MANCHESTER 1824
The University of Manchester

Policy@Manchester

May 2022

The Energy Security Strategy: Going Nuclear – Policy Briefing

Eight new reactors are intended to improve the UK's energy self-sufficiency and reduce greenhouse gas emissions, as well as creating thousands of new jobs. The Dalton Nuclear Institute research analyses what these plans mean, and the best routes to meeting them whilst making policy recommendations on how to deliver a responsible nuclear sector which makes a full contribution to net zero

Summary

- To meet the UK's net zero target by 2050, any new reactor technology must be developed, demonstrated, licensed, and built by the 2040s.
- Setting realistic budgets and schedules will be crucial to ensuring projects are delivered in time to meet the goals laid out in the Energy Strategy.
- For the planned future nuclear programmes, the UK will need to gain access to viable sites, both with and without a history of nuclear.
- There is a need to examine whether the current system of waste classification, treatment and disposal is optimal or even fit for purpose.

Introduction

As the UK faces a legal obligation to achieve net zero by 2050, the government's Energy Security Strategy announced plans to build eight new nuclear reactors in the UK. Rapid action on the part of policymakers is needed to expedite planning approval and minimise our dependence on global supply chains, in addition to developing new reactors, clarifying waste classification and waste policy, and achieving public acceptance for nuclear sites at national, regional and local levels

Reactors, Sites, Framework Delivery

The current UK policy sets out 'Three Waves' of nuclear energy:

1.GWe-scale Gen III+ Light Water Reactors (LWRs; deployable now)

- The current generation of LWRs are large and complex engineering projects, building new stations like this takes years, which adds to the overall cost of the electricity produced. By reducing the physical size of LWRs, reactor modules can be built in factories and assembled more easily on-site, reducing costs.

2.Small Modular Reactors (SMRs; deployable in the early 2030s)

- SMRs come with the aim being to build them in kit form in a factory and then assemble them on site. It is based on well-understood technology. Approval could take up to four years, and construction of the first reactors a further four or five years.

3.Advanced Modular Reactors (AMRs), assumed to be in the form of High Temperature Gas-cooled Reactors (HTGRs; with ambitions for a demonstrator by the early 2030s

- More exotic, advanced reactor designs offer potential benefits such as greater uranium efficiency or higher operating temperatures, but are years away from deployment.

The Nuclear Decommissioning Authority (NDA), a non-departmental public body has been allocated the task of the clean-up of shut down sites. As the nuclear strategy requires access to viable sites, the authors of the Dalton Nuclear Institute position paper 'Siting implications of nuclear energy: a path to net zero' suggest that the strategy of 'build, operate, decommission, add to the legacy' become 'build, operate, decommission, remove, re-use', where 're-use' could be further nuclear or non-nuclear activity. Resulting in a considerable effect on NDA's vision and mission, **changing 'clean-up of the nuclear legacy' to, for many sites, 'clean-up for site re-use'**.

Recommendation one: The UK government should develop an integrated framework for delivery of nuclear energy in the UK to ensure the whole lifecycle is understood.

Recommendation two: The UK government should integrate the NDA mission into this framework, supporting waste management and site clearance for reuse.

> ***"Any residual radioactivity above the average natural background, which can be satisfactorily demonstrated to pose a risk of death to the most exposed individual of less than one in a million per year is 'broadly acceptable'."***
>
> - **"No danger" as interpreted by the Office of Nuclear Regulation**

If the examination of future site uses proceeds, thorough examination of the costs and benefits of site re-use is required. Currently determined by the Nuclear Installations Act that residual activity should represent **"no danger".**

This 'no danger' criterion depends on the dose received by the 'most exposed individual', and there are examples where the 'one in a million' dose could be demonstrated to have an extremely low chance of actually occurring.

Recommendation three: The UK's existing regulatory arrangements are robust and any technology deployed in the UK should conform wholly to those requirements. However, interpretation of concepts like 'no danger' should be rational and risk-based, and avoid limits which are disproportionate to any other area of regulation.

Public Perceptions, Waste, Management of Spent Fission Fuel

Negative perceptions amongst communities are an issue for nuclear development - especially where previous plants may have been perceived to have damaged the environment or left other negative legacy behind.

The approval of any new build nuclear programme depends on whether it has been accepted that the waste produced can be managed. **Clarification of waste routes and end points remains a critical step underpinning the nuclear contribution to net zero by 2050.** In the UK, radioactive waste is classified into High, Intermediate, and Low Level Waste (HLW, ILW, and LLW respectively). ILW exceeds the radioactive boundaries for LLW, but does not generate significant amounts of heat to warrant special consideration for storage or disposal. This is a broad category; the range of wastes falling into the Intermediate Level Waste category is currently very wide.

There is currently no policy for the treatment of spent fuel for the planned Three Waves; local, regional and national choices in this area will affect the futures of the new build sites, and could modify the attitudes of any locality to new build.

Recommendation four: The UK government should re-examine the current, very broad definition of Intermediate Level Waste to consider whether more optimal routing of waste streams can be progressed to appropriate end points.

Recommendation five: The UK government should develop an integrated strategy for management of spent fission fuel from a range of operators and technologies.

Key academics

Francis Livens

Francis Livens is Director of The University of Manchester's Dalton Nuclear Institute and Professor of Radiochemistry.

William Bodel

William Bodel is a Post Doctoral Research Associate at The University of Manchester's Dalton Nuclear Institute.

Adrian Bull

Adrian Bull is BNFL chair in Nuclear Energy Systems at The University of Manchester's Dalton Nuclear Institute.

Gregg Butler

Gregg Butler is Head of Strategic Assessment for The University of Manchester's Dalton Nuclear Institute.

Contact

Suzanne Booth Suzanne.booth@manchester.ac.uk

Communications and Engagement Officer and Lead Contact for the Faculty of Science and Engineering