Draft Strategy

Sept 2015

Input sought on strategy review

This Document

The Energy Act 2004 *(ref 1)* requires NDA to review, update and consult on our Strategy every 5 years.

This document is an early version of our draft Strategy and published in order to share our emerging thinking ahead of a formal consultation process which we anticipate will start in January 2016.

The timing of the formal consultation has been moved in order to ensure that our final draft Strategy is informed by the outcome of the Government's spending review.

This document will give stakeholders the opportunity to provide their further input whilst we complete our review. As well as any general observations we would like this engagement opportunity to particularly focus on:

'**Are we asking the right questions?'**

How to provide your comments and observations

We welcome any comments and observations you may have on our work in progress on the draft Strategy. Please note any feedback received from you in 2015 will not form part of the formal consultation process in 2016.

We will share a summary of the feedback we receive during this 2015 engagement period when we publish the formal consultation draft in 2016.

We would appreciate it if you could send any comments or observations you may have to us by the end of November 2015 by letter, fax or email.

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Engagement events

NDA has arranged a number of engagement events involving Site Stakeholder Groups (SSGs), local authorities and employees at our sites.

In addition, we intend to hold a National Stakeholder Event early in 2016.

Next steps

NDA will:

- consider responses to the 2015 engagement
- issue a summary of responses received and revise the draft Strategy, as appropriate
- publish the draft Strategy for formal consultation
- consider responses to the formal consultation in 2016
- consider outputs from any events
- issue a response to the consultation, including a summary of responses received, and revise the Strategy as appropriate.

Contents

Top left - Sellafield
Bottom left - an image from our 'Come and influence Strategy' event on 19 May 2015

Preface

The Energy Act 2004 requires the Nuclear Decommissioning Authority (NDA) to review and publish its strategy every five years.

In 2005, the NDA was established as a Non-Departmental Public Body (NDPB) under the Energy Act (2004) *(ref 1)* to ensure that the UK's nuclear legacy sites are decommissioned and cleaned up safely, securely, cost-effectively and in ways that protect people and the environment.

The NDA's sponsoring department is the Department of Energy and Climate Change (DECC), with additional obligations to Scottish ministers for matters affecting Scotland.

We work with the UK government and devolved administrations to ensure their policies are reflected in our strategy and implemented at our sites.

'The UK government is responsible for reserved matters including nuclear energy, security and safety. The devolved administrations are able to exercise powers in relation to certain areas, including environmental protection and radioactive waste management. When the term government is used in this Strategy, it refers collectively to the UK government in Westminister and devolved administrations of Scotland, Wales and Northern Ireland.

Our clean-up mission covers 17 sites, 14 in England and Wales as designated by the Secretary of State for Energy and Climate Change and three in Scotland also designated jointly by the Scottish ministers.

We are also responsible for implementing both geological disposal and the UK nuclear industry's Solid Low Level Radioactive Waste Strategy.

We also have a range of supplementary functions including supply chain development, research and development (R&D), skills, socio-economic support for local communities, and stakeholder engagement.

Additional responsibilities include reviewing decommissioning plans for the UK's new nuclear reactor programme and providing oversight of the decommissioning plans for the existing fleet of nuclear power stations operated by EDF Energy (EDFE).

To achieve our mission, we work in partnership with government, regulators, communities around our sites and other stakeholders. We seek to involve them in open dialogue and recognise their views as an important part of our strategy considerations.

Since mid-2014, we have engaged with a range of stakeholders to produce this draft version of our third strategy. In it we present the challenges, our proposed direction over the next five years.

We hope stakeholders will use this opportunity to provide comments and observations on any aspect of this document by the end of November 2015.

Your comments and views will help us to shape this Strategy.

We look forward to receiving your feedback.

Top left - Demolition of turbine hall at Dungeness A
Bottom left - working at the Low Level Waste Repository

1.0 Introduction

1.1 Background

The UK's nuclear legacy represents the largest, most important environmental remediation programme in Europe.

The UK nuclear landscape began to take shape in the immediate post-war period and has evolved over many decades. The 17 sites of our estate reflect this and include the first fleet of nuclear power stations, research centres, fuel-related facilities and our key site, Sellafield, which houses our most challenging legacy facilities. Some of our facilities continue to form an essential part of the nation's nuclear infrastructure and will not reach their planned end state for several decades.

In 2005, the UK government appointed the NDA to take responsibility for developing nuclear decommissioning plans and implementing them through an estate-wide strategy. Our previous strategies developed a clear understanding of what is required to deliver our mission. This approach has served us well and provides a strategic focus and coherent approach to decommissioning that did not exist before.

The nature and scale of decommissioning the UK's nuclear legacy remains subject to significant uncertainties and complexities. These are associated with the condition of the assets and the nature of the decommissioning programmes and projects that have no national or international precedent.

Our current plans indicate that dealing with our core mission of nuclear clean-up and waste management will take around 120 years.

At sites where the task and the associated activities are well understood, the scope of work can be defined more accurately, resulting in good progress and significant savings for the taxpayer. At Sellafield, where the task and the activities are far more complex, hazardous and uncertain, particularly for the legacy facilities, progress is more incremental.

For solid Low Level Waste (LLW) management, we have made major progress in encouraging waste diversion, recycling, and alternative treatments that ensure sufficient capacity is preserved at the Low Level Waste Repository for the foreseeable future.

Our subsidiary, Radioactive Waste Management Limited (RWM), is responsible for developing an underground facility to manage Higher Activity Waste (HAW) in England and Wales. In response to recent developments in government policies, RWM is now carrying out a public consultation before implementing a revised approach to identifying a location for the geological disposal facility (GDF). We are also working with RWM to consider the implications of the Scottish government's HAW policy and implementation strategy, and how best to deliver this at our Scottish sites.

Other key activities that enable our core mission are the management of spent fuel and nuclear materials. We have developed detailed strategies for this, transferring spent fuels and nuclear materials to central facilities at Sellafield.

Since we published our previous Strategy, we have concluded one of our key responsibilities under the Energy Act 2004 *(ref 1)*, by introducing private-sector expertise to our sites through the Parent Body Organisation (PBO) competition programme.

Our initial operating model was based on the PBO concept. This introduced private-sector expertise while providing stability and moving the focus onto nuclear clean-up and waste management.

Since 2011, we have completed competitions for the ownership and management of the Magnox/RSRL and Dounreay Site Licence Companies (SLCs). The process for decommissioning these sites is well understood, with a relatively high degree of certainty over the activities required. This enables highly leveraged, commercial target cost contracts to be awarded, which will result in significant projected savings over the contract period. The contract for managing the LLWR, meanwhile, was extended for a further five years.

After six years of operating the PBO model at Sellafield, we made the significant decision to take direct ownership of the SLC as a subsidiary, which we call the Market Enhanced SLC. The decision was reached after comprehensive consideration and engagement with UK government on the most appropriate model for management and operation of the site given the uncertainties and complexities in the work required. This moves the commercial interface between the public and private sector a layer down. The private sector will still have a significant input through the appointment of one or more strategic partners, who will assist Sellafield in ensuring more effective delivery. We strongly believe this new model will create the environment for success at Sellafield. Improved performance at Sellafield will continue to be a key focus for us in the coming years.

We have continued to act as a strategic authority, ensuring that government policies are reflected in our strategy and implemented at our sites by clearly specifying our requirements to SLCs. The development and management of our strategy is an ongoing process, part of which is to make visible the rationale that underpins our strategic decisions (see Appendix A).

1.1 Background contd

On the highest risk programmes we collaborate closely with regulators and SLCs to deliver proportionate and pragmatic solutions. Among the achievements since our previous Strategy, we have:

- delivered major projects including:
  - commencement of radioactive sludge removal from Sellafield's First Generation Magnox Storage Pond, one of the most hazardous plants in Europe
  - retrieval of canned fuel from Sellafield's Pile Fuel Storage Pond (PFSP) for the first time in 50 years
  - construction of new storage facilities for Intermediate Level Waste (ILW) at Sellafield
  - completion of decommissioning of Sellafield's Windscale Advanced Gas-Cooled Reactor (WAGR), leaving just the outer sphere in place
  - completion of the programme to transfer nuclear 'breeder' material from Dounreay's Fast Reactor (DFR) to Sellafield
  - management of one of the most hazardous legacies from Britain's earliest atomic research, by destroying the highly radioactive sodium-potassium coolant, or NaK, used in the experimental DFR
  - completion of the construction of two LLW vaults at Dounreay
  - demolition of the Harwell Liquid Effluent Treatment Plant (LETP)
  - completion of defuelling at Chapelcross, Dungeness A and Sizewell A
  - pioneering the transfer of fuel between reactors, enabling extended electricity generation at Oldbury and Wylfa and earning £1 billion of additional income
  - releasing a quarter of Harwell site for re-use as a science innovation and business campus
- secured £10 billion of revenue from electricity generation, reprocessing, the sale of land and other assets, improved understanding of asset condition, and improved reliability and value for money by applying Publicly Available Specification-55 (PAS-55) *(ref 40)*
- exceeded our targets for increasing levels of spending with Small to Medium-sized Enterprises, reaching almost £1 billion in the last three years
- supported UK government as it develops a policy for plutonium
- identified and started implementation of the preferred options for oxide and Magnox spent fuels, which will see reprocessing operations conclude this decade, while enabling management of lifetime arisings of EDFE AGR fuel
- consolidated strategies for waste and nuclear material which will see a simplified, more efficient approach to storing Intermediate Level Waste (ILW)
- changed the approach to LLW in the UK, reducing reliance on the LLW Repository (LLWR) and extending its life for decades
- diverted more than 85% of LLW away from the LLWR through a wide range of more environmentally sustainable options such as waste prevention, re-use and recycling
- established Radioactive Waste Management Ltd (RWM) as a subsidiary to enable effective implementation of deep geological disposal;
- progressed work on proportionate regulatory controls for site remediation
- assisted Japan as it deals with the damaged Fukushima Daiichi plant

As the owners of the largest, most important environmental remediation programme in Europe we are in a position to lead the sector. However, we must ensure we learn from others where best practice is identified. This leadership stance supports government's aspiration for the UK to act as a global leader in the civil nuclear industry, as stated in their Nuclear Industrial Strategy *(ref 4).* In doing so, our main priority is to provide leadership for our estate, followed by acting as an exemplar for the wider decommissioning industry, both in the UK and overseas.

