



Department for  
Energy Security  
& Net Zero

# Strategic Review of the National Nuclear Laboratory



United Kingdom  
National Nuclear  
Laboratory



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## Ministerial Foreword



Delivering our central mission to make Britain a clean energy superpower requires the continued operation of our nuclear power plants. The UK National Nuclear Laboratory (UKNNL) plays a fundamental role in accelerating the UK to net zero, delivering cutting-edge innovation and demonstration of nuclear technologies – highlighting the significance of our Public Sector Research Establishments (PSRE) – as well as underpinning and supporting the safe operation of UK nuclear reactors.

Since its establishment in 2008, UKNNL has proven highly effective at providing thought leadership to the nuclear sector, providing enduring expertise through the retention of strategic capabilities to support the UK's most complex nuclear programmes, both now and in the future.

As a PSRE, UKNNL is a valuable national asset which strengthens the broader UK research, development and innovation system. It operates alongside other critical PSREs and national laboratories to support government. Effective collaboration within the UK's nuclear sector and national laboratory ecosystem is essential to driving innovation and continuing to deliver benefit greater than the sum of its parts.

The UK nuclear sector is regenerating in line with our heightened ambitions, securing high-skilled jobs across the country and maintaining the UK's world leading nuclear expertise. As our requirements upon the sector evolve, we will leverage our national nuclear laboratory more effectively to advise on, and deliver, nuclear programmes of national significance.

To deliver this, the strategic review sets out a bold vision of transformation, with government taking a more directive role in its ownership of UKNNL and empowering the laboratory to deliver across the sector. Closer alignment will also support government in remaining an intelligent customer of nuclear technologies and focus the laboratory's resources upon delivering national priorities while retaining sight on innovation and capability development.

The renewed mission, role, and branding of the laboratory encapsulate the closer working relationship, showcasing that UKNNL is government's lead civil national laboratory for nuclear fission, which delivers government priorities.

While the transformation will take several years, the recommendations of this review define our initial steps in achieving that ambition and will require UKNNL to work in close partnership with DESNZ. However, the vision of change can only be delivered with the collective support of the whole nuclear sector playing a crucial role in supporting UKNNL during this transitional phase.

This bold transformation of UKNNL is critical to delivering our energy superpower ambition and ensuring that we are able to meet our net zero commitments.

**Rt Hon Lord Hunt of Kings Heath PC OB**  
**Minister of State for Energy Security and Net Zero**

# Background

The National Nuclear Laboratory (NNL) is the UK's lead civil national laboratory for nuclear fission. It is a public corporation, owned by government and operated as part of the public sector. NNL is the custodian of some of the UK's most critical nuclear skills and capabilities. It is a key enabler of energy security and national security principally through provision of laboratory testing to secure the operation of the civil Advanced Gas Reactor (AGR) fleet and supporting UK's Continuous At Sea Deterrent (CASD). NNL supports both the legacy of the nuclear sector through its pivotal role across the Nuclear Decommissioning Authority (NDA) estate, and pushes boundaries via research and development into novel nuclear applications.

Formed out of British Nuclear Fuel Limited (BNFL), NNL was established in 2008. As owner, the Department for Energy Security and Net Zero (DESNZ) retains policy sponsorship of NNL but discharges its shareholder responsibilities through UK Government Investments (UKGI) which represents government's interests on the NNL Board.

With the rapid growth and crystallisation of UK nuclear ambitions, it is essential that NNL evolves in step with these, so that government can continue to rely on its laboratory working for the Nation. As such, the 2024 DESNZ Strategic Review of NNL sets the direction of the laboratory over the next decade to meet the new sectoral requirements. This provides the first steps in materialising this ambition, by answering the following questions:

- What should the mission of NNL be?
- What role should NNL play in the UK nuclear Civil & Defence ecosystem?
- What does NNL require to enable delivery of government's nuclear fission ambitions?

