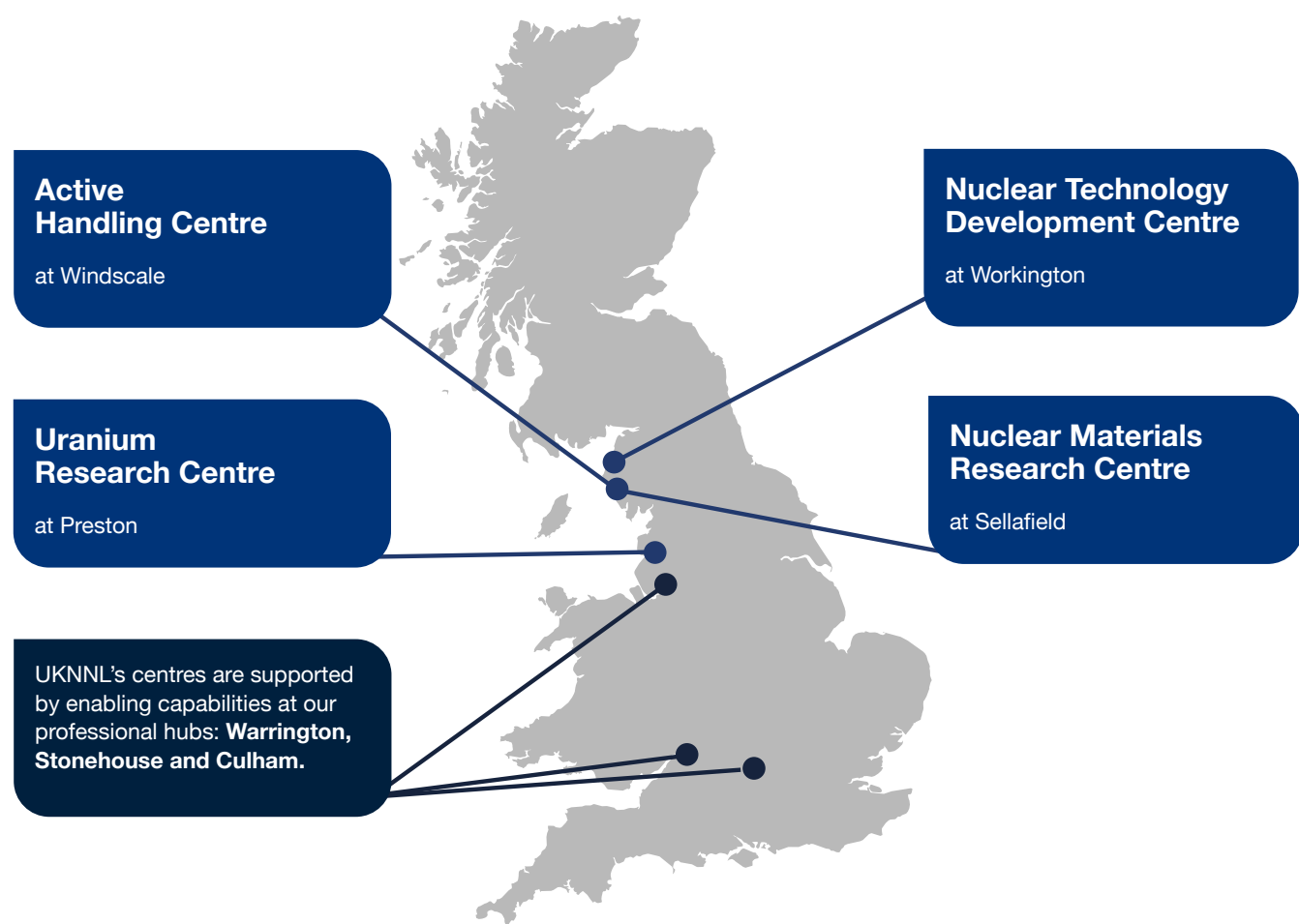


Safe and secure nuclear operations are the foundation of everything we do. Maintaining the highest standards protects people and the environment around them, and it is what allows us to deliver nuclear outcomes for government and support growth of the UK nuclear sector. Whatever role we are performing on behalf of the nation, safety and security will always be the underpinning principles.”

