

# Management of Materials and Samples by the NDA Estate

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Research and Strategic Case (Gate 0)

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**April 2016**

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## **Executive Summary**

### **Introduction**

This paper aims to clarify the Nuclear Decommissioning Authority (NDA) strategic objective for the management of materials and samples, review current management arrangements and assess whether further work is required to ensure that a robust, sustainable and deliverable strategy is in place.

In this context, 'materials and samples' are defined as:

**Physical items that have been retained due to their perceived value in supporting the delivery or technical underpinning of the NDA mission.**

Examples may include materials and samples generated during research, tests and experiments to assist decommissioning and waste management activities, or samples obtained or produced to underpin safety cases and disposability assessments.

### **Case for Change**

At present, there is no estate-wide strategy for the management of NDA-owned materials and samples. This has led to inconsistent approaches to the management of materials and samples, and has exposed the NDA to a number of notable risks. Without a coherent strategy for the management of materials and samples, there are concerns that ultimately:

- There may be an inability to demonstrate that the NDA mission and supporting strategies are technically underpinned;
- The pace of decommissioning is hindered;
- There could be additional costs to the taxpayer;
- The NDA may be left vulnerable to legal and insurance risks relating to the inappropriate transfer of materials and samples to third parties;
- The NDA may be unable to respond to reasonable third party requests regarding materials and samples, leading to reputational damage at national and international levels.

Through this paper, the NDA has identified that there is a strong case for reviewing the current approach to materials and samples management across the estate to support the NDA in developing strategy and delivering its mission, to reduce risks associated with current arrangements and to encourage a consistent approach to materials and samples management across the estate.

### **Strategic Objective**

The proposed strategic objective is to ensure that appropriate materials and samples, and their supporting records, are retained and actively managed to enable the NDA to develop strategy and deliver its mission and, where practicable and appropriate, make materials and samples available to third parties.



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### **Next Steps**

The proposed strategy should remain flexible to accommodate site specific requirements and support collaboration with key stakeholders, where practicable. The proposed strategy and its implementation should seek to enhance current good practice and support those involved in the production and management of samples.

The next phase of work will involve identifying and assessing options for the management of materials and samples in alignment with the above strategic objective. The NDA recognises that the management of materials and samples is of interest to a wide range of stakeholders and we will continue to engage with interested parties throughout the strategy development and implementation work.

## 1. Introduction

This paper aims to clearly establish and communicate the Nuclear Decommissioning Authority (NDA) strategic objective for the management of materials and samples. In this context, 'materials and samples' are defined as:

**Physical items that have been retained due to their perceived value in supporting the delivery or technical underpinning of the NDA mission.**

Examples may include materials and samples generated during research, tests and experiments to assist decommissioning and waste management activities, or samples obtained or produced to underpin safety cases and disposability assessments.

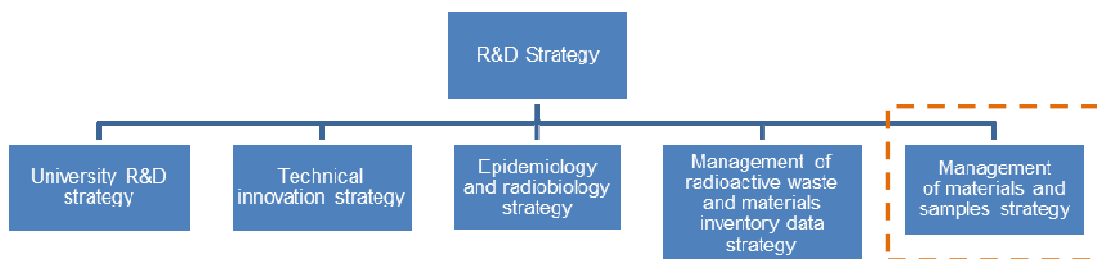
Information gained from materials and samples can help to provide the technical underpinning that is essential for Site Licence Companies (SLCs) delivering the NDA mission. It is also recognised that materials and samples currently held within the NDA estate may have value in supporting activities not directly related to the NDA mission, for example in wider nuclear research (e.g. new build research and development programmes).

This paper aims to:

- clarify the strategic objective for our work in this area;
- review current management arrangements; and
- identify whether further work is required to ensure that a robust, sustainable and deliverable strategy is in place.

This work is a strand supporting the NDA's Research and Development Strategy (Figure 1).

**Figure 1 - Component strands of the NDA's Research and Development Strategy**





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## 1.1 Scope of Strategy

This strategy focuses on the management of materials and samples generated through work funded by the NDA or NDA-owned SLCs or subsidiaries. The work may have been undertaken directly by these organisations or by contractors working on their behalf.

Due to the wide range of testing activities that have happened across the estate, materials and samples exist in a variety of formats. Typical examples include graphite, steel and cemented samples. They may be active or inactive, and can be any size, weight or shape. The items may also have been treated (e.g. encapsulated or packaged). They may have been generated recently or may have been stored on sites for many decades.

Some typical examples of materials and samples covered by the scope of this strategy are shown in Appendix 1.

This strategy relates to materials and samples as described above that have been stored or archived, and also to materials and samples that will be generated as a result of current and future programmes of work across the NDA estate.

This strategy does not relate to routine analytical samples that are taken for operational purposes, such as effluent discharge samples. Routine soil samples are also excluded; however, soil samples that have been retained for specific remediation and land quality studies are included.

## **2. Current Situation & Identified Issues**

At present, there is no estate-wide strategy for the management of NDA-owned materials and samples. It is currently the responsibility of each SLC to determine the most appropriate solution for managing these items at their sites or their contractor premises. This has resulted in the development of a range of management approaches at various level of maturity.

The NDA is therefore leading the development of an appropriate estate-wide strategy for the management of materials and samples. NDA SLCs will be responsible for delivering this strategy, which is anticipated to deliver the following benefits:

- a consistent approach to the management of materials and samples across the NDA estate;
- improved ability for the estate to extract best value from the materials and samples;
- improved ability to ensure compliance with our legal and insurance obligations;
- improved opportunities for credible third parties to identify and utilise any surplus samples for their benefit.

