NDA Risk and Assurance, Environment and Sustainability Post-Doctoral Research Associate bursary
Call for proposals

The NDA is requesting applications to its PDRA bursary scheme, that is targeted at predominately risk and assurance, environment, and sustainability subjects. The call for proposals sets out several specific challenges against two broad themes (detailed later in this document):

- **Theme 1: Risk and Assurance**

- **Theme 2: Environment and Sustainability**

Speculative proposals will be considered only if these fall within the remit of those subjects as broadly defined by funding bodies including AHRC and ESRC within their relevant calls and will have a component of the research that does not have to fit the traditional STEM subjects (science, technology, engineering and mathematics).

The NDA's goals for the scheme are as follows:

- Provide fundamental understanding of technologies and processes across the NDA estate

- Maintain and develop the key technical skills that will be required to help us carry out the mission over the coming decades

- Encourage two-way knowledge transfer between the academic and industrial communities working on nuclear decommissioning

Universities and Research Institutes are invited to make proposals within the scope of the call a. Up to £500,000 is available and it is anticipated that up-to 3 projects will be funded in this year's call.

Call Theme 1: Risk and Assurance

1) Measurement of uncertainty for economic planning

With timescales of more than 120 years and uniquely complex problems, estimates of decommissioning costs across the NDA Group are subject to high levels of uncertainty. As a result, communicating the financial uncertainty to NDA's stakeholders can be challenging. NDA would like to undertake research that results in the development of a "scale" that could be used to give some measure of how "uncertain" an activity is from a financial perspective. This scale is to act as a tool for communicating uncertainty to a range of stakeholders from Government to regulators to the wider public.

The research is required to improve NDA and stakeholders' understanding of the mathematics and communication of uncertainty. NDA suggests that the scale could be co-ordinated with existing tools in use across the NDA estate (e.g. Safety and Environmental Detriment (SED) scores, Reference Class Forecasting (RCF), Technical Baseline and underpinning Research and Development (TBuRD) approaches exploring technical maturity), or it could be linked to risk appetite.   We would expect the research to include an audit of existing uncertainty scales. The research could also include the development of a roadmap towards optimisation of multi-dimensional problems related to financial planning of decommissioning operations.

2) Development of economic forecasting tools for policy planning across the NDA estate

The unique nature of many of the decommissioning challenges faced on our sites means that many of the techniques and technologies used are innovative and estimating costs with accuracy is subject to large uncertainties. NDA would like to explore the development of an economic forecasting tool for policy planning across the NDA estate that considers the technical maturity of planned decommissioning approaches. NDA's concept is that this tool will bring together technology readiness levels (TRL) with reference class forecasting (RCF) as a means of quantifying predictions of the capital costs for various decommissioning technology options.

The research should investigate the potential to incorporate TRLs into optimism bias uplifts to improve financial predictions, and to assess both the feasibility of the concept and the issues and biases within both TRL and RCF that could impact on the quality of the predictions. Where possible, research should include learning from best practice from infrastructure projects and project management learning from experience that is cross-sector, including how techniques such as reference class forecasting can be internally systemised within existing business practices.

3) Cross-sector best practice in strategic planning to benefit the NDA mission

Whilst NDA faces many unique challenges, there is significant potential to learn from other sectors, both across the UK and worldwide. NDA would like to understand strategic planning approaches adopted by other businesses, industrial sectors and major infrastructure projects that have a similar scale of mission to NDA. Similarities could include multi-decadal projects, budgets running into £ billions per year, operating within a regulated environment or significant stakeholder and policy influence drivers that impact on mission delivery. Research that gathers information from other industry sectors where planning decisions influence or are impacted by policy development in the public sector would be of particular interest.

Where other industry sectors undertake costly, regulated long-term projects, the NDA is interested to discover how they build in factors such as environmental and social challenges. The research could also include how a measure for benchmarking best practice could be developed.