Our supplementary role in funding nuclear research and development in the UK puts us at the forefront of pioneering technology and innovation for decommissioning. In doing so, we must ensure our estate-wide activities promote best value for money, balancing the benefits of generic decommissioning techniques against the risks and opportunities associated with novel, untried technologies. Where we see benefit for our mission, or to the UK's wider aim to be a global leader in decommissioning, we will support the development of new technologies.

In the area of nuclear skills, capability and the supply chain, we are in a unique position to show strong leadership nationally. The expertise and skills of the wider industry are vital to our mission. However, we recognise that there are significant challenges as nuclear new build and other large-scale infrastructure projects develop.

Through this Strategy and our leadership, we aim to provide an effective platform for our next phase of work.

1.2 Next Steps

Our recent progress has been achieved amid a major global economic downturn. The UK situation remains challenging and pressure on public expenditure is set to tighten further. We have prioritised funding towards the highest risks and hazards, while making steady progress on decommissioning and operations associated with fuel and waste management. Progress on reducing the risks and hazards in our major legacy facilities has been incremental, but we have made demonstrable progress in developing the infrastructure required to enable retrievals of radioactive materials and reduce the hazards in these facilities.

To continue making progress on decommissioning in such a difficult fiscal environment, we must secure income, operate more efficiently, and prioritise resources to best effect. With inevitable funding constraints, difficult decisions will need to be made. We will consider how best to progress our mission while maintaining the focus on our priorities. Some work may need to be deferred and some options may be ruled out. However, we will seek to continue with our hazard reduction programme and avoid short-term efficiencies that result in an accumulation of future liabilities for the next generation to deal with.

We are committed to resolving these major strategic issues, working with government and our contractors to optimise our strategy and realise greater efficiencies.

We also operate in an environment where political circumstances continue to change. Events at Fukushima, following the Great East Japan earthquake, led to a renewed global emphasis on the impacts of nuclear facilities on health, safety and the environment. As a direct result, a significant review was undertaken at UK nuclear sites followed by the introduction of more resilient arrangements. Indirectly, the events at Fukushima also influenced our decision to close the Sellafield MOX plant as Japanese plants embarked on early decommissioning strategies. Meanwhile, the pace of international nuclear new build slowed down which, together with a shift towards earlier decommissioning, altered the supply chain dynamics of the nuclear industry. In addition, security issues have come under increased scrutiny since the publication in 2012 of the National Counter Proliferation Strategy *(ref 5)* which aims to strengthen security in the nuclear sector.

UK governent has continued to develop policy positions on nuclear energy and new nuclear power stations are currently being planned in England and Wales. This does not change our mission but it does mean we need to consider our impact on the UK's new reactor programme, its impact on our mission, and where there may be opportunities to work together, for example in areas such as skills and nuclear industry infrastructure. Much of the UK's knowledge relating to spent fuel management and reprocessing, waste management and

Wylfa site, due to finish generating electricity December 2015

decommissioning lies within the NDA estate and it is important this expertise is made available to the UK's broader nuclear programme.

The next phase of our mission will build on the progress made since our last Strategy, continuing a similar overall approach where activities are grouped into a series of themes that deliver our mission.

The ultimate goal is to achieve the end state at all sites by 2125. Key milestones over the course of our mission are captured in figure 1(below) while the focus for the near term will include:

- retrieval of high hazard materials under way at all of Sellafield's Legacy Ponds and Silos facilities
- completed vitrification of bulk Highly Active Liquor (HAL)
- the end of spent fuel reprocessing at Sellafield by around 2020
- retention of the capability to continue receiving and managing AGR fuel from the operating fleet of nuclear power stations, in support of UK electricity generation
- completion of the programme to return waste to overseas customers within the next five years
- continued transfer of nuclear materials from Dounreay and Harwell to Sellafield, where they can be managed more securely and cost effectively
- entry of two Magnox sites, Bradwell and Trawsfynydd, into quiescence known as Care and Maintenance
- restoration of Winfrith to heathland, in line with its interim end state designation (the first UK site to reach such a significant milestone)
- the ongoing pursuit of new management routes for Low Level Waste (LLW), preserving capacity at Low Level Waste Repository
- ongoing progress in developing safe and secure waste management facilities across the estate prior to geological disposal for English and Welsh HAW
- updating plans at sites in Scotland to reflect Scottish government policy for managing HAW.

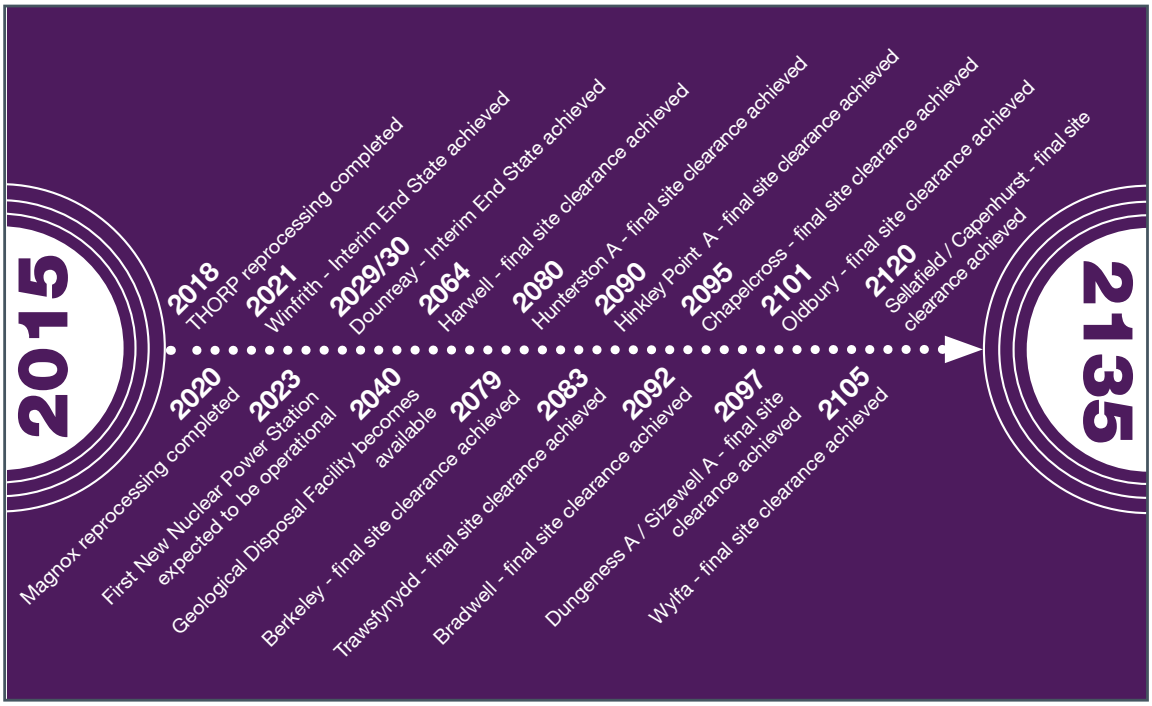


Figure 1. Timeline showing key milestones over the course of our mission. A version of this timeline can be seen in 'Nuclear Provision - explaining the cost of cleaning up Britain's nuclear legacy' ***(ref 48)***

1.3 Our Funding

As a Non-Departmental Public Body (NDPB), the NDA's annual spending limits are set by parliament, combining funds from the public purse and income from our commercial activities (figure 2).

Our income is projected to reduce and by the time this Strategy is published, our revenue from electricity generation will reduce significantly as Wylfa closes. Similarly revenue from spent fuel management will reduce as contracts conclude. At the same time, greater pressure will be exerted on our £3.3 billion expenditure (2015/16) from a requirement to invest in significant capital projects that are needed to reduce near-term risk and hazard at Sellafield.

Our current commercial operations are dominated by spent fuel and nuclear materials management, including reprocessing and operations. However, our operations largely rely on ageing assets and infrastructure, creating a significant element of income volatility. We will continue to explore all available options within government rules to maximise revenue from existing assets and to secure alternative funding for our mission.