In 2014/15, the NDA gathered information about materials and samples being managed in stores or archives at all NDA sites<sup>1</sup>. The project aimed to generate high level, baseline data to inform the development of this strategy.

Key findings from the review are summarised below:

- Materials and samples are currently held in a wide range of store types, from formal archives managed under contract by third parties, to small, ad hoc stores with little or no formal management arrangements.
- NDA-owned materials and samples are held both at SLC sites and at a range of contractor premises.
- The quality of record keeping for materials and samples is variable; some materials and samples are accompanied by comprehensive records, whilst some have very limited supporting documentation.
- For the majority of the stores identified, it was found that little or no arrangements are in place to aid decision making about whether to keep or dispose of samples.
- For the majority of stores, no formal procedures were in place for accessing the materials and samples, or for maintaining an appropriate inventory.
- In some instances, accountabilities for management of the stores and for the renewal of associated contracts were unclear.

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<sup>1</sup> NDA (2015), Review of Materials Archives and Stores at NDA SLC Sites, Issue 3.





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- In the majority of cases, there was no single person within the SLC responsible for maintaining an oversight of archived materials and samples management within their SLC.
- A range of issues may impact the SLCs ability to continue maintaining facilities for materials and samples. Examples include:
  - lack of funding to support ongoing management and monitoring of the store or archive;
  - potential for the existing facilities to become unavailable, for example, due to the expiry of a lease or decommissioning of the building in which a store is located;
  - uncertainty over the inherent value of a material or sample.
- There is currently no formal mechanism for sharing information about materials and samples management and availability, or for encouraging best practice in this area.

The study highlighted some significant areas for improvement in the management of materials and samples.

In 2015/16 a series of workshops were held with Radioactive Waste Management (RWM) Ltd, a number of SLCs (both NDA and non-NDA SLCs) and representatives from the academic sector to explore how the 'value' of samples could be assessed and to investigate options for improving the transfer of materials and samples to third parties. Work is ongoing in these areas.

### 2.1 Risks Associated with Current Situation

The current lack of an estate-wide strategy for managing materials and samples introduces a series of risks to the NDA estate. An overview of key issues identified have been summarised in Figure 2, along with their underlying causes and associated impacts.

Without a coherent strategy for the management of materials and samples, there are concerns that ultimately:

- There may be an inability to demonstrate that the NDA mission and supporting strategies are technically underpinned, either through the loss or damage of potentially valuable materials and samples, or through an inability to extract value from materials and samples.
- The pace of decommissioning is hindered, through a lack of understanding of materials and samples that are available to support activities associated with the delivery of our mission, and also due to known and unknown duplication of effort.
- There could be additional costs to the taxpayer through unnecessary repeat sampling, unknown duplication of effort, unnecessary storage of surplus materials and samples, and prolonged decommissioning timescales. In addition, there may be missed opportunities to maximise the value extracted from existing materials and samples through poor management and lack of knowledge transfer.