Mike White
Chief Nuclear Officer



Enhancing our research centres



Our facilities are fundamental to who we are. It is the unique combination of scientific infrastructure and equipment, located on nuclear-licensed and conventional sites, which enables our people to do work that no other organisation in the UK can.

Our mission sets out our role as custodian of national capabilities and infrastructure which are critical for national and energy security. It is our responsibility to maintain and upgrade this infrastructure, and to understand the future infrastructure needs of the UK’s nuclear programmes, so that when a programme of national importance needs a facility to support it, that facility is there and ready.

Our goal is to transform the UK’s sovereign research infrastructure into a world-class nuclear research capability, driving innovation and expanding the expertise upon which the nation’s nuclear ambitions rely.

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| Action 20. | We will create a unique identity and purpose for each of our sites, with these newly named ‘centres’ aligned to the Science Missions and national programmes they each support. We want to ensure everyone understands where our experts and specialisms are and how vital they are in underpinning the UK’s nuclear ambitions. |
| Action 21. | We will unlock the potential of our centres through considered investment in maintenance, modernisation and capability enhancement, aligned with the requirements of national programmes and in a way which provides value for money for the UK, ensuring our high-value real estate serves the sector as well as it can. |



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There are things this country can only do inside these four centres. The facilities matter, but why customers come to us is for the combination of this infrastructure and our technical capability, and it's our job to make sure those who need this expertise know where to find it.”

Wayne Muckley
Chief Operating Officer



Inspecting fuel in a highly protective facility at the Active Handling Centre

Active Handling Centre

Our Active Handling Centre at Windscale, located on the Sellafield site, is uniquely capable and flexible, and the only place in the UK which can handle and conduct scientific investigative work on large-scale and highly radioactive materials. This post-irradiation examination (PIE) capability supports multiple programmes of national importance, including the propulsion of the Royal Navy's submarine fleet providing the UK's continuous at sea deterrent, and safe continued operation and life extension of EDF's AGR fleet. It is our primary facility for achieving our Fleet Support mission. Additionally, it supports the NDA's mission, and our Environmental Restoration and Health Science Mission, through work on radioactive waste processing and post storage examination of used fuel, and makes possible research into new high-activity materials and novel fuel types.

Action 22. Over the next five years, we will sustain and strengthen the UK's national active handling capability, ensuring that the Active Handling Centre remains the UK's premier capability for PIE and high-active materials research, underpinning critical national missions in defence, energy security and nuclear decommissioning. This will include a long-term investment programme that secures operational resilience, modernises capability and positions the centre to meet future national requirements while providing maximum value to the UK.

Uranium Research Centre

Located on the Springfields Fuels Ltd fuel manufacturing site near Preston, this is the UK's leading centre for advanced uranium science and fuel-cycle innovation. It is our primary centre through which our Fuel Science Mission will be progressed, and vital for our Environmental Restoration and Health Science Mission.

The work here provides quality assurance and process improvement, helping to secure the fuel supply for the UK's nuclear reactors, and transforms nuclear residues into sustainable resources for the benefit of society. It is where we conduct ground-breaking research into advanced fuels and fuel manufacturing, and is the IAEA's only Collaborating Centre focused on advanced fuel and fuel cycles.

This centre is also where we are developing ways to extract and purify valuable radioisotopes from legacy materials, with the aim of making them available for research into new medicines for radiopharmaceutical trials.

Action 23. Over the next five years, we will establish a sovereign front-end fuel cycle capability at our Uranium Research Centre. We will ensure the laboratory is able to conduct vital research programmes supporting the manufacturing of advanced nuclear fuels. This includes developing deconversion processes as part of the UK's ambition to establish a domestic HALEU capability, and leading on the development of GPF production processes, giving the UK a leading position in the global market.

Action 24. We will expand the UK's strategic uranium capabilities, establishing our laboratory at Preston as a centre for uranium science, waste processing and recycling technologies that accelerate the clean-up of legacy nuclear materials across the UK, and extract valuable radionuclides to support medical research.