We are participating in the current Spending Review process, via the Department of Energy and Climate Change (DECC), to determine the level of UK government funding for the estate. The last spending settlement in 2013 secured outline funding up to end of financial year 2015/16.

Our own estate-wide spending review process is based on criteria drawn from our Value Framework. These criteria - Affordability (short, medium and long-term), Value for Money, Safety and Environmental Impact, Deliverability, Socio-Economic and Government Policy Impact – shape decisions for allocating funds to work programmes across the estate during the settlement period.

Subject to affordability constraints, we will seek to maintain progress and maximise value for money through the implementation of this Strategy. In the event that the full projected funding that reflects current plans is not available we will prioritise the highest hazards and risks. At the same time, we will ensure that safe, secure and environmentally responsible site operations are maintained and our ability to deliver decommissioning in the future is not compromised.

Due to uncertainty around funding in the UK public sector, the current status of the SLC life time plans is indicative only and subject to change that could affect the resolution of key strategic issues and dates indicated for key milestones. It is anticipated that by the time we are ready to consult on this document, the current Spending Review will have been completed allowing us to reflect the outcome in our strategy and reflect this in the key milestones.

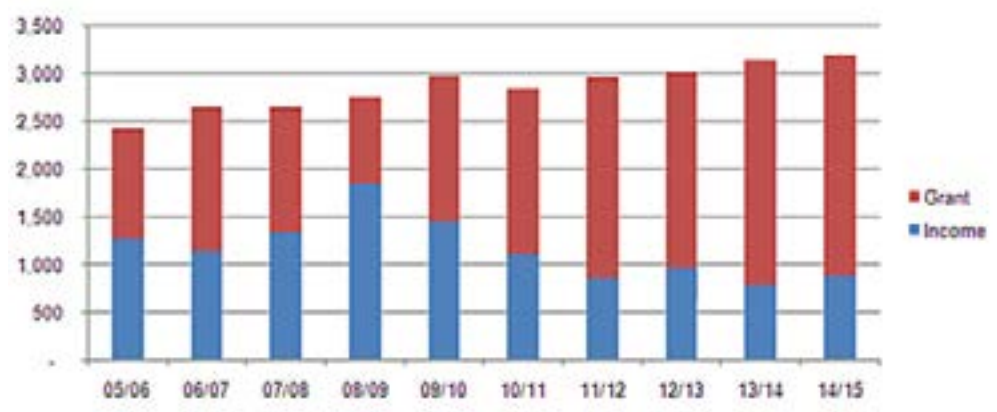


Figure 2. A bar chart showing the combination of grant and income since 2005

Top left - working on Europe's largest asbestos strip at Chapelcross
Bottom left - inside the Fuel Handling Plant, Sellafield

2.0 Strategy Overview

Our mission is:

Deliver safe, sustainable and publicly acceptable solutions to the challenge of nuclear clean-up and waste management.

Our strategy describes our high level approach to delivering our mission. We work on strategic issues all the time and our strategy evolves as a result, so the periodic publication of our Strategy can only be a snapshot of the status of strategic topics at the time of publication.

Early planning of decommissioning inevitably focused on site by site solutions, which was a feature of our first Strategy *(ref 2)*. As we have developed our strategies more sophisticated generic approaches were introduced to improve the delivery of our mission and secure best value for money.

Currently each of our 17 sites is operated by a Site Licence Company (SLCs) under contract to the NDA. SLCs are responsible for day-to-day operations and the delivery of site programmes. To secure the implementation of our strategy through site programmes, our strategic requirements are translated into action by issuing Site Strategic Specifications (SSS) or Client Specifications. These specifications detail to our SLCs what our Strategy means for a particular site, which then become embedded in its Lifetime Plan (LTP). The NDA subsequently monitors and measures the SLCs' delivery performance against the agreed LTP.

2.1 Our Approach to Strategy

In our previous Strategy we identified six strategic themes under which we grouped all our activities. This approach allowed us to bring a clear focus to our mission and better understand the relationships between different aspects of our mission. It has served us well and our strategy continues to be based on this approach, although we have now reduced the number of themes to five, as follows:

See p20

Site Decommissioning and Remediation defines our approach to decommissioning redundant facilities and managing land quality in order that each site can be released for its next planned use.

See p36

Spent Fuel Management defines our approach to managing the diverse range of spent nuclear fuels for which we are responsible, including Magnox, oxide and exotics.

See p46

Nuclear Materials defines our approach to dealing with the inventory of uranics and plutonium currently stored on some of our sites.

See p54

Integrated Waste Management considers how we manage all forms of waste arising from operating and decommissioning our sites, including waste retrieved from legacy facilities.

See p68

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) *(ref 1)*.

This Strategy is structured to reflect the strategic themes and colour coding is used to indicate the strategic themes and their interactions (figure 3). All the strategic themes are summarised in the next section, with further detail available in the corresponding sections and on our website www.nda.gov.uk.

Business Optimisation has been removed from the list of strategic themes. This is because we see limited, and much reduced, opportunities to generate significant revenue through our activities in future. However, the aspects of this theme that continue to remain relevant are captured under the Critical Enabler theme.

Our five strategic themes are further divided into individual topic strategies. Our Strategy is structured to reflect the strategic themes and topics and organising our work in this way provides clarity and a consistent basis for communicating with our contractors and stakeholders.

There is a great deal of interdependence between the themes and hence limited discretion to stop activities under a particular theme without impacts on other themes. These impacts are not limited to our estate. For example, our spent fuel management strategy can affect electricity generation.

Our Strategy covers the duration of our mission. However the strategy is continually evolving and decisions are continually being made. As such, each five yearly Strategy document summarises the position at the time of publication.

To manage the many interactions between the different parts of our strategy we have the Strategy Management System (SMS) *(ref 7)* (see Appendix A). This simple, gated decision-making process enables us to:

- develop strategy in a controlled fashion through distinct stages allowing us to engage effectively with government, nuclear regulators, SLCs and other stakeholders on its development and possible changes in strategic direction
- ensure the strategy is robust and coherent at all times, recognising the numerous interdependencies
- effectively respond to internal and external events that impact our strategy
- ensure compliance with the regulatory framework
- transparently underpin the decisions we make on preferred strategic options.

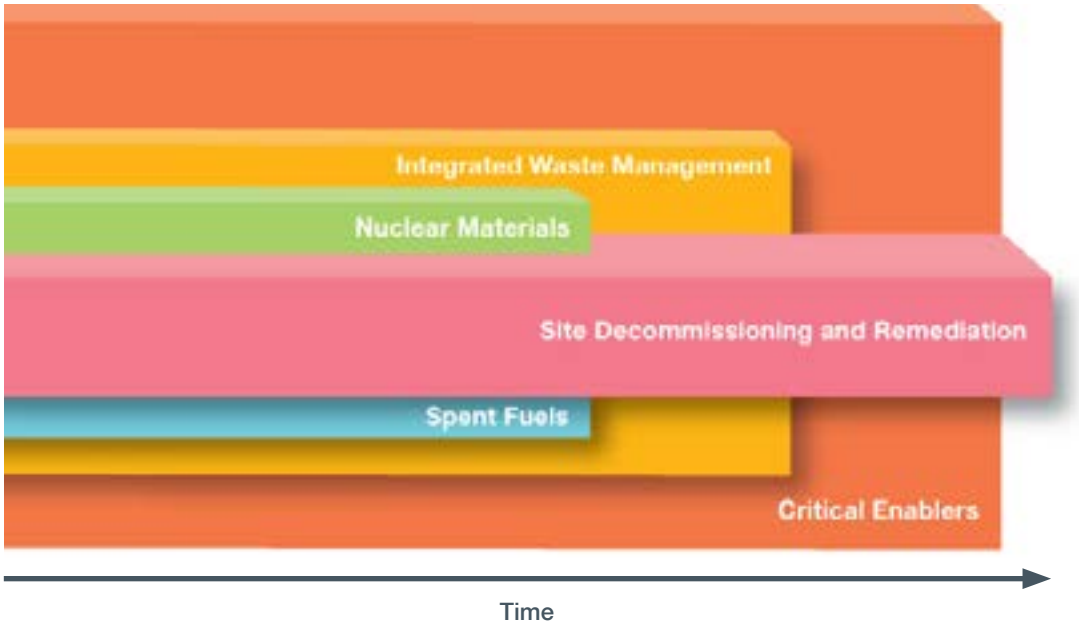


Figure 3. Illustration of the five strategic themes with an indication of how they interact. Site Decommissioning and Remediation is the driving theme supported by Integrated Waste Management; the need to manage Spent Fuels and Nuclear Materials is an early part of Site Decommissioning and Remediation; the entire mission is underpinned by the Critical Enablers.

Our SMS approach is aligned to HM Treasury guidance, using a business case approach to build up the underpinning rationale for a strategic decision. In selecting a preferred strategy we consider the options against a wide range of factors, which is our Value Framework *(ref 8)*. The NDA has used its Value Framework to underpin its strategic decision-making. Value Framework factors balance our top priority of risk and hazard reduction alongside socio-political and affordability considerations (figure 4.).

Figure 4. NDA Value Framework

Through the Value Framework we incorporate the specific requirements of statutory assessments into the heart of our strategy development and decision-making.

For each topic in this Strategy we have considered four questions under the following headings:

— Objective – What is the objective of the strategy?