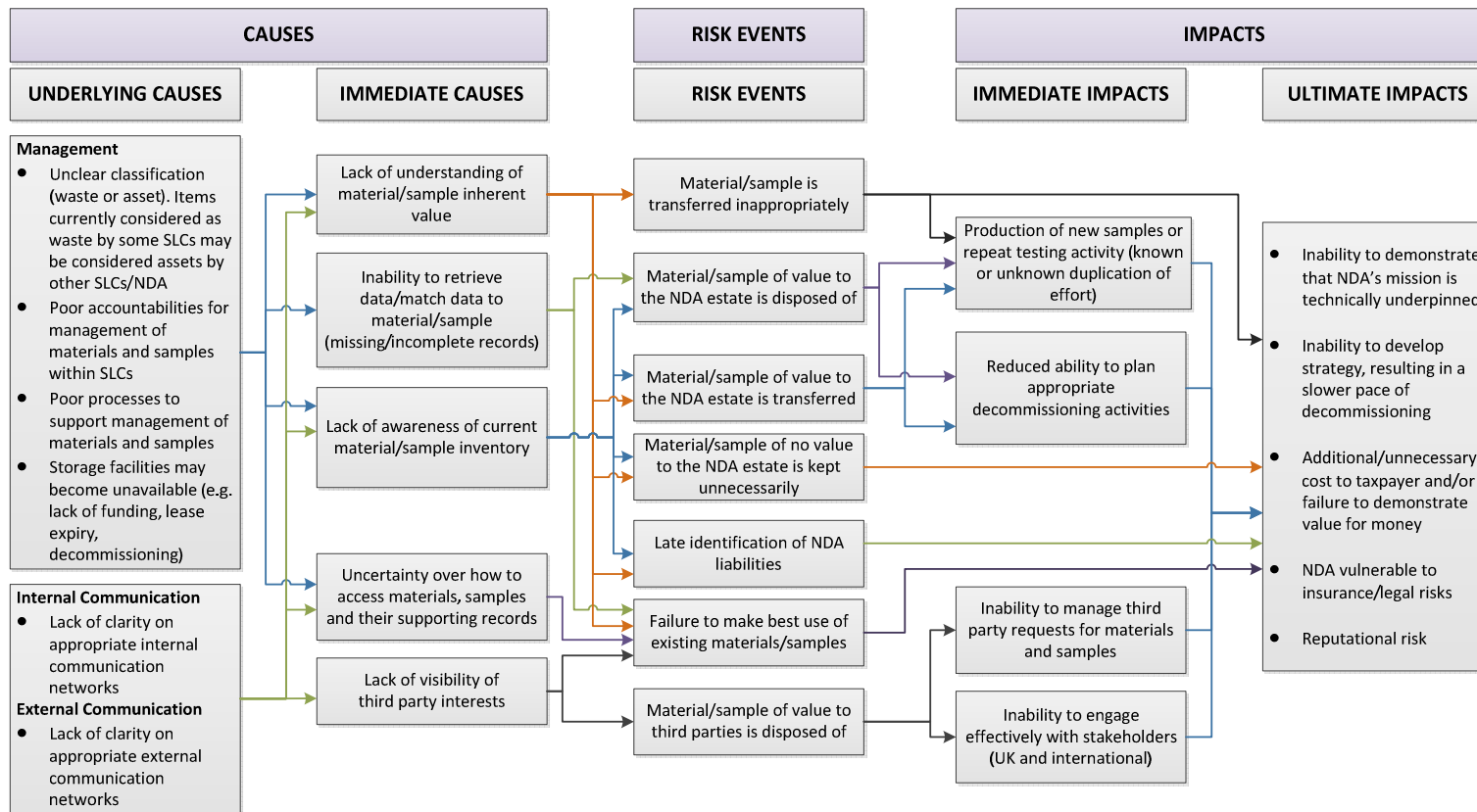


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- The NDA may be left vulnerable to legal and insurance risks relating to the inappropriate transfer of materials and samples to third parties (in particular, to non-licensed sites).
- The NDA may be unable to respond to reasonable third party requests regarding materials and samples, leading to reputational damage both at national and international level.

# Management of Materials and Samples Research and Strategic Case (Gate 0) April 2015

Figure 2 – Key Risks to the NDA Associated with the Current Situation for Management of Materials and Samples



## **2.2 Alignment with Corporate Strategic Risks**

The NDA has set out 14 Corporate Strategic Risks, each owned by a member of the NDA Executive. This materials and samples strategy aims to reduce the risk that *'Technical solutions fail to achieve desired outcomes'* (Corporate Strategic Risk No. 2)<sup>2</sup>. This risk is owned by the NDA Strategy & Technology Director.

## **2.3 Risk Assessment**

The NDA assesses risks using a Probability Impact Diagram (Appendix 2), to provide a consistent assessment of impact and likelihood<sup>3</sup>.

A number of key risk events associated with the current strategy for managing materials and samples have been identified in Figure 2. Each of these risks has been subject to a risk assessment (Appendix 2).

The assessment indicates that the current situation for managing materials and samples exposes the NDA to a number of notable risks. This assessment will inform the prioritisation of actions to mitigate risks associated with the current situation for managing materials and samples.

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<sup>2</sup> NDA (2015), Corporate Strategic Risk Dashboards.

<sup>3</sup> NDA (2015), Risk Management Framework. Risk policy, governance, procedures and tools.

### 3. Interfaces with Other NDA Topic Strategies

The NDA strategy describes our high level approach to delivering our mission. We have grouped all of our activities under five strategic themes, these include:

- **Site Decommissioning and Remediation**, which defines our approach to decommissioning redundant facilities and managing land quality in order that each site can be released for its next planned use.
- **Spent Fuel Management**, which defines our approach to managing the diverse range of spent nuclear fuels for which we are responsible, including Magnox, oxide and exotics.
- **Nuclear Materials**, which defines our approach to dealing with the inventory of uranics and plutonium currently stored on some of our sites.
- **Integrated Waste Management**, which considers how we manage all forms of waste arising from operating and decommissioning our sites, including waste retrieved from legacy facilities.
- **Critical Enablers** support the overall delivery of our mission and, in some cases, reflect the supplementary duties assigned to the NDA by the Energy Act (2004).

The strategy for management of materials and samples will interface with all of these strategic themes; information gained from such assets can help to provide the technical underpinning for decommissioning and remediation activities, as well as for spent fuel, nuclear material and waste management activities. Materials and samples are used to underpin safety cases in all of these areas and also support disposability assessments.

Identifying interfaces with these strategic themes and their supporting topic strategies is important to ensure that internal opportunities for joint working and collaboration are not missed and to ensure alignment with approved strategic positions. The most important interfaces are discussed below.

#### 3.1 Critical Enabler: Research & Development

Research & Development (R&D) is a Critical Enabler of the NDA Strategy. Our strategic objective is to ensure that *'the delivery of the NDA's mission is technically underpinned by sufficient and appropriate research and development (R&D)'*<sup>4</sup>.

R&D is fundamental to ensuring the safe, cost-effective delivery of our mission. Together with innovation and the sharing of good practice both nationally and internationally, the intelligent application of R&D can also reduce costs, timescales and environmental impact.

Materials and samples are often generated as a result of R&D activities. It is not necessary or practicable to retain all materials and samples generated as a result of R&D projects;

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<sup>4</sup> NDA (2016), NDA Strategy, Effective from April 2016

however, there is a need for improved guidance for project managers on which samples may be considered to be of particular value in the long-term and may require retention.

The effective management of materials and samples can also support the NDA in achieving its wider R&D objectives. For example, the success of our R&D programme is dependent upon effective collaboration, both with co-funders and within the supply chain. Opportunities for collaboration will increase through sharing knowledge about materials and samples and providing authorised bodies (both nationally and internationally) with appropriate access to these items for credible R&D purposes. Although there are mechanisms available for encouraging collaboration, such as the Nuclear Waste & Decommissioning Research Forum (NWDRF) and Nuclear Industry Research Advisory Board (NIRAB), their focus has not been on addressing materials and samples management issues.

Our R&D strategy also aims to encourage proactive engagement with Governments to ensure that NDA R&D forms a visible part of the wider UK nuclear R&D portfolio. Collaborative working on issues relating to materials and samples would aid this objective; in addition to supporting decommissioning activities, materials and samples can be of value to wider nuclear materials research (e.g. new build research programmes).

Finally, allowing the UK supply chain, including academia, appropriate access to existing materials and samples for credible R&D purposes would also help to upskill the supply chain and improve the competitiveness of UK businesses internationally. This is also a key element of our R&D strategy.