The review was led by the NNL Sponsorship Team within DESNZ and is underpinned by over 100 interviews with industry leaders covering more than 30 organisations across government, industry, and academia to obtain a rich understanding of NNL's current operational performance and how it can best enable the UK's nuclear future. This review is indebted to the laboratory's staff and leadership, and members of the UK nuclear sector who gave their time to inform this work. It also follows on from and draws on previous public reviews including the 2011 Nuclear Research and Development Capabilities – House of Lords Science and Technology Committee and 2017 Nuclear Research and Technology: Breaking the Cycle of Indecision.

# Findings

NNL is deeply valued by the sector, with its scientific capability being repeatedly praised as world leading. The laboratory and its staff should be commended for the exemplary work it has delivered since its creation 16 years ago, and the substantial effort that went into ensuring the UK retained a national nuclear laboratory and its associated capabilities.

This has not been by accident; its public corporation model has required constant effort and balance from the leadership team and its board to ensure the stability of the organisation while striving to deliver benefit to the UK. The UK has been fortunate that NNL leadership sought to retain sovereign capabilities despite the model not prioritising these aspects.

NNL has stewarded critical national capabilities and effectively supported the sector, with key strengths in capability, flexibility, thought leadership, and convening power. The laboratory deploys its advanced capabilities across the breadth of the sector, enacting a high degree of flexibility through adapting its facilities and processes to support some of the UK's most complex nuclear challenges. NNL has also effectively utilised its expertise to inform decisions through its thought leadership, such as in setting out the use cases for the potential of nuclear power in industrial applications. In bringing these together, NNL leverages its unique connections between government, industry, and academia to highlight opportunities and leverage influential stakeholders.

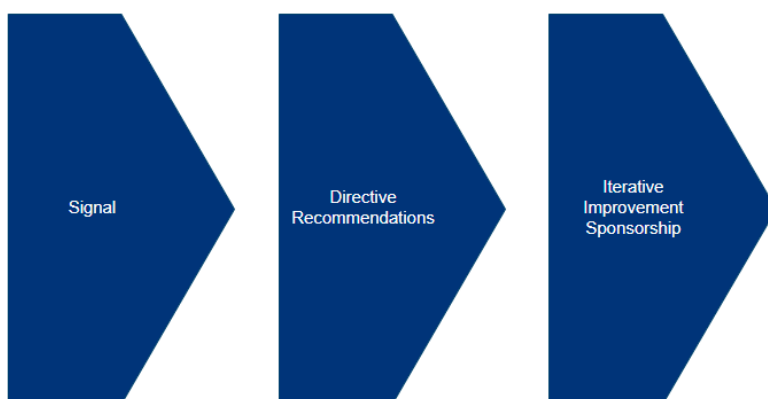
Nevertheless, the public corporation model limits investment to a level that can be supported by NNL's balance sheet. It has therefore been impossible for NNL to sustain investment at a level required by facilities costing billions to build and tens of millions to maintain whilst simultaneously growing the capacity of its technical capabilities.

Challenges have consequently arisen following an increase in demand for NNL's services to underpin the regeneration of the UK nuclear sector to meet net zero and defence commitments. Delivery performance has come under pressure, amplified by legacy facility issues and resource constraints which has strained relationships with key stakeholders.

In seeking to address the growing requirements of the UK nuclear sector as it regenerates, this review sets out a bold vision of transformation for NNL using a threefold approach:

- a clear signal defining the future direction of the laboratory,
- a set of directive recommendations establishing the first steps in achieving that intent,
- followed by an iterative improvement sponsorship approach which will continue to investigate areas of interest identified throughout this review.

**Figure 1: Approach to transformation**



# Signal

This review identified uncertainty within the sector relating to the mission and role of NNL, which was supported by requests for government to provide additional direction and clarity on these aspects. In reaffirming that NNL is a government owned laboratory, which delivers national priorities on behalf of government, DESNZ will galvanise NNL into a more nationally focused organisation through redefining its mission, role, and branding to:



# United Kingdom National Nuclear Laboratory

United Kingdom National Nuclear Laboratory (UKNNL) is government's lead civil nuclear fission laboratory whose mission is twofold: to enable and deliver nuclear outcomes for government, and to support growth of the UK nuclear sector.