Nuclear Materials Research Centre

Formerly known as Central Laboratory, and located on the Sellafield site, this is a centre of excellence for plutonium and radioactive materials science. It is the only civil laboratory in the UK which has the capability and is licensed to perform plutonium research at scale, which makes it vital to supporting the NDA's mission of plutonium immobilisation and disposal. It will be our primary centre through which our Plutonium Science Mission will be driven.

In addition to plutonium research, the facility hosts work on other important areas of nuclear R&D in support of our other Science Missions, such as fuel development and recycling options, graphite behaviour, waste management and decommissioning, plant intervention and inspections, and a wide-ranging measurement and analysis capability which underpins everything else.

Nuclear Technology Development Centre

Located in Workington, this is UKNNL's 'non-active' research centre. Not being on a nuclear-licensed site means that the facility acts as an R&D test bed, allowing innovative technologies to be demonstrated quickly and cost-effectively before they are deployed for real in active facilities, such as our other centres or customer sites. The centre supports both civil and defence nuclear programmes, and is also a skills pipeline, providing access to academia and industry to develop technologies and people. It will be vital in supporting each of our Science Missions.

For our Fuel Science Mission, it is where we are developing graphite compositions for our CPF programme. For our Fleet Support Science Mission, we have replica active handling cells which enable operations to be trialled. Our Plutonium Science Mission is supported through inactive trialling of Hot Isostatic Processing, and it is home to our robotics capability where we can demonstrate remote handling operations prior to on-site decommissioning operations for our Environmental Restoration and Health mission.

Professional hubs

Our centres are augmented by desk-based enabling capabilities in our professional hubs. Our Culham and Stonehouse sites in the south of England, for example, host much of our reactor materials and chemistry capability. These teams use a combination of experimental and modelling work to understand the materials, chemistry and corrosion processes that occur during reactor operations, supporting civil and defence fleets, including Sizewell B, a key component of how we deliver our Fleet Support science mission. The experimental work supporting this is done at UKNNL's other centres, in dedicated laboratory space at the University of Bristol, or through access to laboratories at other universities.

Our headquarters at Chadwick House, Birchwood, near Warrington also hosts capabilities such as modelling and simulation, engineering design, knowledge asset management, and nuclear safety, security and safeguards expertise, underpinning all of our Science Missions. These, and our supporting functions such as project management and professional services, are located across each of our professional hubs.

Planning for the future

We know that our facilities will not last forever, and even if they could, they would not meet the expanding and evolving needs of the UK's diverse and ambitious nuclear programmes. That is why we will work with government and industry stakeholders to fully understand and prepare to meet those needs.

We have a duty to fulfil our role as custodian of critical national infrastructure. Through these actions and commitments, we will ensure that critical national programmes have access to the required infrastructure which is fit for current and future missions, and that government and the nuclear sector has confidence that strategic capabilities are available when needed.

Action 25.

We will establish a task force to evaluate the national nuclear research infrastructure needs, and collectively determine a way forward towards meeting these. This roadmap will include agreement on where it is appropriate for UKNNL to lead, and where we will support the capability and infrastructure of others, and provide the basis for future investment decisions and development programmes.

In particular, as custodian and operator of the UK's national active handling capability, we will provide trusted advice to government, the NDA and industry on the future active handling infrastructure the UK will need to support long-term defence, civil nuclear and fuel cycle ambitions.

We will also engage with government and the advanced nuclear technology industry to understand what infrastructure they will need to move their reactor and fuel designs from concept, validation, qualification, licensing through to deployment, including the potential for a UK-based irradiation facility.



Remote can surveillance at the Active Handling Centre

Securing the nuclear capabilities that the nation needs

Alongside our infrastructure investment, we fund research programmes which enable us to develop the highly skilled people and scientific capability the UK needs for its civil and defence programmes. We do this in partnership with industry, academia and government.

Laboratory Directed Research – how we invest in scientific capability

Laboratory Directed Research (LDR) is our internal research programme. Its purpose is to create the scientific capability and technical leadership needed to achieve our five Science Missions. It is the engine that maintains UKNNL as a world-leading national laboratory, sustaining sovereign nuclear expertise and the scientific foundations on which the UK's nuclear future will be built.