A robust strategy for the management of materials and samples across the NDA estate, and its effective implementations, will aid the NDA in achieving its strategic objectives for R&D.

### **3.2 Critical Enabler: Information Governance**

Information Governance is a Critical Enabler of the NDA Strategy. The Information Governance strategic objective is *'to optimise value from NDA knowledge and information assets in a compliant and secure manner, investing only in that which needs to be retained to deliver the NDA's mission'*<sup>4</sup>.

Materials and samples are considered by the NDA to be 'physical records' and, along with their supporting documentation, should be managed in accordance with our Information Governance strategy<sup>5</sup>. The Information Governance strategy consists of five interdependent strands, each of which should be considered during the development of a strategy for the management of materials and samples:

- **Information Management**, Information Management is the application of techniques to collect information from a variety of sources and to store it in such a way that it is both safe and accessible to those who need it.
- **Information Risk Management**, The NDA is responsible for the safe-keeping of information that is subject to the UK national security regulatory system. In addition to

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<sup>5</sup> NDA (2013), Information Governance Strategy, February 2013

providing safe and accessible storage, the NDA must have the capability to keep its sensitive nuclear and personal information assets secure.

- **Knowledge Management**, Effective Knowledge Management identifies and captures the knowledge held in an organisation, allowing it to be shared and applied.
- **Information and Communication Technology (ICT)**, Well-planned and managed ICT is a vital enabler for efficient Information Governance.
- **Intellectual Property Management**, The Intellectual Property generated and owned by the NDA Estate is a valuable asset which should be managed and protected.

The strategy for managing materials and samples has strong interfaces with a number of these disciplines:

- **Information Management**, Where possible, materials and samples should be supported by adequate records to help future users to understand the context for creation of the samples and the conditions in which they have been kept. The availability of information about sample provenance and subsequent management greatly increases the sample's inherent value. There may also be supporting research outputs, including data and reports, relating to particular materials and samples. In addition, when a sample is transferred to a third party, a range of supporting documents should be retained to evidence the decision-making process, and the compliant and safe transfer. All of this information should be managed in accordance with the Information Governance strategy. If it has been determined that best value has been extracted from the sample, it may be appropriate to dispose of the sample; however, the remaining records (e.g. research reports) should be retained in accordance with our Information Governance strategy.
- **Information Risk Management**, Some materials and samples comprise or contain nuclear materials, such as plutonium and uranium. A strategy for the management of materials and samples should ensure alignment with the related security and information risk management strategies.
- **Knowledge Management**, Effective Knowledge Management currently plays an important role in the management of materials and samples, particularly when determining the provenance of materials and samples without supporting records. The loss of this knowledge represents a key risk for the retention of such samples. Knowledge management issues will be acknowledged within this strategy, but will be addressed through the programmes of work associated with the Information Governance strategy.
- **Information and Communication Technology (ICT)**, ICT will support the development and implementation of an appropriate strategy for the management of materials and samples. For example, ICT solutions will be reviewed when considering how best to communicate information about materials and samples. Any ICT solution should be developed in accordance with the Information Governance strategy, considering common standards and technologies.

- **Intellectual Property**, Issues with Intellectual Property may arise through the use of NDA materials and samples for research and development purposes; particularly where NDA samples are used by third parties. It is anticipated that IP issues arising would be managed in alignment with the Information Governance strategy and the NDA Intellectual Property Policy<sup>6</sup>.

The development of a strategy for the management of materials and samples should complement and support the Information Governance strategy. In particular, the NDA will need to invest in those materials and samples which need to be retained in order to support the delivery of our mission.

### **3.3 Critical Enabler: Asset Management**

Asset Management is a Critical Enabler of the NDA Strategy. This key strategic objective is to *'secure reliable, value for money performance by making the best use of UK assets and thereby enabling delivery of the site end states'*<sup>4</sup>.

If materials and samples have been assessed as valuable to the NDA's mission and will be kept, adequate storage facilities must be available to accommodate them. Some materials and samples require specialist storage facilities with controlled environments (e.g. regulated temperature and humidity).

Reviewing storage arrangements is particularly important for sites that are progressing towards interim end states in the near future, where such materials and samples may need to be removed from sites.

This strategy must consider how existing assets can be best utilised to enable the appropriate storage of such materials and samples. In addition, it is also essential that materials and samples which have no value to the NDA estate or our wider strategic objectives are not retained (either transferred to other stakeholders or managed as waste), freeing up existing assets (such as stores) for alternative uses or enabling them to be decommissioned.

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<sup>6</sup> NDA (2016), EGP12 NDA Intellectual Property Policy.



#### **4. Interfaces with National Strategy**

It is important to acknowledge the interface between this strategy and relevant UK Strategy. In March 2013, Government published the *Nuclear Industrial Strategy - The UK's Nuclear Future*<sup>7</sup>. This document stated that:

*'A National Nuclear User Facility (NNUF) will be supported to expand greatly nuclear research involving the most advanced methods for the handling, testing and inspection of radioactive materials. Academic access will be enhanced for both industrial focused work and improving our understanding of how nuclear systems behave under the extreme conditions found in nuclear reactors and across the fuel cycle.'*

The NDA recognises that the management of materials and samples is of interest to a wide range of stakeholders and we will continue to engage with interested parties throughout the strategy development work. The NDA currently engages with the NNUF via the Irradiated Archive Working Group.

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<sup>7</sup> HMG (2013), Nuclear Industrial Strategy - The UK's Nuclear Future.

## **5. Key Stakeholders**

It is important that the development of a strategy for the management of materials and samples considers the views of key stakeholders. It may not be possible to meet all stakeholder needs; however, an understanding of key interests and drivers can support the development of a robust, sustainable and deliverable strategy.

A wide range of stakeholders have an interest in the management of NDA materials and samples. The below provides an indicative list of key stakeholders and high level information about their interests in materials and samples management. The list is not intended to be exhaustive and instead provides contextual information to aid the development of this strategy.