— Our Strategy – What is our current strategy, and any associated risks and opportunities?

— Strategy Development – What strategy development do we plan to undertake in the future?

— Delivery – What have we delivered so far and how do we plan to implement our strategy?

In each Strategy Development section we make clear if an individual strategy is undergoing development or is mature and being implemented. Further information on how we develop strategy is provided in appendix A.

2.2 Lessons from 2011

Following publication of our last Strategy in 2011, we re-examined the way we approach stakeholder engagement as part of strategy development. We identified a clear need to regularly engage with our key stakeholders, particularly regulators.

Strategy development has entailed extensive engagement with stakeholders since 2011, with a number of targeted and focused strategy groups and interactions in operation. These groups consist of representatives from the full range of organisations including government, regulators, our SLCs, broader industry and the public. These, now well-established forums will continue to support strategy development and delivery over the coming years.

We have recognised the need to avoid including tactical and operational information in our strategy and instead focus on our high-level approach. This tactical and operational information is of significant interest to our stakeholders, and we place greater emphasis on linking our high level strategic approach to the tactical and operational information presented in our Business Plan and Annual Report and Accounts.

We have received feedback that greater emphasis should be placed upon strategy implementation and to this end we have added several more case studies which, whilst not actually providing a strategic input, provide useful context for the reader. In addition we have expanded the sections that cover our sites, and included information about our subsidiaries in Appendix B. We ask the reader to ensure that our strategy is read alongside the annual Business Plan, which sets out our near-term objectives and plans for the following three-year period and the Annual Report and Accounts, which reports our performance against these activities.

2.3 Theme Overview

See p20

Site Decommissioning and Remediation

Our mission will be complete when we release our designated sites for other uses. We aim to complete this mission as soon as reasonably practicable with a progressive reduction of risk and hazard.

Defining the objective of decommissioning and remediation requires a site-specific assessment of the benefits and detriments of clean up. This recognises that, in some cases, removing all traces of a site's industrial use will do more harm than good. Furthermore we believe that there are opportunities for the beneficial re-use of waste on site, for example, using decommissioning rubble for landscaping and void filling. In these cases, it is our strategic preference to undertake enough remediation to enable the beneficial re-use of a site. Accordingly, our strategy is to be proactive in promoting beneficial re-use of our sites.

See p36

For many sites, the end state will not be achieved for many decades. In these cases, interim states help to focus delivery on near-term goals. They typically mark a stepped reduction in risk or hazard on the way to the site end state. Interim states enable SLCs to plan more effectively.

An interim state can be followed by continuous or deferred decommissioning, i.e. a decision may be taken to work towards the next interim state or to pause. Given that an interim state is typically a stable state, it is important that the route to the next interim state is clear before starting to work towards it.

How quickly we progress through the interim states depends on the priority that is given to a particular facility or site. In order to prioritise delivery of decommissioning and remediation projects, we take into account a range of relevant factors as set out in our Value Framework *(ref 8)*. Our approach is influenced strongly by the level of risk to people or the environment. Where the risks are intolerable we will take urgent action to reduce them. Where the risk is less significant, prioritisation takes greater account of other factors in the Value Framework. This recognises that whilst risks might be tolerable or broadly acceptable, there are other advantages to progressing with hazard and risk reduction that influence prioritisation. With this in mind, our strategy is to progress decommissioning on a broad front as far as resources allow.

Our preference is for continuous decommissioning except where there are clear benefits to be had from deferring work. In some cases we would choose to defer decommissioning, for example, to take benefit from radioactive decay. In addition, there are a number of constraints that might prompt us to consider a deferred decommissioning strategy, notably availability of resources and waste management infrastructure. Whatever the reason for a deferral, it must be a conscious decision.

For both the target and timing of decommissioning and remediation, the optimum solution will be case-specific. To support optimisation, the NDA provides strategic direction and guidance on decision-making, which SLCs can deploy throughout their development of lifetime plans. We also maintain an overview of decommissioning and remediation projects to ensure helpful precedents are set and to encourage a 'lead and learn' culture across the entire NDA estate.

Definition of Hazard: *Hazard is the potential for harm arising from an intrinsic property or ability of something to cause detriment.*

Definition of Risk: *Risk is the chance that someone, or something that is valued, will be adversely affected by the hazard.*

Spent Fuels

Our strategy is to secure and subsequently implement the most appropriate management approach for spent Magnox and oxide fuels and, where possible, take advantage of these approaches to manage spent

exotic fuels. In making strategic decisions we consider the lifecycle of the fuels, their products, wastes and discharges and all of the existing or potentially new facilities that are required to manage them.

We engage with government, regulators and stakeholders on the strategic options before finalising our strategic decisions and implementing them.

See p54

Our strategy is to reprocess all Magnox fuel in line with the Magnox Operating Programme. For our oxide fuels, we aim to reprocess the contracted amount of spent fuel in Thermal Oxide Reprocessing Plant (THORP), and for the remaining and future arisings of Advanced Gas Cooled Reactor (AGR) spent fuel we plan to place them into interim storage pending disposal to a geological disposal facility (GDF). We intend to consolidate all of our exotic fuels at Sellafield. Some of these fuels can be managed in much the same way as our bulk Magnox and oxide fuels. But some exotic fuels present particular challenges which may require specifically tailored solutions for their long-term management and final disposition.

In the next five years we expect that the THORP and Magnox reprocessing plants will complete their committed reprocessing programmes. The completion of the Magnox and oxide reprocessing programmes represents a major milestone along the NDA's long-term mission of clean-up and decommissioning.

There are risks with both Magnox and oxide reprocessing that mean it may simply not be possible to reprocess all of the fuels that are currently scheduled to be reprocessed. We will, therefore, continue to invest in developing alternative options and contingency plans in the event that our reprocessing and storage facilities cannot fulfil their current commitments, or are not available.

With UK government agreement we will, if requested, supply advice and information to parties involved in the UK's new reactor programme.

See p46

Nuclear Materials

Implementing a solution for the management of all of our nuclear materials is essential to enable us to restore our sites and deliver our mission.

Our strategy is to safely and securely store our nuclear materials while we develop cost-effective lifecycle solutions for their management in line with UK government policy.

The priority for UK government policy is to provide a solution that puts the vast majority of UK-held plutonium beyond reach.

The UK government proposed a preliminary policy view to pursue re-use of UK civil separated plutonium as Mixed Oxide fuel (MOX). We are continuing to support the UK government in developing strategic options for the implementation of policy by undertaking further strategic work on its behalf.

Our nuclear materials are held at a number of sites in the UK. We are consolidating our nuclear materials at sites which we consider are best suited to their safe, secure and cost-effective management.

Foreign-owned nuclear materials are the responsibility of the owners. These materials are managed in line with UK and the foreign government policy requirements, contractual commitments and customer requirements.

Integrated Waste Management

Strategic decisions about waste management are informed by the following key principles, we will:

- support key risk and hazard reduction initiatives by enabling and delivering a flexible approach to long-term waste management. This takes into consideration the entire waste management lifecycle, including how waste management is needed to support other NDA strategic or wider-UK initiatives such as large scale decommissioning programmes
- apply the waste hierarchy , which is recognised as good practice and should be used as a framework for waste management decision-making
- promote early and timely characterisation and segregation of waste, to deliver effective waste management
- where appropriate, provide leadership aimed at integrating waste management delivery across the estate and the supply chain, in particular by seeking opportunities to share treatment and interim storage assets, capabilities and learning
- supporting and promote the use of robust decision-making processes to identify the most advantageous options for waste management
- enable the availability of sustainable, robust infrastructure for continued operations, hazard reduction and decommissioning.

We believe there are opportunities for a more flexible approach in the management of radioactive waste based on a lifecycle approach. This is reflected in the structure of the Integrated Waste Management section where our Higher Activity Waste (HAW) and Low Level Waste (LLW) topic strategies are reported under the heading of Radioactive Waste. Our vision is stated in The NDA Radioactive Waste Strategy – A Lifecycle Approach.

We will continue to promote the importance of waste characterisation, improved waste information (see Information Governance Strategy) and waste segregation to facilitate waste management planning and application of the waste hierarchy.

Our HAW strategy is to implement the UK government's policy of deep geological disposal and the Scottish government policy for long-term management in near-surface facilities. For LLW disposal will be in fit for purpose facilities that reflect the nature of the wastes to be managed.

Within this overall framework our priority is to achieve risk reduction by dealing with waste in ageing storage facilities (for example legacy facilities at Sellafield) and placing it into safer more secure modern storage conditions. Diverse radioactive waste management and disposal solutions will be pursued where these offer benefits over previous arrangements. Where we can see benefit we will continue to investigate opportunities to share waste management infrastructure across the estate and with other waste producers including EDF Energy (EDFE) and the Ministry of Defence (MOD).

New waste management approaches will often require different transport arrangements and will be a matter of great interest to planning authorities and people living close to the sites involved. We will continue to engage with interested parties from an early stage, irrespective of whether such developments represent new investments proposed by us or by other organisations on our behalf. We will work with key organisations, for example local authorities, to build on the feedback we have received on how this engagement should happen and develop a framework for engagement that provides for useful discussion when considering new waste management initiatives.