LDR is structured around three pillars:

- Core Science: driving forward cutting-edge scientific research which will maintain and advance core scientific capabilities that underpin our Science Missions
- Innovation: providing a platform to accelerate the development of new ideas, technologies and approaches that create value for government, industry and society
- Strategic Research: developing future capabilities that enable our Science Missions by working collaboratively with government, academia and international partners

Action 26.	We will invest over £40 million in the next five years into Laboratory Directed Research to enable our Science Missions. We will measure the success of our Laboratory Directed Research through our Value Framework across Quality, Talent, Partnerships and Impact. Our aim is to exceed the targets we achieved through our Science and Technology agenda over the past five years.
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Setting up the mass spectrometer for material inspection at the Nuclear Materials Research Centre

CASE STUDY: The impact of UKNNL investment in science

Our previous Science and Technology Agenda achieved some truly impactful outcomes over its five-year lifetime (2021-2026):

- **Quality** - 400 peer reviewed journal articles
- **Talent** - 70 PhDs supported
- **Partnerships** – leveraging over five times our investment and enabling around 100 User Access projects benefiting from our facilities and establishing two new collaborating centres
- **Impact** - 29 published case studies

The 29 impact case studies provide compelling evidence of the return on our strategic investment in nuclear research and innovation. Across Core Science, Innovation, Strategic Research, Collaboration and People, they demonstrate how UKNNL has converted scientific excellence into real-world outcomes, from advancing future reactor and fuel technologies, radioactive waste solutions and medical isotope production, to pioneering AI and decontamination innovations, leading international research programmes and strengthening the UK's nuclear skills base. Together, these case studies highlight our unique ability to connect science, partnerships and national capability, creating enduring environmental, economic and societal impact while reinforcing the UK's position as a global leader in nuclear science and technology.





Using robotics at the Nuclear Technology Development Centre

How we will nurture advanced nuclear skills

One of our roles, as defined in the 2024 Strategic Review, is to champion and nurture advanced nuclear skills. This is why it is vital to the success of this organisation, and of the UK nuclear sector, that we develop and invest in the scientists, technical specialists and future leaders needed to achieve the nation's civil and defence nuclear ambitions.

Our ability to deliver against this role for the nation depends not only on scientific excellence, but also on the systems that enable science to thrive. A series of strategic foundations underpin our LDR programme and our approach to nurturing advanced nuclear skills:

UKNNL Fellowship

The UKNNL Fellowship provides the highest level of technical leadership within the organisation. Fellows shape our Science Missions, influence national and international policy, support programme delivery, mentor future leaders and strengthen UKNNL's visibility across government, academia and industry. Over the next five years the Fellowship and Associate Fellow pathways will play an increasingly important role in shaping Science Mission priorities and developing the next generation of technical leaders.

Strategic university partnerships

Forming strategic partnerships with leading universities is how we will accelerate capability development, expand access to talent and strengthen the UK's nuclear research ecosystem. We have recently formed strategic partnerships with the University of Manchester and Bangor University, and with a focus on our Science Missions, we will explore additional strategic partnerships with our world leading universities.

CASE STUDY:

Strategic university partnerships with Bangor University and The University of Manchester

UKNNL's internal investment in strategic partnerships is creating tangible national impact. Our new long-term agreements with Bangor University and The University of Manchester strengthen the UK's nuclear research and innovation ecosystem, combining UKNNL's nationally important capabilities with world-class academic expertise to accelerate technology development, as well as cultivate future nuclear leaders, and support major national ambitions, including clean energy deployment and nuclear sector growth. These partnerships exemplify UKNNL's evolution as a partnerships-led national laboratory, creating greater value than any organisation could achieve alone.