### **5.1 The Nuclear Decommissioning Authority (NDA)**

The NDA is a Non-Departmental Public Body (NDPB) responsible for decommissioning and clean-up of UK's nuclear legacy sites.

Considering the activities of the NDA only - excluding NDA Site Licence Companies (SLCs) - materials and samples are typically generated through the NDA's directly funded research projects. The NDA uses information extracted from these materials and samples to inform our strategy development work and to underpin position statements.

Work using such materials and samples is undertaken primarily by our SLCs, the academic sector and supply chain; these projects help the NDA to develop innovative decommissioning technology and / or maintain key skills that are essential for the delivery of our mission.

The NDA also holds a small number of materials and samples, used as tools in stakeholder engagement and training activities (see Appendix 1 for examples). These materials and samples help people to understand more about the reality of decommissioning and the technical challenges involved.

### **5.2 NDA Site Licence Companies (SLCs)**

The NDA SLCs act as NDA's agents to meet the decommissioning mission under the Energy Act 2004. NDA has ownership of the sites and assets, and provides the funds to enable SLCs to carry out the necessary operations (i.e. provide staff to run the sites) and let contracts needed to run and decommission the sites.

NDA SLCs use materials and samples for a variety of purposes:

- To underpin safety cases and risk assessments;
- To provide assurance in long term performance;
- To inform the development of site-specific strategies (for example, waste packaging strategies);
- To support current and future R&D activities and investigations. This may involve the use of third parties to carry out controlled experiments or could involve making the materials available to researchers.



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- To underpin the Environmental Safety Case for a site (e.g. LLWR use materials and samples to demonstrate how the condition of the facility will change over time. Samples may include construction materials and waste samples).

### 5.3 Radioactive Waste Management Ltd (RWM Ltd)

RWM Ltd. is a wholly-owned subsidiary of the NDA. RWM Ltd is responsible for delivering a geological disposal facility and for providing solutions for the management of Higher Activity Wastes.

RWM Ltd generates and uses materials and samples to assess product quality and to underpin decision-making processes and disposability assessments. For example, samples may be generated to enable assessments of package construction materials and immobilising materials. Samples may also be generated to help RWM understand how packages might function in 'worst case' scenarios (e.g. impact scenarios). Images of typical samples managed by RWM Ltd. are shown in Appendix 1.

Much of the information obtained from these samples is used to inform disposability assessments and safety cases, and to refine models. Some of these materials and samples may need to be retained to assess their long-term performance (e.g. corrosion monitoring).

RWM Ltd also uses materials and samples as tools in stakeholder engagement and training activities, helping people to understand more about how radioactive wastes may be packaged and transported for disposal.

### 5.4 International Nuclear Services Ltd (INS Ltd)

International Nuclear Services Limited (INS) is a wholly-owned subsidiary of the NDA and has specialist expertise in irradiated fuel management and nuclear material transportation.

INS use and retain product certification samples for spent fuel reprocessing customers. They also retained samples for future use, for example, by the future processors to confirm analytical results on the product batches which they may receive.

### 5.5 The Office for Nuclear Regulation (ONR)

The Office for Nuclear Regulation (ONR) is the independent regulator of nuclear safety and security across the UK. ONR has regulatory expectations for the management of nuclear matter and radioactive waste, which apply to the management of materials and samples.

ONR's primary concerns are that materials and samples that are likely to be beneficial or required to underpin a safety or disposability case are retained, along with their supporting records, and stored appropriately. This would include any materials and samples of use to a future Geological Disposal Facility (GDF) or other disposal site operator.

ONR also requires that materials and samples that are no longer of use should be transported and disposed of safely.

### 5.6 Environmental Regulators

There are four environmental regulators in the UK: the Environment Agency, Natural Resources Wales (NRW), the Scottish Environment Protection Agency (SEPA) and the

Northern Ireland Environment Agency (NIEA). These public bodies aim to ensure the protection of the environment and the sustainable use of natural resources.

The environmental regulators are responsible for regulating all disposals of radioactive waste on and from nuclear licensed sites in the UK. Disposals of radioactive waste include discharges into the atmosphere, discharges into the sea, rivers, drains or groundwater, disposals to land, and disposals by transfer to another site.

The environmental regulators require that materials and samples that are no longer of use are transported and disposed of safely and in accordance with their environmental permits. Where appropriate, the environmental regulators would encourage alternative uses for unwanted materials and samples in preference to disposal.

### **5.7 Nuclear Innovation and Research Advisory Board (NIRAB)**

NIRAB was established in January 2014 to advise Government on the level, approach and coordination of nuclear innovation and R&D that will keep future energy options open and enable both domestic and international commercial opportunities to be realised by the UK.

NIRAB's mission is to ensure that public R&D programmes are aligned to support industrial and energy policy, and to maximise synergy across different aspects of the nuclear sector, including fusion and the NDA portfolio.

The availability and management of existing materials and samples has been identified as an issue by NIRAB and is included in their recommendations for future investigation. The NDA will continue to work with NIRAB on this topic, supporting the wider UK nuclear R&D programme, as appropriate.

### **5.8 Non-NDA Site Licence Companies (SLCs)**

Within the UK, there are a range of businesses that hold nuclear site licenses. Non-NDA SLCs will use materials and samples in similar ways to NDA SLCs, for example, to underpin safety cases and risk assessments, to provide assurance in long term performance and to inform the development of site-specific strategies. Materials and samples will also be used to support current and future R&D activities and investigations.

The NDA currently shares some materials and samples storage facilities with non-NDA SLCs (notably EDF Energy Nuclear Generation Ltd). Where applicable, the NDA will consider how changes in strategy may impact non-NDA SLCs and identify opportunities to deliver best value for the taxpayer through potential collaboration with other organisations as appropriate.

Where practicable, the NDA would like to support the legitimate use of NDA-owned materials and samples by non-NDA SLCs, where it can be demonstrated that the sample is no longer required by the NDA estate and there is potential benefit to the sector.