We recognise that in future the radioactive waste management landscape will change, particularly as a result of the UK's new reactor programme. With UK government agreement we will supply advice and information to utilities involved in the programme. This will ensure both an integrated approach to radioactive waste management and that our facilities, some of which support both the civil and defence nuclear industries, can plan effectively for the future.

See p68

Critical Enablers

Critical Enabler topics have been identified as critical to the overall mission. They include a number of general duties placed on us by the *Energy Act (2004) (ref 1)*. We will continue to develop approaches for all the critical enablers to support the delivery of our mission.

Health, Safety, Security, Safeguards, Environment and Quality (HSSSEQ) – Our strategy is to apply proportional approaches to HSSSEQ across our estate by requiring the application of appropriate contemporary standards which allow and encourage accelerated risk and hazard reduction.

Research and Development (R&D) – Our strategy is that, where possible, R&D is undertaken by the SLCs and their supply chain. Where necessary the NDA will maintain a strategic R&D programme, that focuses on targeted, estate-wide R&D needs, risks and opportunities to inform and develop strategy, encourage innovation and support key technical skills.

People – We recognise that people with appropriate skills and capabilities are essential to the successful delivery of our mission over its lifecycle and aim to ensure that there is a skilled workforce available at all times within our organisation, the SLCs and the supply chain. We will mitigate risks of skill shortages and wage inflation caused by current labour market developments by ensuring the attraction and supply of the right people in the right place at the right time at optimum cost and quality; retain, maintain and develop a competent and skilled workforce across the estate; and enable the mobility across our estate and within the wider nuclear industry.

Asset Management – Our strategy continues to address the enduring risk that asset performance adversely impacts our mission. We aim to secure and sustain asset management capability by utilising Publically Available Specification – 55 (PAS-55) *(ref 40)* across our estate.

Contracting – We recognise that a single contracting strategy does not exist in isolation but generates a series of individual contracting strategies developed to meet the needs of individual projects. To that effect our strategy is to retain the capability to act as an effective contracting authority.

Supply Chain Development – We acknowledge that we are dependent on the market to provide safe, affordable, cost-effective, innovative and dynamic services. Our strategy is to help maintain and, where necessary create and develop, a healthy, vibrant, effective and competitive supply chain.

Information Governance – We have identified that in the absence of a consistent approach our information assets and data are being retained unnecessarily and in isolation. To optimise the value from the knowledge of the estate, and our information assets in a compliant and secure manner we will implement the Information Governance programme, which ensures we invest only in what needs to be retained to deliver our mission.

Socio-Economics – Our strategy is to support the economic development of communities affected by our activities, focusing on employment, education and skills, economic and social infrastructure and diversification. In order to deliver our strategy we work together with our SLCs, subsidiaries, our suppliers, new build organisations and EDFE to develop and share best practice to create synergies in our socio-economic activity.

Public and Stakeholder Engagement – We regard openness, transparency and effective public and stakeholder engagement as key to building and maintaining the support, confidence and trust necessary for us to deliver our mission. One of the

major considerations for the Public and Stakeholder Engagement strategy is how we take forward engagement at the national and local level, while offering good opportunities for discussion with all those who have an interest in our activities.

Transport and Logistics – We acknowledge that our mission depends on having transport systems that work. We will work together with our SLCs, subsidiaries and regulators to ensure transport takes place in a timely fashion to meet the implementation needs.

Revenue Optimisation – We need to help fund our mission through revenue generation. We seek to develop commercial opportunities to maximise revenue from our existing assets, operations and people where it does not materially impact on our core mission, or increase our liabilities. These opportunities have been identified as:

- spent fuel management
- MOD services
- marine transportation services
- rail transportation services
- electricity generation.

International Relations – Our strategy is to gain access to international good practice through developing targeted relationships, sharing know-how and collaborating with counterpart organisations in other countries. We are aware that we need to understand and influence international technical guidance and legislative developments while supporting UK government in international commitments in the nuclear sector.

Land and Property Management – We will retain the minimum land and property required to complete our mission. Where land or property is clearly surplus to requirements, it will be divested commercially or for socio-economic uses.

Additional Obligations

We also have additional obligations placed on us by the Secretary of State under provisions in the Energy Act (2004) *(ref 1)* to undertake specified tasks or to provide expert advice to the Secretary of State (or to third parties). Obligations from UK government or third parties for technical support are determined on a case by case basis and are implemented subject to availability of resources. These obligations are in addition to our core mission and currently cover a number of activities. Examples include:

- oversight of decommissioning plans for EDFE existing fleet of nuclear power stations
- expert advice to UK government on nuclear new build operators' Decommissioning and Waste Management Plans (DWMP)
- implementing Geological Disposal (A Framework for the Long-Term Management of Higher Activity Radioactive Waste)
- developing and implementing the UK Strategy for the Management of Solid LLW from the Nuclear Industry
- provide support and resource to Major Projects Authority (MPA)
- we are accountable to Department of Energy and Climate Change (DECC) for ensuring the UK has a route for the disposal of redundant sealed sources.

Oversight of EDF Energy's Existing Fleet of Nuclear Power Stations:

The NDA is nominated to act as agent for UK government to provide oversight of EDFE plans, budgets and funding claims for the eventual decommissioning of its existing fleet of eight nuclear power stations.

These liabilities are funded by The Nuclear Liabilities Fund (NLF), established by UK government in 2005 as part of the restructuring of British Energy Group Plc (now EDFE). The NLF is backed by the UK taxpayer and a key function of the NDA is to ensure that EDFE's plans represent value for money, that funds are disbursed appropriately, and that any recourse to the taxpayer is minimised.

As part of the work to implement the UK Strategy for the Management of Solid LLW from the nuclear industry, we are focused on preserving the Low Level Waste Repository capacity to meet the nation's needs.

3.0 Site Decommissioning and Remediation

Objective:

To decommission and remediate our designated sites, and release them for other uses.

Top right - workmen remove pipework from one of the reactors at Berkeley
Bottom left - the demolition of Dungeness A turbine hall

3.0 Site Decommissioning and Remediation

Site decommissioning and remediation is our primary focus and all other strategic themes support or enable its delivery.

Site Decommissioning and Remediation

Site decommissioning and remediation is our primary focus and all other strategic themes support or enable its delivery.

The decommissioning and remediation of our sites presents a number of major challenges:

- legacy plants in excess of 60 years old containing significant quantities of corroding radioactive material which represent some of our largest hazards and our highest risk
- deteriorating infrastructure
- ground and groundwater contamination resulting from a variety of past uses, including non-nuclear activities.

We can only complete our decommissioning and remediation mission if we secure and integrate final management solutions for spent fuels and nuclear materials and establish effective waste management solutions (see Spent Fuels, Nuclear Materials and Integrated Waste Management).

See p36
See p46
See p54

Site decommissioning and remediation must take account of non NDA liabilities managed at our sites, but owned by others (e.g. the Ministry of Defence (MOD), EDF Energy (EDFE).

The NDA's role is to define what should be achieved at our sites. This means that we are responsible for defining both the target and timing of decommissioning and remediation, allowing the Site Licence Companies (SLCs) to determine how best to deliver this outcome.

This theme was previously called Site Restoration. It has been renamed to emphasise the component parts of the strategic theme, particularly decommissioning. The Site Decommissioning and Remediation theme comprises four topic strategies, namely Decommissioning, Land Quality Management, Site Interim and End States and Land Use (figure 5).

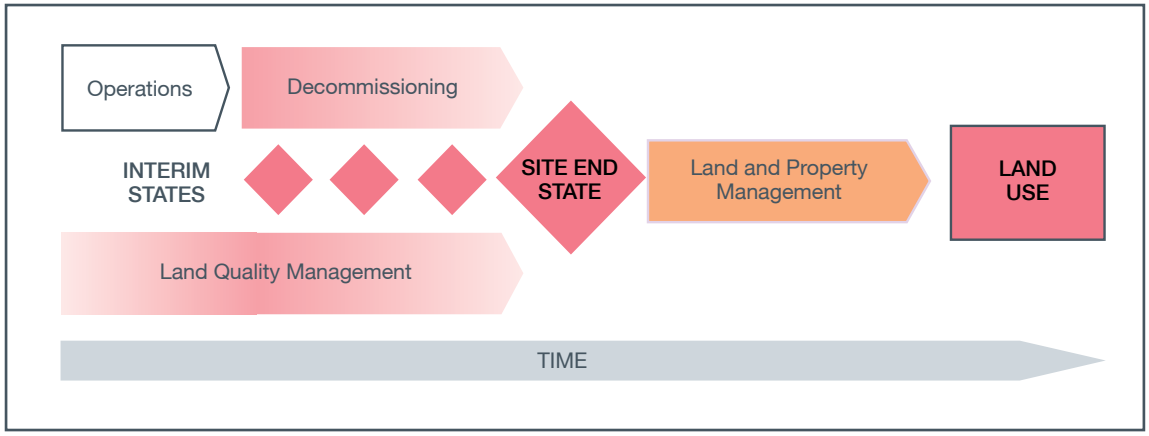


Figure 5. Site Decommissioning and Remediation timeline

Experience has shown that the target for decommissioning and remediation is best communicated using an end state and interim states for each site, which together describe the journey from the state of the site today through to where we want it to be. As far as possible, we want the end of each journey to result in the beneficial re-use of our sites, enabled by our Land and Property Management strategy. This ambition influences our approach to defining site end states. Although the next use will be defined by the next land owner in consultation with stakeholders, it is necessary to understand which land use(s) would be credible for our sites so that we can make informed decisions about the removal or re-use of structures and infrastructure, and the most appropriate way to manage residual contamination. Our strategy is to be proactive in promoting beneficial re-use of our sites.