To achieve this, it will:

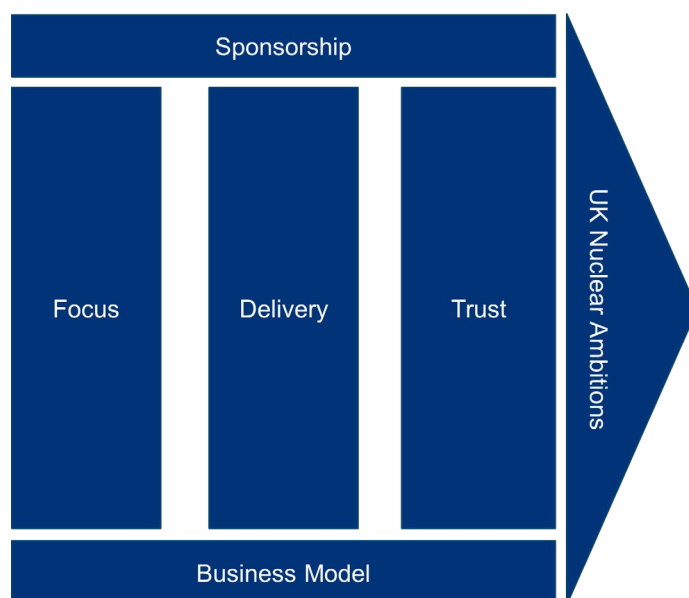
- Be a custodian of national capabilities and infrastructure critical for national and energy security.
- Become government's lead civil technical and strategic advisor for nuclear fuels and nuclear materials.
- Carry out research to continue securing the safe operation of nuclear plants domestically 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.

# Directive Recommendations

The following sections set out the initial enhancements required for UKNNL to embody this new mission and role. In combination with the signal, these recommendations and enhanced sponsorship will ensure that UKNNL is adequately supported to implement this bold transformation.

Five areas of enhancement have been identified - three operational pillars which UKNNL will drive forward, and two environmental which DESNZ and UKGI as shareholder representative, will lead on to empower the laboratory. While these areas outline the primary accountabilities, it is critical that the sector recognises that UKNNL cannot regenerate without being enabled by other key stakeholders including the Ministry of Defence, NDA, and EDF Energy.

**Figure 2: Structure of enhancements**



## Focus

UKNNL will embed a strong governmental focus and clear prioritisation across all levels of the laboratory to align with national priorities. It will refresh its strategic plan to account for the findings of this review, with the new mission and role being reflected in the work it undertakes.

DESNZ will take a more engaged stance in its ownership of UKNNL to provide it with foresight of developing policies to aid prioritisation and strategic planning, and focus its finite resources on stewarding critical capabilities to address national priorities. This will be achieved through enhancing the use of existing and new governance mechanisms, complemented by new combined government-industry forums where necessary. DESNZ will also leverage its overarching position to aid NNL in identifying and mitigating cross-sector programmatic challenges. Through elevating its partnership with government, NNL will be empowered to translate existing commercial relationships to strategic partnerships.



To monitor the implementation of this transformation and drive enduring change, DESNZ shall standardise its engagement as UKNNL's owner to underpin Strategic Planning and the Science and Technology agenda.

UKNNL will continue to serve both the civil and defence nuclear sectors through retaining the facilities it currently operates. UKNNL should remain the operator of the UK's Active Handling Capabilities. No work undertaken by the laboratory has been identified that should be immediately ceased.

Although UKNNL operates effectively as a sub-tenant on its key sites, which creates some dependencies on others, it is suggested that UKNNL should not seek to obtain a site license at Sellafield due to the additional complexity this would introduce.

International nuclear laboratories typically operate medical, material, or research reactors. This remains a long-term aspiration for UKNNL; however, meeting the sector's transformative requirements must take precedence.

### **Recommendations:**

**RECOMMENDATION 1: DESNZ intends to give clear direction and accountability to UKNNL, utilising existing governance and control mechanisms (e.g. strategic plan, objectives, KPIs) to the greatest extent possible and considering alternatives where necessary, including board presence.** Detailed mechanisms to achieve this intent continue to be investigated as it seeks to minimise disruption to UKNNL and be consistent with its status as a public corporation.