### **5.9 The Supply Chain**

Supply chain organisations (such as the National Nuclear Laboratory Ltd) hold materials and samples for both NDA and non-NDA stakeholders. These materials and samples are typically generated and managed to aid SLCs (and other operators) in discharging their requirements to have access to materials properties information in support of safety cases and plant

operation. The types of tests conducted vary widely but typically investigate sample physical properties (e.g. density, thermal and mechanical properties), chemical properties and microstructural examinations (microscopy).

With agreement from owners, the supply chain may also use materials and samples to support supply chain funded R&D, and national and international research programmes.

#### **5.10 Culham Centre for Fusion Energy (CCFE)**

The United Kingdom Atomic Energy Authority Culham Centre for Fusion Energy (CCFE) recently opened a Materials Research Facility (MRF). The MRF allows users to process and examine material that is too radioactive for university premises, but not so radioactive as to require facilities on a nuclear licensed site.

The facility aims to support fission R&D undertaken by university and industry scientists as part of the Government's National Nuclear User Facility (NNUF) initiative. There is interest from UK academic researchers to use this facility to conduct research on NDA owned materials and samples.

#### **5.11 The Academic Sector**

The academic sector plays a vital role in conducting technical research in support of the NDA's mission and the wider nuclear industry (e.g. new build programmes). In order to undertake this work, researchers may require access to NDA-owned materials and samples for physical, chemical and/or radiological testing, analysis and monitoring.

The NDA would like to gain a better understanding of the academic sector's needs. This will help the NDA to support specific research programmes, where appropriate. The NDA is engaging with representatives from the academic sector through the NNUF Irradiated Archive Working Group.

#### **5.12 Others**

Other key stakeholders may have an interest in the management of NDA-owned materials and samples, for example, other Government bodies, international research organisations, educational establishments, museums and historians. The proposed strategy should be flexible to accommodate credible stakeholder needs, where practicable.

## **6. Case for Change**

Materials and samples are important assets; information gained from such assets can help to provide the technical underpinning that is essential for the delivery of our mission. At present, there is no estate-wide strategy for the management of NDA-owned materials and samples. This has led to inconsistent approaches to the management of materials and samples, and has exposed the NDA to a number of notable risks (see Section 2).

The NDA is in a unique position to lead the development of this strategy; the NDA owns a diverse range of materials and samples, reflecting the wide scope of activities across the estate and the long timescales over which our sites have been in existence. A single, estate-wide strategy is needed to support the NDA in developing strategy and delivering its mission, to reduce risks associated with current arrangements and to encourage a consistent approach to materials and samples management across the estate.

The subsequent sections review the case for change for the NDA and for our SLCs and subsidiaries.

### **6.1 NDA Case for Change**

We need to review our approach to ensure that sufficient materials and samples (and their supporting records) are kept, managed and maintained by SLCs to support the delivery and technical underpinning of our mission. This involves identifying those materials and samples which are considered to be of value to the NDA estate, ensuring that appropriate management arrangements are in place to preserve the materials and samples, and ensuring that best value can be extracted from them. The NDA is also keen to ensure that materials and samples which are no longer required can be easily identified, allowing them to be managed accordingly.

The NDA also receives requests from organisations such as academic institutions and research establishments for access to NDA owned materials and samples, primarily for R&D purposes. Our response to such requests has typically been inconsistent and the current lack of processes to manage such requests introduces inefficiencies to the way we work.

Where practicable, the NDA would like to support the legitimate use of NDA-owned materials and samples by such organisations, where it can be demonstrated that the sample is no longer required by the NDA estate and there is potential benefit to the sector. Not only does this work help in the development of technical solutions to challenges on site, but it helps to develop and maintain key skills within the workforce that can enable the delivery of the NDA's mission in the long-term.

### **6.2 NDA SLC and NDA Subsidiary Case for Change**

Materials and samples and their associated records provide essential underpinning for various SLC activities and must be managed appropriately. There is a strong case for SLCs to review their approach to management of materials and samples as part of this strategy:

- To enable the development of robust nuclear safety cases.
  - The ONR states that a good safety case ‘*should be supported with verifiable and relevant evidence (i.e. documented, measurable, etc.)*’<sup>8</sup>. Materials and samples may be used to provide part of the evidence and underpinning to support the safety case, and should be managed appropriately.
- To ensure a comprehensive understanding of nuclear liabilities.
  - An improved understanding of the materials and samples inventory will help SLCs to ensure that they have a comprehensive understanding of their nuclear liabilities. Due to the nature of the research conducted on the materials and samples, some may be considered as problematic to dispose of. An understanding of the inventory and resulting liabilities will aid waste management planning and help to mitigate delays to the decommissioning programme.
- To provide assurance of long term performance (e.g. of materials and waste forms) and product quality.
- To facilitate disposability assessments.
- To support effective asset management.
  - An improved understanding of the materials and samples inventory and the ‘value’ of the items will enable sites to dispose of surplus materials (either transferred to other stakeholders or managed as waste), freeing up existing assets (such as stores) for alternative uses or enabling them to be decommissioned.
- To improve the efficiency of materials and samples management.
  - In particular, improved processes for assessing the value of materials and samples and facilitating the transfer of materials and samples to third parties will allow more effective use of SLC resources.
- To maximise the value extracted from materials and samples.
  - Greater visibility of materials and samples available across the estate will help to maximise the value that can be extracted from materials and samples and help to avoid costs associated with unnecessary repeat sampling. SLCs can benefit from access to materials and samples held by other sites across the estate.
- To support the development and maintenance of skills.
  - Facilitating the transfer of materials and samples to third parties for credible R&D purposes is of benefit to SLCs in the long-term; such work supports the development of technical solutions on site and helps to develop and maintain key skills within the workforce, enabling SLCs to deliver their contractual obligations.