See p96

Interim states help to focus delivery on near-term goals. They typically mark a stepped reduction in risk or hazard on the way to the site end state. Interim states can align to phases of decommissioning and contract delivery milestones.

How quickly we progress through the interim states depends on the priority that is given to a particular facility or site, and the pace at which we are able to tackle that priority given the availability of resources (skilled people, funding, etc.) and other enablers such as waste management infrastructure and appropriate technology.

In order to prioritise delivery of decommissioning and remediation projects, we take into account a range of relevant factors as set out in our Value Framework *(ref 8)*. Our approach is influenced strongly by the level of risk to people or the environment, as shown in figure 6. Where the risks are intolerable we will take urgent action to reduce them. In such cases, we may make a conscious decision to accept appropriate near-term increases in risk in order to achieve enduring risk reduction. We will work with our SLCs and the regulators to manage this balance safely and ensure we are taking a lifecycle view of risk to people and the environment.

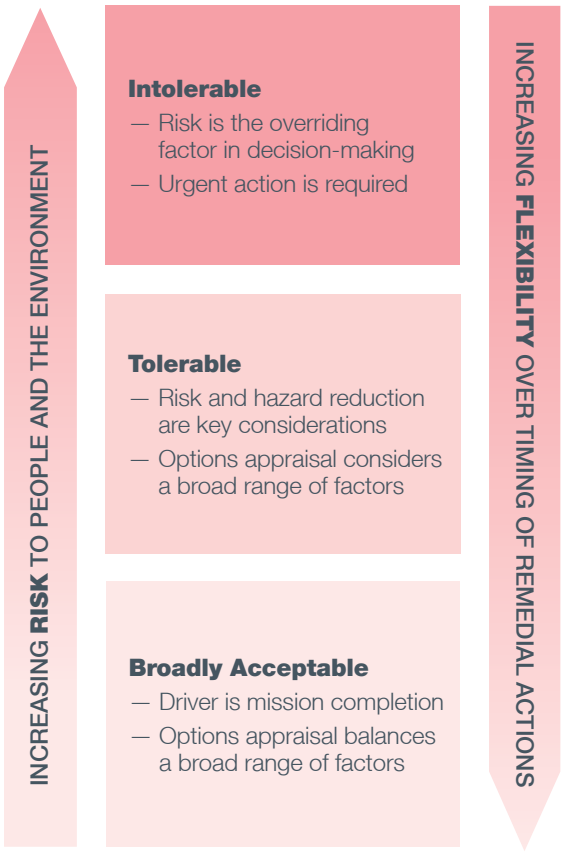


Figure 6. Summary of our approach to prioritisation of risk

Where the risk is less significant, as is the case for the majority of facilities within the NDA estate, prioritisation takes greater account of other factors in the Value Framework *(ref 8)*. This recognises that whilst risks might be tolerable or broadly acceptable, there are other advantages to progressing with hazard and risk reduction that influence prioritisation. For example, all decommissioning and remediation projects have potential to minimise the burden of asset management; maintain and develop skills for future decommissioning and remediation projects; test emerging technologies (see Research and Development); release land for re-use by the SLC or society (see Land Use); demonstrate progress that instils confidence in our industry (see Asset Management and Research and Development). With this in mind, our strategy is to progress decommissioning on as broad a front as resources allow.

See p72

See p34

See p77

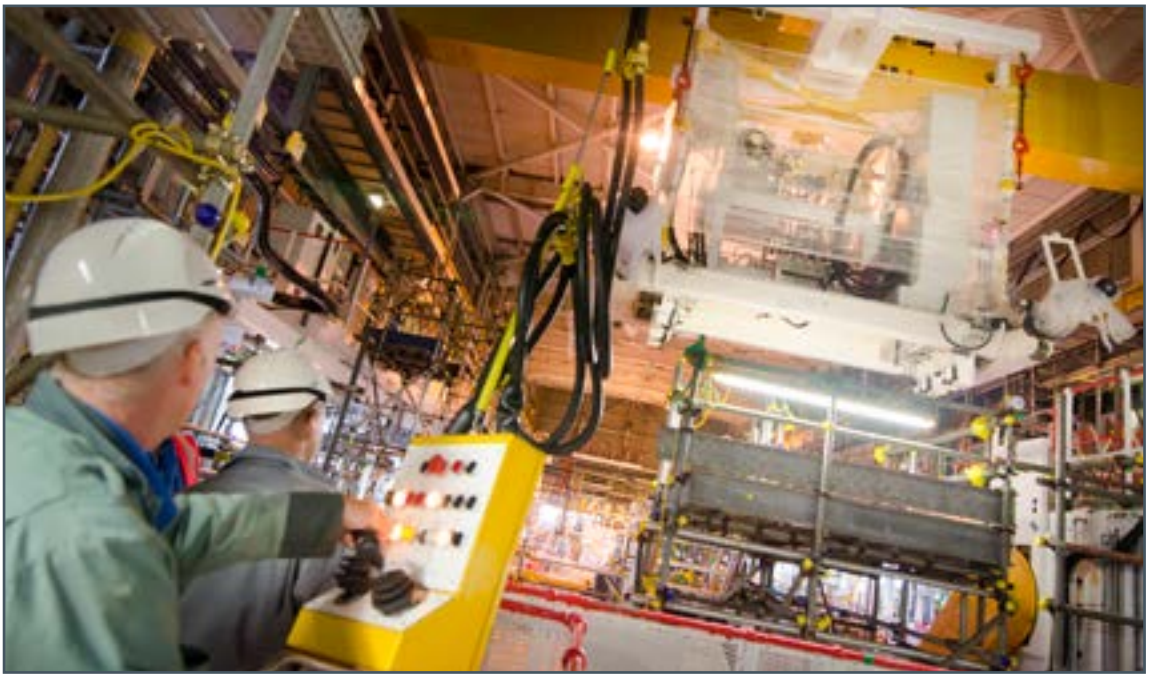
For both the target and timing of decommissioning and remediation, the optimum solution will be case-specific. To support optimisation, the NDA provides strategic direction and guidance on decision-making, which SLCs can deploy throughout development of Lifetime plans. We also maintain an overview of decommissioning and remediation projects to ensure helpful precedents are set, and to encourage a 'lead and learn' culture across the entire NDA estate.

1. Do you agree that the NDA should aim to progress decommissioning and remediation on as broad a front as far as resources allow or focus on prioritised projects?

Case Study

Legacy Pond and Silos Waste Treatment

The legacy ponds and silos (LP&S) at Sellafield were historically used to prepare fuel for reprocessing and to store the resulting waste. Radioactive materials accumulated and have remained in the facilities since routine operations ended.



Arrival of new equipment for waste retrieval at the Magnox Swarf Storage Silos

Over the decades the facility conditions have deteriorated and there is increased urgency to reduce the intolerable risks they pose. These facilities were not originally designed with decommissioning in mind and were not properly cleaned out at the end of operations which makes the decommissioning tasks more complex and uncertain.

For the Higher Activity Waste (HAW) contained in LP&S this urgency has resulted in a decision to retrieve the wastes from the ageing facilities and place them into safer and more secure modern storage conditions, without necessarily converting them into a disposable waste-form immediately. This offers benefits to programmes where complex waste management challenges exist by breaking down the incredibly complex tasks of retrieving the waste and packing it for disposal into more manageable steps. This means that, while the waste is still not ready for disposal, we achieve the overall goal of risk reduction by placing it under more modern storage arrangements.

This approach has started to yield some benefits but will not fully deliver its potential until the capability to retrieve wastes is in place. Installation of waste retrieval equipment is currently being progressed for all the LP&S facilities.

The developments in waste retrieval equipment in First Generation Magnox Storage Pond (FGMSP) will allow for transfer of some fuel into a more modern pond and storage of other waste in self-shielded boxes, where the boxes themselves provide the containment and shielding required.

We believe that in some circumstances there is merit in this approach as it allows the separation of final treatment from retrievals. As the challenges are divided into discrete steps, the tasks will be less difficult to accomplish allowing us to undertake better characterisation of wastes as they are retrieved, which could lead to cost savings in the long-term.

3.1 Decommissioning

Objective:

To deliver Site End States as soon as reasonably practicable with a progressive reduction of risk and hazard.

Decommissioning involves decontamination and full or partial dismantling of facilities following cessation of operations and the removal of operational material and waste (sometimes known as Post Operational Clean Out or POCO). The approach to decommissioning is developed in a case by case basis reflecting the specific nature of the facility in question. The NDA estate includes reactors, chemical plants, research facilities, waste management facilities, fuel fabrication and reprocessing plants, all of which present different decommissioning challenges.