Read the full announcements here:

<https://uknnl.com/2026/02/uknnl-and-bangor-university-partnership-to-power-north-wales-nuclear-expertise-and-technology/>

<https://uknnl.com/2026/07/uknnl-and-the-university-of-manchester-sign-landmark-nuclear-partnership-agreement/>

International partnerships

Equally important are our international collaborations. This includes relationships with equivalent national laboratories in allied leading nuclear nations such as JAEA in Japan, Idaho National Laboratory in the USA, Canadian Nuclear Laboratories (CNL) and France's French Alternative Energies and Atomic Energy Commission (CEA). We are also involved in international joint treaties and programmes on behalf of the UK, such as the Generation IV International Forum (GIF). Through these partnerships we exchange technology and know-how and increasingly our own people through secondments that build their careers as well as our capability. Lab to lab partnerships strengthen wider government and industrial international partnerships, boosting export opportunities for UK businesses.

User access and national infrastructure

Our unique centres are a national asset. Through expanded User Access programmes, researchers from academia, government and industry will continue to gain access to specialist capabilities, supporting innovation, skills and collaboration across the sector. Over the previous strategy period, nearly 100 projects and dozens of partner organisations benefited from these programmes.

Over the next five years, we will:

Action 27.	Create the next generation of nuclear leaders, building a strong and diverse talent pipeline through graduate, apprentice, doctoral, postdoctoral and early-career programmes.
Action 28.	Strengthen the national skills ecosystem by connecting academia, industry and research organisations through partnerships that develop, attract and retain the skills the sector needs.
Action 29.	Provide unique opportunities to learn and innovate by giving researchers and technologists access to world-leading facilities, as well as national programmes and international collaborations that accelerate professional development and impact.

What this will achieve:

- A sustainable pipeline of highly skilled nuclear scientists, engineers and technical specialists for the UK nuclear sector
- Retention and growth of sovereign nuclear expertise in nationally critical disciplines
- Increased numbers of PhDs, researchers and early-career professionals entering and remaining in the sector
- A stronger UK nuclear innovation ecosystem through deeper collaboration between government, industry and academia
- Enhanced UK capability and competitiveness, along with a leading position in delivering the nuclear energy, security and decommissioning objectives ahead

Knowledge asset management

Through the activity of our people within our research centres we generate huge amounts of nuclear data and information. We also possess one of the world's largest collections of nuclear knowledge from historical programmes. Through advanced knowledge management and AI-enabled tools, we will continue to transform how knowledge is captured, as well as shared and applied to accelerate our Science Missions.

Action 30.	We will continue to work closely with the Government Office for Technology Transfer (GOTT) to implement and deliver on our Knowledge Asset Management Strategy (KAMS).
Action 31.	Building on our Innovation programme and working with GOTT, we will also establish a mission-led intellectual property (IP) model which protects and actively manages strategic national IP assets, focusing on identifying the most appropriate commercialisation route for each knowledge asset, and develop long-term partnerships that enable industry to exploit nuclear know-how and technology.

These actions align with our role to support the private sector to accelerate technology commercialisation, leading to economic growth of the sector.

Independent advice to government

The Nuclear Innovation and Research Office (NIRO)

UKNNL is proud to host the Nuclear Innovation and Research Office (NIRO), a nationally important capability, providing independent, evidence-based advice to government on nuclear research and innovation. Established following the government's 2013 Nuclear Industrial Strategy, it draws on insights from industry and academia, as well as from government and the wider research community, using them to inform policy and prioritise investment while identifying the innovation opportunities that strengthen the UK's nuclear sector.

It also convenes and supports the Nuclear Innovation and Research Advisory Board (NIRAB), and engages directly with government to support its decisions and analysis.

NIRO's independent advisory function sits alongside our Technical Authority role, under separate governance arrangements. Where the Technical Authority provides authoritative scientific and technical judgement, NIRO provides system-level strategic advice, so DESNZ has both deep technical expertise and broader independent insight to draw on.



Our People

Our capability as a national laboratory is defined by all our people: our scientists and technical talent have the nuclear skills, knowledge and expertise which drive our science missions and operate our facilities. Our science missions are equally reliant on the professional functions which enable the business to perform effectively. We want to ensure we have the best of the brightest supporting the best of the brightest.