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<sup>8</sup> ONR (2013), The purpose, scope and content of safety cases.

### **6.3 Summary**

Based on the above, there is a strong case to review our approach to materials and samples.

It is timely to develop a strategy for the management of materials and samples because:

- A range of risks associated with the current situation for materials and samples management have been identified and need to be mitigated;
- Many NDA sites are progressing decommissioning activities which require the clearance of buildings containing materials and samples. Failure to determine the value of these materials and samples, and to implement appropriate management routes, could lead to the loss of valuable assets;
- The NDA is currently reviewing its information governance arrangements and is in a stronger position to provide guidance to sites on effective information management practices for records associated with the management of materials and samples;
- The NDA and SLC sites continue to fund research and development projects which result in the production of materials and samples. A robust framework for managing such samples will help to ensure that best value can be extracted from such samples, minimising the potential for unnecessary storage and ensuring compliance with our legal and insurance obligations.

## **7. Strategic Objective**

The proposed strategic objective is to ensure that appropriate materials and samples, and their supporting records, are retained and actively managed to enable the NDA to develop strategy and deliver its mission and, where practicable and appropriate, make materials and samples available to third parties.



## **8. Aspirational Outcome**

The proposed strategic objective is to ensure that appropriate materials and samples, and their supporting records, are retained and actively managed to enable the NDA to develop strategy and deliver its mission and, where practicable and appropriate, make materials and samples available to third parties.

This estate-wide strategy should enable the strategic objective to be met and enable key risks to be reduced to a minimal acceptable level.

It is anticipated that the development and implementation of a robust, coherent strategy for the management of materials and samples will allow the following outcomes to be achieved:

- Improved clarity on NDA and SLC roles and responsibilities with respect to materials and samples management;
- Improved consistency in approaches to the management of materials and samples across the NDA estate;
- Improved opportunities for collaboration and knowledge sharing on issues associated with materials and samples, both within the estate and with external stakeholders;
- Improved records management for materials and samples, in alignment with the NDA Information Governance Strategy;
- Improved ability to assess the value of materials and samples to inform decision-making about retention, transfer or disposal;
- Increased confidence that valuable materials and samples are being retained to support the NDA in delivery of our mission;
- Improved ability to transfer or dispose of materials and samples that are not of value to the NDA estate;
- Improved visibility of materials and samples held by NDA estate which are available for internal and third party use;
- Improved clarity on the process for transferring materials and samples to third parties;
- Solution identified for the long-term management of retained NDA materials and samples, particularly for sites entering care and maintenance or interim end states in the near term.

The proposed strategy should remain flexible to accommodate site specific requirements and support collaboration with key stakeholders, where practicable. The proposed strategy and its implementation should seek to enhance current good practice and support those involved in the production and management of samples.

## **9. Constraints to Strategy Development**

There are few constraints to the development of this strategy; those that have been identified include:

- There is a requirement to agree the strategy for managing materials and samples in advance of existing NDA sites transferring into 'Care and Maintenance' or reaching their interim end states. This imposes time constraints for strategy development and implementation. These time constraints are not considered to be a significant barrier at this stage, provided that sufficient resource is maintained within the NDA (and wider estate) to support strategy development and implementation.
- There may be opportunities to collaborate with non-NDA producers and users of materials and samples during the development of this strategy. Where appropriate, these opportunities (e.g. co-storage opportunities) should be exploited; however, the NDA must prioritise work needed to ensure the delivery of our mission.
- Financial constraints are also a key consideration in the current economic climate. There are costs associated with the retention of samples, in terms of sample transport, storage and ongoing management, and there are costs associated with the treatment and disposal of unwanted samples.
- The strategy must be developed to enable compliance with our legal and insurance obligations.

## **10. Risks Associated with Strategy Development**

Failure to develop and implement an appropriate strategy for the management of materials and samples will leave the NDA vulnerable to the risks identified in Section 2.

The risks associated with the development of a new strategy in this area will include:

- the use of internal and external stakeholder time in developing, reviewing and selecting credible and preferred options;
- ensuring the appropriate contractual mechanisms are in place for NDA SLCs to encourage action in support of the strategy;
- internal and external stakeholder interest in prioritising the topic to enable strategic decisions to be made;
- delays and/or an inability to process third party requests for materials and samples whilst strategy is being developed;
- the use of internal and external stakeholder time in implementing the preferred option;
- damage to valuable materials and samples resulting from potential changes to storage and management arrangements (these risks are to be managed on a project by project basis).

Overall, it is considered that risks associated with development of this strategy are low when compared to the risks associated with the current position (outlined in Section 2 and Appendix 2).

## **11. Conclusions**

This paper has clarified the NDA's strategic objective for the management of materials and samples, reviewed current management arrangements and assessed whether further work is required to ensure that a robust, sustainable and deliverable strategy is in place.

The proposed strategic objective is to ensure that appropriate materials and samples, and their supporting records, are retained and actively managed to enable the NDA to develop strategy and deliver its mission and, where practicable and appropriate, make materials and samples available to third parties.

The NDA has identified that there is a strong case for reviewing the current approach to materials and samples management across the estate to better meet the above strategic objective, reduce risks associated with current arrangements and encourage a consistent approach to materials and samples management across the estate.

The proposed strategy should remain flexible to accommodate site specific requirements and support collaboration with key stakeholders, where practicable. The proposed strategy and its implementation should seek to enhance current good practice and support those involved in the production and management of samples.

The next phase of work will involve identifying and assessing options for the management of materials and samples in alignment with the above strategic objective. The NDA recognises that the management of materials and samples is of interest to a wide range of stakeholders and we will continue to engage with interested parties throughout the strategy development and implementation work.

## **Appendix 1 – Example Materials and Samples**

This appendix provides an overview of typical materials and samples covered by this strategy. The scope is broad and these examples should not be considered as exhaustive.