The Legacy Ponds and Silos at Sellafield are our greatest decommissioning challenge and remain our highest priority. The ponds and silos were historically used to prepare fuel for reprocessing and to store waste respectively. They, like many other legacy facilities, were neither built nor operated with decommissioning in mind. Furthermore, there are cases where POCO has been delayed, thereby exacerbating the decommissioning challenge. We must learn from these mistakes as we operate and maintain existing and future facilities.

Our previous Strategy (2011) *(ref 3)* stated that we will decommission our sites as soon as reasonably practicable taking account of lifecycle risk to people and the environment and other relevant factors. We continue to implement this strategy and have acted on our commitment to develop a consistent set of relevant factors for consideration during decision-making, which are described in our Value Framework. We have continued to explore the important interdependencies between decommissioning and the management of assets and waste.

Our Strategy

Our strategy remains to decommission our sites as soon as reasonably practicable, taking account of lifecycle risks to people and the environment and other relevant factors.

Our preference is for continuous decommissioning except where there are clear benefits to be had from deferring work. In some cases we would choose to defer decommissioning, for example to realise an opportunity for reusing a facility or to take benefit from radioactive decay or natural attenuation of risks to people and the environment. In addition, there are a number of constraints that might prompt us to consider a deferred decommissioning strategy, notably accessibility of a facility, affordability and the availability of waste management infrastructure.

See p30
See p54

Whatever the reason for a deferral, it must be a conscious decision. The decision must be underpinned by records of the associated interim state and confirmation that the asset can be maintained in a safe condition with appropriate, cost-effective asset management and institutional control. There will be a point at which the cost of asset management is greater than the cost of decommissioning (see Asset Management). This may justify a continuous decommissioning strategy that incurs cost now to avoid unproductive maintenance at a later date. The role of interim states is described further in the Site Interim and End States strategy.

See p57+67
See p77
See p30
See p63

Both decommissioning and land quality management can make use of in-situ and ex-situ solutions. In situ and ex situ solutions involve leaving parts of a facility (or land contamination) in place and regarding them as having been disposed of or beneficially re-used, as opposed to ex situ solutions where items are removed for management elsewhere. These are both credible options. The preferred option will be case-specific, and will require consideration of the Site Interim and End States strategy and strategies within the Integrated Waste Management theme.

There is an important interface between decommissioning and waste management. A sound understanding of the waste arising from a decommissioning project, and how that waste will be managed, informs the approach to decommissioning. It is good practice to map how waste will be managed before creating it. This is known as waste-led decommissioning. Our approach to decommissioning is influenced strongly by the Waste Hierarchy and decommissioning wastes will be managed in accordance with our Radioactive Waste and Non-radioactive Waste strategies. Conversely, as outlined above, the timing of and approach to decommissioning will influence our waste management requirements such as waste processing and treatment, and the need for waste storage and disposal facilities (see NDA Radioactive Waste Strategy – A Lifecycle Approach).

Bradwell auxiliary turbine hall demolition

Strategy Development

We will play our part in understanding and, where possible, reducing the influence of constraints on continuous decommissioning. For example, there might be a compelling case for continuous decommissioning of a facility but the pace of progress is constrained by the lack of waste management infrastructure such as the geological disposal facility (GDF), in which case it might be appropriate to consider developing alternative waste management solutions. We will also work with SLCs and international decommissioning experts to understand which constraints have the greatest effect on the pace of progress and try to determine whether the impact is proportionate and justified.

We will work with UK government to understand the extent to which discounting should influence decisions on the timing of decommissioning activities, and try to clarify the circumstances that justify a 'spend to save' approach.

We will develop guidance on how to record the condition of assets in a manner that informs the choice between continuous and deferred decommissioning.

Delivery

Our Value Framework (8) describes in more detail the influence of relevant factors on our decision-making process. SLCs will use this guidance to inform periodic reviews of the decommissioning plans in the light of emerging opportunities and constraints.

See p72

On cessation of operations, the transition from operations to decommissioning (including POCO) will be prompt unless exceptional circumstances justify deferral. Where there has already been a significant delay, as is evident in some legacy facilities, a conscious decision may be made to assign the removal of operational material and waste to the decommissioning phase.

To improve the efficiency of strategy delivery, decommissioning experts from the NDA estate and beyond have formed a Decommissioning Working Group to share experience and learning. They also explore common researc h requirements (acting as a working group of the Nuclear Waste and Decommissioning Research Forum) (see Research and Development), examine potential shared solutions, discuss requirements for skills development and, where appropriate, arrange training workshops.

2. **In your opinion, is it beneficial for the stakeholders to understand when decommissioning is deferred due to an external constraint?**
3. **What are your views on the NDA's decision to review the deferred dismantling strategy for Magnox reactors?**

Optimum timing and sequencing of Magnox reactor dismantling

The NDA's Strategy outlines our commitment to decommission sites as soon as reasonably practicable, and to reach case-specific decisions taking relevant factors into account.

The NDA's Strategy outlines our commitment to decommission sites as soon as reasonably practicable, and to reach case-specific decisions taking relevant factors into account. At our Magnox reactor sites, the baseline strategy is to defer reactor dismantling for around 85 years following shutdown.

Whilst we will celebrate as the first few sites are made safe and secure for a long period of quiescence, it is hard to ignore the question of what comes next. Increasingly we find ourselves questioning whether the baseline strategy is appropriate as a blanket strategy for all reactors in the Magnox fleet.

Our current strategy

The deferred dismantling strategy involves preparing each reactor for many decades of quiescence known as Care and Maintenance. As well as ensuring that the reactor is physically safe, preparations for quiescence must also put in place appropriate management arrangements including those required for site security, monitoring, maintenance and records management.

Preparations for quiescence are phased across the Magnox reactor sites, which reflects their different ages and also enables learning from experience. The sites will enter quiescence at different times but there will be a period of around 30 years where all sites are in quiescence at the same time before the first site commences reactor dismantling.

The drivers for this deferred reactor dismantling strategy are:

- benefitting from radioactive decay in terms of (i) dose rate reductions that enable dismantling to be undertaken with significant worker access, and (ii) changes in the categorisation of radioactive wastes;
- avoiding the need for interim storage of reactor waste pending consignment to the geological disposal facility (current plans are predicated on the GDF being available for Magnox reactor waste at around 2060)
- the substantial reduction with increasing deferral time of lifecycle costs on a discounted or Net Present Value (NPV) basis.

Balanced against the benefits of a lengthy deferral period, as outlined above, are a number of risks which include: loss of skills, knowledge and capability to carry out final site clearance; loss of records and information; potential for increased costs from the complexity of dismantling assets that have deteriorated over the years; taking up land that could be used for other purposes; uncertainty over future economic circumstances and regulatory standards; and even unpredictable developments arising from events such as financial crises, pandemics or wars.

Magnox Ltd is making good progress in considering how best to mitigate these risks.

What Hunterston A will look like on reaching the Care and Maintenance stage

Optimum timing and sequencing of Magnox reactor dismantling contd

Why review this strategy?

The industry has for many years assessed the benefits and detriments of undertaking Magnox reactor dismantling sooner in recognition of the risks outlined above. Since the last full review, there have been developments that change the decommissioning landscape:

1. Advances in remote decommissioning techniques and international experience demonstrate that nuclear power reactors can be dismantled promptly without the need for significant worker access.

2. There is now considerable experience in remote handling, packaging and storage of high dose rate wastes at Magnox reactor sites.

3. Government policies on the long-term management of HAW aim to investigate alternative disposal options for some of the inventory where Scottish policy does not support deep geological disposal (see HAW Strategy).

See p58

4. New waste routes have become available for the management of LLW to permitted landfill, for the recycling of metals, and for the interim storage of HAW.

5. Increasingly, international bodies such as the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA) hold the view that reactor dismantling should be carried out as soon as possible, and have questioned the high weighting given to cost calculations on a discounted cost basis.

Prompted by these developments, the NDA has worked with Magnox Ltd to research the implications of alternative decommissioning strategies. The findings of this research support a review of the decommissioning strategy. Firstly, an improved understanding of the implications of radioactive decay have shown us that after the long period of quiescence a large amount of the reactor waste will still not be suitable for management as LLW, despite broadly fitting into the LLW category, due to high inventories of long-lived radionuclides.

Secondly, a preliminary high level cost model suggests that as the deferral time increases, the reduction in decommissioning costs (resulting from increased worker access) is largely offset by the increased cost of preparing for and managing quiescence. Furthermore, even after a significant period of deferral, it is likely that remote dismantling techniques would be applied to Magnox reactor dismantling as a matter of best practice to help minimise conventional safety risks and doses to workers.

Why undertake this review now?

Work is ongoing to prepare the Magnox reactor sites for quiescence. If an alternative, shorter period of deferral proves preferable then some of these preparations might not be necessary. At some sites there may also be opportunities to defer the decommissioning of waste plants and infrastructure, to make beneficial use of these assets for reactor dismantling.

The way forward

On behalf of the NDA, over the next few years, Magnox Ltd will develop and evaluate credible options for the alternative timing of reactor dismantling. This will focus first on those sites for which the benefits of early reactor dismantling are particularly evident, for example sites with a high land value or sites likely to yield the greatest learning for other sites.