Our strategy for people and culture aims to attract, as well as engage and retain the talent required to build the Lab of the Future. It is the offer we make to our people in return for what they contribute and the commitment they bring, built on honest communication and strong leadership, on real development opportunities, and on a modern and inclusive environment where everyone is supported fairly and can thrive.

Inclusivity is hugely important for us. It is essential to being a high-performing scientific organisation. Being able to access the most talented individuals, whatever their backgrounds, and harnessing their diversity of ideas, is how we make great science happen.



Transformation ultimately happens through our people. Our people and culture strategy and employee value proposition will ensure we have the capability, leadership and culture to deliver today, transform for tomorrow, and build an organisation where talented people choose to come, stay, grow and do their best work."

Rebecca Jenkins
Chief People Officer



Analysis supporting extraction of valuable medical isotopes at the Uranium Research Centre

Sustainability

Our scientific work is energy and resource intensive and we will continue to operate our facilities as best we can to minimise the environmental impact. Our contribution to sustainability will also be judged on the outcomes our science will enable. For example, where our work aims to accelerate a reactor programme that gets electricity to the grid, or heat

to industry, earlier than it otherwise would, there is a positive impact of that to decarbonising the UK. We will keep our own sustainability ambitions realistic and keep making the wider case honestly.

CASE STUDY:

A UK supply of medical radionuclides

Our work is finding new opportunities to establish a circular economy in nuclear materials, improving health outcomes for UK patients and reducing our reliance on long-distance overseas supply chains.

The NHS currently relies on importing the radioactive isotopes behind PET (positron emission tomography) scans and a growing range of cancer treatments, and building an irradiation facility to make them here would take until the 2030s. Our chemists are extracting them instead from material the nuclear industry already stores, which could give the UK its own supply chain lasting several hundred years.

Working with Medicines Discovery Catapult, Queen Mary University of London and King's College London, we are developing lead-212 for targeted alpha therapy and building a new laboratory at Preston where visiting researchers can test their own work.

Read the full case study here:
<https://uknnl.com/case-study/an-innovative-production-route-for-medical-radioactive-isotopes/>

Social Value

Our impact extends beyond the science we deliver for government and industry: we are committed to creating social value that goes beyond our core mission. Many of our sites are located in areas of significant economic deprivation. Our programmes look to enable social mobility, by supporting mentoring and workshops for care-experienced young people, building relationships with youth centres, engaging with families of underrepresented communities and mentoring young girls that are underperforming in secondary school. These programmes provide rewarding opportunities for our people to contribute to their local communities.

In our outreach programme, we advocate for science, technology, engineering and maths (STEM) subjects, inspiring the next generation of nuclear scientists and engineers. As well as providing rewarding opportunities

for the young people we speak to, we hope that many of them will eventually come back to us, or to the wider sector, whether that be through apprenticeships or through graduate and academic partnership programmes.



Pupils testing their glove box skills

Transformation

The 2024 Strategic Review made thirteen recommendations across the themes of focus, delivery and trust. Since it was published, we have launched our new mission and rebranded the laboratory to signal our closer alignment to government. This section sets out what we have done, and what we are continuing to do, to implement the recommendations.

Focus

DESNZ now attend our Board meetings, and a Policy Advisory Group has been established with DESNZ and MOD to advise on strategic alignment. Cross-sector working groups are in place with those stakeholders to address prioritisation and programmatic challenges. Through our transformation programme we will be redesigning our Target Operating Model (TOM) making sure we have the right people in the right place at the right time to give our stakeholders what they need. Our relationship with government has notably shifted following the Strategic Review and our mission statements allow us to cross check everything we do against government policy and priorities.

Delivery

Working jointly with DESNZ, we have completed an activity mapping exercise giving a comprehensive view of what we do on government's behalf, which is now used for prioritisation, conflict resolution and responsive intervention where it is needed. Alongside it we have begun developing a new framework of metrics against which DESNZ will assess us, modelling how value, impact and outcomes are measured under it.

Over the past year we have delivered a number of cost savings to put the laboratory on a more robust financial footing. In the next stage of the journey, we will transition into a broader transformation programme designed to turn the organisation into one that can truly deliver on our mission.