4) Quantitative Risk Assessments

The NDA is interested in research that could lead to improvements in quantitative risk assessments. The research could cover statistical approaches to summing individual S-curves arising from projects into programmes, portfolios and ultimately a decommissioning provision. It could take due care to account for correlation between the underlying projects, and links to systemic bias revealed by approaches including reference class forecasting.

From a practical perspective, NDA is also interested in research that assesses the statistical validity of summing predictions of overspends (P50, P60 etc) across several different projects.

5) The role of artificial intelligence (AI) and risk culture in decommissioning benchmarking

Reducing both hazard and risk are core drivers in NDA's mission. Developing improved models for hazard reduction and decision making based on risk reduction is therefore of interest to NDA. The research could cover topics such as the potential application of big data/ AI to assurance analysis leading to the development of improved models for hazard reduction.

The research could include benchmarking in environments where the number of data points are low. In terms of measuring the impact of improved models on decision making.

The research could also include an understanding of risk culture within project-based organisations both in terms of the culture of risk management and how risk appetite is often disconnected from the decision.

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Call Theme 2: Environment and Sustainability

1) Benchmarking of methods to demonstrate the social value of NDA's mission

NDA has a unique role, charged with the mission to clean up the UK's earliest nuclear sites safely, securely and cost-effectively - but we also have a unique opportunity to invest in our people, our communities and by protecting the environment for long term future use. We are committed to making the journey towards delivering our mission a sustainable one. Social value is a 'new term' within government strategy and the demonstration of social value has recently been set out in the NDA mission as a strategic objective.

NDA is interested in conducting research into social value, to help define what it means to the NDA strategy, to benchmark ways in which it is measured and to understand how the concept of social value can be applied within nuclear decommissioning. NDA would like to undertake research to establish which other industry or government sectors apply social value, what is best practice and how it is measured, for example value frameworks.

2) Sociological and anthropological impact of decommissioning

At NDA, we believe our duty is not simply about avoiding compromising the needs of future generations, we want to leave a positive legacy. The NDA has a duty in the Energy Act (2004) to have regard for the impact of its activities on communities living near its sites. The NDA must ensure that decommissioning activities benefit local communities and provide a beneficial legacy once decommissioning work is completed.

NDA is interested in conducting research into the sociological and anthropological impact of decommissioning. The research could support NDA in learning from communities on how they see a post nuclear future, measuring the impact that goes beyond individuals that are directly employed in the industry. The research could consider the social barriers including the potential impact of social distrust of institutions, the impact of change within the nuclear industry and the emergence of new industries that could replace nuclear within communities currently dependent on nuclear.

3) Benchmarking of NDA's ecological impact

As part of the journey towards delivering its mission, NDA inevitably has an impact on the environments and communities in which we operate, and a responsibility to protect the environment for long term future use. Understanding the ecological impact of our decommissioning mission is a key part of this.

NDA is looking to undertake research that can support implementation plans that will be put in place over the next 10-20 years, to realise ecological benefits over timescales of the next 30 years. NDA faces questions on how best to use the land we manage, making best use of the natural capital to contribute towards reducing the impact of climate change and the resulting loss of ecological diversity.

Models that help us understand our natural capital are well understood by our supply chain. However, NDA is interested in undertaking research that could establish a new state-of-the-art that goes beyond what is available in the supply chain.

4) Development of tools to enable long-term carbon accounting

With decommissioning timescales extending into the next century, NDA is interested in research that could lead to the development of tools to assist in long term carbon accounting. The goal of this research

would be to develop a framework for making the right choices over extended timeframes and generations. The research could include a benchmarking of existing tools and would lead to the development of a roadmap that could potentially go beyond the state-of-the-art.

5) Organisational psychology and the implementation of sustainable thinking

NDA is interested in research that would help us embed "sustainable thinking" within NDA Group. To be more successful in our mission we want to encourage openness and instil an appetite for change across the nuclear sector and its supply chain. The research should investigate the root causes of organisation insularity and tendency of large organisations not to be externally orientated.

The research could consider cross-sector best practice on approaches to develop a culture of sustainable thinking, including methods of communication and measurement of the impact of change. The research could consider the efficacy of organisational interventions to address insularity.