**RECOMMENDATION 2: A quarterly Policy Advisory Group be set up to advise and support on strategic alignment.**

**RECOMMENDATION 3: A cross-sector working group be established with key UKNNL stakeholders to address prioritisation and programmatic challenges,** including (but not limited to) the use of the Active Handling Facility and Central Laboratory.

**RECOMMENDATION 4: DESNZ undertake strategic reviews at least every five years** to monitor alignment, performance, and efficiency. These will include a reasonable outreach approach to validate internal understanding of delivery performance. Supplementary light-touch reviews may be undertaken within these intervals.

**RECOMMENDATION 5: UKNNL Strategy to be refreshed to take into account the outcomes of the Strategic Review.**

## Delivery

Due to its unique capabilities and position within the sector, UKNNL faces heightened demand which places pressure upon its delivery capability. Delivery pressures have been amplified by a combination of legacy facility challenges due to historic underinvestment (much of which predated NNL and later was constrained by its model), and resource limitations arising from sector-wide shortages in critical skills, such as programme managers and safety case engineers.

To meet the heightened demand, UKNNL must reliably implement programmes effectively and efficiently, with delivery confidence and credibility at its core. This will require UKNNL to re-evaluate how it delivers programmes for its key customers, streamlining processes and identifying efficiencies. UKNNL will undertake an internal delivery enhancement programme with findings reported to DESNZ.

As the successful delivery of programmes is dependent upon effective interfaces between codependent organisations such as NDA and Sellafield, it is critical that UKNNL strengthens its relationships across the sector. One step to achieving this will be for UKNNL to provide greater transparency to key stakeholders; however, it is also essential that stakeholders reciprocate this transparency to aid prioritisation.

DESNZ will continue to champion delivery enhancement efforts beyond the scope of this review and monitor these through the development of refined organisational performance metrics, in partnership with the UKNNL board. While delivery improvements primarily sit with UKNNL leadership and its programme teams, the complex interfaces surrounding the laboratory's delivery portfolio requires cross-sector support. Stakeholders must aid the laboratory as it fully embodies the role of national nuclear laboratory, ensuring it is adequately empowered to deliver these programmes in the national interest.

### **Recommendations:**

**RECOMMENDATION 6: DESNZ and UKNNL undertake an activity mapping exercise** to create a comprehensive overview of what UKNNL is delivering on behalf of government. This will enable clearer prioritisation, simpler conflict resolution, and more responsive interventions where required.

**RECOMMENDATION 7: DESNZ to work with the UKNNL Board to review the metrics by which UKNNL is assessed with consideration given to incorporating outcomes (including advancing government policy), schedule, and trust.** This will build upon the existing work of the UKNNL Board and the achievement of them will be underpinned by demonstrable evidence.

**RECOMMENDATION 8: UKNNL continue to enhance its interfaces with key stakeholders,** translating existing commercial relationships to strategic partnerships. The DESNZ sponsorship team will champion the regeneration of UKNNL within government and across the sector.

**RECOMMENDATION 9: UKNNL launch an internal taskforce to improve delivery**, with findings being reported to DESNZ.

**RECOMMENDATION 10: An Infrastructure and Projects Authority review of UKNNL activities be undertaken** to augment the implementation of the Strategic Review recommendations and pathway to UKNNL's redefined role.

## Trust

Building upon its world leading expertise and experience as custodian of some of the UK's most critical nuclear skills and capabilities, UKNNL will become the UK's technical authority on civil nuclear fuels and nuclear materials, while supporting Defence as required. As such, it will be responsible for establishing, approving, and assessing conformance to technical, safety, and certification requirements and policy for both products and processes. This is essential for it to enable government to be an intelligent customer of nuclear technologies.