### **Radioactive Waste Management Ltd (RWM Ltd)**

**Figure 3 - Transport container sections**



The image above shows various castings of transport container sections. These tested impact absorbers and 'proof of casting' samples are used to underpin the selection of materials for transport containers.

**Figure 4 - 3m<sup>3</sup> rounded corner boxes**



The image above shows carbon steel and stainless steel 3m<sup>3</sup> rounded corner boxes, used for packaging Intermediate Level Waste (ILW). These samples have been subjected to impact tests and are valuable in the short term to illustrate worst case fault scenarios and to help validate models.

**Figure 5 - Prototype 4 metre box steel container**



The image above shows a prototype 4 metre box steel container for Intermediate Level Waste (ILW). RWM has been running corrosion monitoring on the prototype and uses the prototype to illustrate an alternative waste container designed for the larger, less active decommissioning wastes.

**Figure 6 - 500 litre drums**



The image above shows 500 litre drums that are used for containing ILW for disposal. These drums have been subjected to impact testing to examine worst case fault conditions and release fractions in a GDF. They illustrate the different variants of 500 litre drum and provide

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a resource for further research on aged cement and wastefrom properties. They are also used to develop package inspection techniques.

### Site Licence Companies

Site Licence Companies also hold a wide variety of materials and samples. Typical examples include graphite, steel and cemented samples. They may be active or inactive, and can be any size, weight or shape. The items may also have been treated (e.g. encapsulated or packaged). They may have been generated recently or may have been stored on sites for many decades.

**Figure 7 Range of Simulant Wastefrom and Corrosion Samples**



The image above shows a range of smaller simulant wastefrom and corrosion samples that would fall under the scope of this strategy.



Nuclear Decommissioning Authority

Figure 8 - Example container for vitrified High Level Waste (HLW) (left) and fuel rods for nuclear reactors (right).



The images above show an example container for vitrified High Level Waste (HLW) (left) and a variety of fuel rods for nuclear reactors (right). The samples are used by the NDA for stakeholder engagement and educational purposes.

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**Appendix 2 – Assessment of Risk to NDA Associated with Current Approach**

**NDA Probability Impact Diagram**

IMPACT SCORE									LIKELIHOOD SCORE				
Financial	Strategy	Programme Scope / Schedule	Safety	Security	Legal	Reputation	Environment	Impact Level	<2% Very Unlikely	2>25% Unlikely	25>50% Possible	50>80% Likely	>80% Very Likely
> £200m (in year) > £10bn (economic)	NDA strategic programme cannot be completed. Real threat to NDA mission and/ or requirement to significantly alter strategy	Programme cannot be completed, schedule undeliverable.	Multiple loss of life and/ or extensive injuries arising from a major site event	Significant breach of security controls resulting in a threat to, or loss of radioactive materials	Reportable breach of regulations resulting in prosecution and/ or successful legal challenge at national level.	Sustained international adverse media coverage >1 yr Severe and sustained damage to stakeholder relationships <1 yr	Widespread permanent damage	Severe	High	High	High	Very High	Very High
£200m > £100m (in year) £10bn > £5bn (economic)	NDA strategic programme thresholds compromised Non-recoverable schedule slippage	Technical goals of programme cannot be achieved. Excessive schedule slip affects facility, site or LTP	Single loss of life or extensive and enduring injuries	Threat to or loss of Nuclear Sensitive Information. Breach of physical security controls on a section of site without radioactive materials	Breach of regulations requiring formal reporting leading to possible prosecution and a large fine	International adverse media coverage <1 yr Severe damage to stakeholder relationships in the medium term <1 yr	Long term widespread damage / permanent localised damage	Major	Medium	Medium	High	High	High
£100m > £50m (in year) £5bn > £1bn (economic)	Moderate impact to NDA strategic critical path milestones, still able to recover and meet programme completion date at moderate cost.	Moderate threat to programme requiring redesign or significant remediation. Critical path impacted, completion milestone may be recovered at cost	Major injury	Threat to or loss of information marked "Official Sensitive" or commercially confidential	Breach of regulations requiring formal reporting and/ or a medium fine	National adverse media coverage Damage to stakeholder relationships in the short term	Long term localised damage	Moderate	Low	Low	Medium	High	High
£50m > £0 (in year) £1bn > £0 (economic)	Minimal impact to NDA strategic critical path milestones, still able to recover and meet programme completion date	Marginal threat may require minor redesign or rework. Minor impact to schedule critical path intermediate milestones but no impact to completion milestones	Minor reportable injury, ill health	Threat to, or loss of information marked "Official"	Minor breach of regulations and/ or small fine	Local short term adverse media coverage Minor localised damage to stakeholder relationships	Short term regional or localised damage	Marginal	Very Low	Very Low	Low	Medium	Medium



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Risks to the NDA estate associated with current arrangements for the management of materials and samples are shown in the table below. They have been assessed in accordance with the NDA's Probability Impact Diagram (above).

Risk	Probability of Risk Occurring	Financial	Strategy	Programme Scope / Schedule	Safety	Security	Legal	Reputation	Environment
Material/sample is transferred inappropriately	Very Unlikely	Marginal impact	Marginal impact	Marginal impact	Moderate impact	Severe impact	Severe impact	Severe impact	Moderate impact
Material/sample of value to NDA estate is disposed of	Possible	Marginal impact	Marginal impact	Marginal impact				Marginal impact	
Material/sample of value to NDA estate is transferred	Unlikely	Marginal impact	Marginal impact	Marginal impact				Marginal impact	
Material/sample of no value to NDA estate kept unnecessarily	Likely	Marginal impact	Marginal impact	Marginal impact				Marginal impact	
Late identification of NDA liabilities	Possible	Marginal impact	Marginal impact	Marginal impact	Marginal impact			Marginal impact	
Failure to make best use of existing materials/samples	Likely	Marginal impact	Marginal impact	Marginal impact				Marginal impact	
Material/sample of value to third parties is disposed of	Possible	Marginal impact	Marginal impact					Moderate impact	