Trust

CEO-to-CEO forums with key stakeholders are now in place, and our interfaces with customers and partners continues to strengthen. We want to form strategic partnerships with key stakeholders, aligned around common goals and which achieve outcomes and value to all parties. The recent memorandums of cooperation with Rolls-Royce and JAEA, and the memorandum of understanding with the University of Manchester, are evidence of that. Globally, national nuclear laboratories sit at the heart of national nuclear ambition, underpinning development of technologies and providing technical assurance to nuclear deployment. Trust is fundamental to this role and UKNNL is committed to working with the rest of the sector to make sure we are delivering what is needed.

Where the transformation goes next

Change on this scale needs the organisation behind it to work differently. The transformation programme will put that in place. What we have done so far has achieved enduring efficiencies. What comes next will start us on the road to the Lab of the Future.

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We are working closely with government to identify the optimum business model that puts us on a sustainable footing to do the things we need to in the most cost-effective way.”

Brian Tenner
Chief Financial Officer



“

We know what needs to change. Transformation is about implementing our actions so that the true potential of the laboratory can be realised.”

Matt Leedham
Chief Transformation Officer



Lab of the Future

Picture this laboratory a decade from now, once the transformation is complete.

Materials analysis at the Nuclear Technology Development Centre

The Lab of the Future is a fully digital, connected, and secure environment where modern integrated systems support advanced science, and unified data and AI-driven insights enable smarter, faster decision-making across the lab. The time it takes to get from a scientific idea to a completed experiment, measured in months today, has been halved or better, which frees our scientists to do more of what they came here to do.

Capability across the fuel cycle has been built to support reactor technologies that did not exist when this plan was written. Our facilities are modern and efficiently run, with new and enhanced laboratories across all our centres. The foundations are laid for the UK to have domestic sovereign access to scientific capability, such as neutron irradiation, that is essential for a top tier nuclear nation.

Government trusts us as its technical authority on nuclear fuels and materials, because our advice continues to be rigorous and impartial, and because government now comes to us earlier and with bigger strategic questions than it does today. The UK's sovereign plutonium science capability is secure, and the long-term decisions on the nation's plutonium inventory that once felt intractable have been progressed safely and openly, informed by the science we provided.

Reactors have reached the grid faster than anyone thought possible a decade earlier, licensed and built on fuel qualification and materials testing that was ready when industry needed it, with the safety case science behind them. The existing fleet operated safely for longer than originally planned, extending clean power generation when the country needed it most. Decommissioning of the UK's nuclear legacy has accelerated, enabled by enhanced scientific understanding and evidence, and materials once considered a

waste are recognised as the national asset they always were. This means that NHS patients receive innovative, world-class cancer treatments and deep-space probes are powered by the isotopes that our scientists developed techniques to extract.

The knowledge and intellectual property this laboratory holds is generating value for the country rather than sitting unused. Our commercial thinking has grown into something the sector recognises, and stimulating economic growth is understood as part of what a national laboratory is for. Behind that sits a funding model agreed with DESNZ that lets us take the long view on research the UK needs, no longer straining against a balance sheet built for a different era.

There is a buzz inside our laboratories. A new generation of nuclear scientists and engineers, many of whom came through apprenticeship and graduate schemes to answer the sector's skills shortage, lead programmes that did not exist when this plan was written. They stayed in nuclear because the work and the environment gave them a reason to. People here find it easy to get their job done, they can see a career worth having, and they know that the work they are doing matters. We are one connected and purpose-driven organisation.

High performance and high safety hold together in how we work. The sector has historically suffered from assuming they are competing choices. We have shown they are not.

Above all, this is a laboratory judged by what others say about it when it is not in the room. Known for doing what it says it will do. Trusted by the sector rather than seen as competing with it, with organisations outside the laboratory articulating its value themselves.

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There will be a real ‘yes and’ attitude, a real buzz to the facilities. People will know that the work they do matters. We will be purpose driven and connected, one UKNNL.”

Julianne Antrobus
Chief Executive Officer



This is the Lab of the Future we are building.

A laboratory the UK continues to rely on, and one the country's energy security, national security and net zero ambitions rest on, for the next five years and for decades to come.