In embodying the role of technical and strategic advisor to government as set out above, UKNNL will be held to a heightened reputational standard within the sector. As such, UKNNL will continue to build upon the trust it holds across the sector, working collaboratively and seeking areas of unique opportunity to avoid instances of competition with the sector. It will operate in an impartial manner, presenting advice that is void of commercial interests. As the current model presents an impartiality risk, it is proposed that advice continues to be provided through the Nuclear Innovation and Research Office (NIRO) (which utilises information barriers to avoid commercial interests) while the future model of UKNNL is investigated by DESNZ.

UKNNL will undergo an internal transformation to reflect its new mission and role, paving the way for closer government interaction and alignment. This will leverage the existing culture of delivering benefit for the UK and drive transparent communication across the sector, learning from international exemplars.

Where practicable, UKNNL should continue to avoid competing with industry, instead seeking to collaborate and support the broader supply chain. DESNZ accepts that there will be times when industry disagrees with government's decision on which areas UKNNL should be active in. These will be selected based on strategic national capability requirements. As a steward of strategic capabilities, UKNNL should continue to safeguard Intellectual Property (IP) generated through government funded programmes.

UKNNL will continue to engage with and support reactor vendors in the development and deployment of their technologies. Engagement decisions will be taken collectively between UKNNL and DESNZ, evaluating alignment of proposals with government priorities.

## Recommendations:

**RECOMMENDATION 11: A transformation programme be launched by UKNNL** to ensure that its new role is effectively adopted and communicated. This will enhance how UKNNL presents itself externally, providing greater consistency and aiding understanding of its intentions.

**RECOMMENDATION 12: UKNNL to deliver an implementation plan, responding to the review** in collaboration with the DESNZ sponsorship team and its shareholder representative UKGI.

**RECOMMENDATION 13: DESNZ work with UKNNL to develop a standardised approach to the retention and handling of IP.**

## Business Model

Given the transformation required to enable UKNNL to embody the ambitious future role set out in this review, any further disruption to the operation of the organisation should be avoided. Therefore, UKNNL shall remain a public corporation if practicable. The optimal long-term organisational model of UKNNL will be further investigated by the sponsorship team once the directive recommendations have been implemented.

Due to the varied and underpinning nature of the work that UKNNL undertakes, it should not be merged with any other public sector organisation. Absorbing UKNNL into an existing Arm's Length Body would be detrimental to its new mission and likely constrain the work it could undertake in the long term.

Government must retain ownership of UKNNL delivered strategic nuclear capabilities for national and energy security purposes and as such UKNNL will not be privatised. The new role defined for UKNNL voids privatisation as an option.

# Iterative Improvement Sponsorship

## Sponsorship

In overseeing the above workstreams, DESNZ will establish a more proactive, engaged, and strategic sponsorship approach, driving iterative improvement. This will monitor and evaluate the effectiveness of this review while further optimising the laboratory's performance and efficiency.

To guide this transformation, the DESNZ sponsorship team will continue to evaluate detailed aspects of UKNNL's activities, role, and model. While these areas will evolve throughout the transformation, indicative topics are included below:

- How can the scope of UKNNL's role in International, Medical, and Space be redefined?
- Does the public corporation model optimally deliver government's priorities and is it sustainable in the long-term?
- How should UKNNL approach securing IP?
- What is the best mechanism for UKNNL to act as technical and strategic advisor to government?
- How should UKNNL's activities be sustainably funded, including the maintenance of its current and future facilities?
- What role should UKNNL play in the development and deployment of medical, material, research, and demonstration reactors?

## Implementation

Fully embodying the mission and role defined in this review is expected to take up to 10 years for UKNNL to achieve. This regeneration cannot be achieved by UKNNL, DESNZ, and UKGI alone. The laboratory must be empowered by the sector with each nuclear organisation playing a crucial role in supporting UKNNL during this transitional phase. By doing so, the UK will ensure that UKNNL not only meets but exceeds its strategic goals, which will ultimately strengthen and regenerate the UK nuclear sector and capabilities.

In response to this review, UKNNL will develop an implementation plan which will be communicated to the sector – highlighting the roles of enablers and additional opportunities for collaboration, meeting the requirements of the regenerating UK nuclear sector. DESNZ will formally monitor UKNNL's implementation of the Strategic Review and will undertake a formal review of progress by December 2026.

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