Magnox Ltd will also consider the sequencing of reactor dismantling. There would be considerable advantages in a decommissioning programme that avoids fleet wide quiescence. This would provide the existing skilled workforce with increasing experience in decommissioning that could be deployed to manage the reactor dismantling programme, while continuing to monitor and maintain sites in quiescence. A continuous decommissioning strategy of this type would deliver wider benefits by demonstrating progress in reactor decommissioning, contributing to the socio-economic wellbeing of communities by retaining skilled employment for longer, and enabling land to be released earlier for re-use.

3.2 Land Quality Management

Objective:

To ensure that land quality is managed to protect people and the environment.

Land quality management involves managing risks to people and the environment (including flora and fauna) from radioactive and non-radioactive contamination in ground and groundwater. In line with regulator expectations *(ref 10)* and industry good practice guidance *(ref 11)*, the key activities for land quality management should be to:

- prevent leaks, spills and the spreading of residual contamination
- develop a land quality management strategy and plan, taking consideration of both
- radioactive and/or non-radioactive contamination and involving stakeholders
- identify and characterise contamination as soon as practicable
- evaluate management and remedial options and prioritise activities
- keep good records and manage knowledge appropriately.

See p54

Each of our sites has land contamination as a result of previous land uses. It is essential that we understand the extent of the contamination through effective characterisation to ensure that remedial action is proportionate to risk, now and in the future.

The UK has a long-standing land quality industry and a comprehensive regulatory regimes to manage contamination in ground and groundwater. The approach to defining remedial targets (e.g. site end states) is risk-based. On non-nuclear sites, where radioactive and / or non-radioactive contamination may exist; remediation ensures that the land is suitable for its next planned use. This enables the re-use of many former industrial sites for commercial, social and environmental benefit.

Monitoring work on the beach at Sizewell

Risk to people and the environment is our primary and enduring consideration in deciding how to manage land contamination. The extent to which people and the environment are at risk depends on the properties of the contaminant (e.g. organic solvents, fission products, asbestos, etc.), how much contamination is present, and how people and the environment could come into contact with the contamination. The aim of remediation is to break the pathway between the contaminant and people and the environment.

The remediation of land has the potential to generate large volumes of material. In addition, demolition of redundant facilities will also generate large volumes of concrete and brick rubble. The majority of this waste is either not contaminated or lightly contaminated. This material represents a significant liability to the NDA and it is a major challenge for the NDA and SLCs to decide how to manage this waste. This is an important interface with our **Integrated Waste Management** theme.

Our previous Strategy focused on developing our understanding of site conditions and demonstrating that risks posed by land contamination are being managed. Guidance for land quality reporting has been developed by the NDA with the Environment Agency in consultation with the Office for Nuclear Regulation, Natural Resources Wales and the Scottish Environment Protection Agency. We must develop this approach to support our reporting by SLCs. Consistency of reporting will continue to build stakeholder confidence and enable us to demonstrate the progression of the land quality programmes at each of our sites.

Our Strategy

Our strategy for land quality management is to employ early risk-based decision-making ensuring remediation is proportionate to the level of risk. Our focus is on dealing with both radioactive and non-radioactive contamination which poses the greatest risk to people and the environment.

Our preference is for early remediation. This might include a decision to monitor the natural attenuation of contamination. However, sometimes we may have to defer remediation; for example where the contamination exists beneath buildings that are still to be demolished. Choosing to defer remediation must be the result of a conscious decision and will depend on site specific factors.

See p83

We recognise that decommissioning and land remediation activities cannot be considered in isolation as they are linked. If decommissioning activities are not carefully implemented they could lead to contamination.

Our strategy is to minimise the amount of material being excavated and disposed of as waste. This could include using in situ remediation techniques (e.g. Monitored Natural Attenuation) to remediate the land. When waste is generated from remediation (or demolition), our strategy is to explore opportunities for its beneficial re-use on site. For example, the waste could be a valuable resource for landscaping or void filling. This approach has the additional advantage of minimising the use of new materials and reduces environmental impacts associated with the work (e.g. transport movements, protection of natural resources). Re-use must still ensure protection of people and the environment and allow the site end state to be achieved.

To enable the re-use of land, it is essential we ensure good records are kept and knowledge is managed (see **Information Governance**). This is particularly important where residual contamination is being remediated in situ for a period, or waste has been disposed on site. Our records will be available to future users and owners of the site and must meet the needs of regulators and the land development industry.

Strategy Development

This strategy is developing. We will focus on two key areas of work.

See p56

Firstly, we will continue to work with regulators and our SLCs to facilitate the beneficial re-use of wastes generated from land remediation and demolition. Legislation requires that beneficial re-use of radioactive waste is classed as a waste disposal and we are working with regulators to understanding whether this has any unintended consequences. We are also supporting the environmental regulators in the preparation of guidance for the revocation of Environmental Permits (in England and Wales) or Radioactive Substance Authorisations (in Scotland). This guidance supports the waste hierarchy (see **Integrated Waste Management - figure 7**) by enabling the beneficial re-use of waste on site, while ensuring protection of people and the environment. This is a common approach on non-nuclear development sites.

Secondly, we are further developing our instructions to SLCs on the reporting of land quality to better demonstrate the status of the site, the associated risks and the progress in managing them.

Delivery

SLCs will continue to deliver the strategy through plans and procedures that minimise contamination and evaluate existing contamination. SLCs will continue to appraise options for managing contamination on a case-specific basis ensuring action is timely and proportionate to risk. Options should take account of impacts on the site end state.

See p72

To ensure consistency in strategy delivery we convene regular meetings of land quality management experts from the nuclear industry at the Nuclear Industry Group for Land Quality (NIGLQ) to share good practice and lessons learned. The group also provides an opportunity for regulators to engage early with the wider nuclear industry on emerging regulatory guidance.

NIGLQ also explores common research and development requirements (supporting the Nuclear Waste and Decommissioning Research Forum), examines potential shared solutions, discusses requirements for skills development and, where appropriate, arranges training workshops. This has facilitated, via the NDA Direct Research Portfolio (see **Research and Development**), the publication of two industry good practice guides covering qualitative risk assessment *(ref 12)* and routine water quality monitoring *(ref 13)*. These guides will benefit the nuclear industry by outlining a consistent approach which will improve planning and working practices and demonstrate NDA leadership.

4. What do you think are the merits of reusing remediation or demolition wastes on site for backfilling void and landscaping?

3.3 Site Interim and End States

Objective:

To define credible objectives for the restoration of each site (or part of a site).

The NDA owns significant quantities of land, of which around one quarter is designated, i.e. land that has been assigned by UK government to us for decommissioning and remediation. As part of our responsibilities to government, we are required to propose the end state for the designated land at each of our sites. The site end state describes the condition to which the site (land, structures and infrastructure) will be taken and, where necessary, should be accompanied by a description of controls required to protect people and the environment from any residual hazards.

For many of our sites, the site end state is not scheduled to be achieved for many decades. For these sites, it is difficult to define the site end state in detail without ruling out credible options prematurely.

To support the development of plans and maintain clarity of the decommissioning journey, our previous Strategy introduced an aspiration to make better use of interim states as natural milestones and decision points on the way to the site end state. An interim state is typically a stable state that marks a stepped reduction in risk or hazard.

Site interim and end states together define objectives for ongoing management of structures, infrastructure and land quality as well as having implications for the management of waste, spent fuels and nuclear materials arising from operations, decommissioning and remediation.

Our Strategy

Our strategy remains to employ pragmatic, risk-informed remediation objectives for our sites that balance the benefits and detriments of site decommissioning and remediation. This recognises that, in some cases, removing all traces of a site's industrial use does more harm than good and does not represent sustainable development (see Land Quality Management). For example, the removal and off-site disposal of waste arising from remediation will increase conventional risks (worker safety, transport), worker dose, aerial emissions (transport, dust), energy use, costs and timescales without necessarily achieving commensurate improvements in the impact of that waste on people or the environment. In these cases, it is our strategic preference to undertake enough remediation to enable the beneficial re-use of a site, and, if needed, use administrative controls (e.g. land use restrictions) to protect people and the environment from residual hazards.

See p34

See p28

In other words our preference is to restore our sites to a condition suitable for their next planned use. This is consistent with conventional land development and with controls implemented routinely under the UK land use planning regimes.

It is essential that we keep appropriate records of the site end state and associated controls. This ensures that land will be used safely and sustainably in the future.

As a site gets closer to the end of its decommissioning journey, the end state will need to be defined in increasing levels of detail. As far as possible, this should be informed by a view of future land use to ensure the safety of future users and maximise beneficial re-use of structures, infrastructure and land (see Land Use).

See p24

In cases where the site end state will not be achieved for many decades, fixing a site end state now could rule out options currently not envisaged or risk pursuing an unsuitable end state. It also presupposes what society may desire for a site at the time it will be remediated. Instead, it is more appropriate to develop an overarching vision for the site. Without this overarching vision, it is difficult to set objectives for ongoing decommissioning and remediation projects.

As important as the vision is a clear articulation of the next interim state. No matter how broad the definition of the site end state, there will be work that is common to all potential decommissioning journeys. Once this work is complete, a decision will be required as to the next step. At this point, the number of potential decommissioning options reduce, and so the cycle continues. In some cases, the next step might rule out an end state option, for example deciding to decommission infrastructure or demolish a building removes the opportunity for its re-use. If an end state option is being ruled out then this must be a conscious decision with appropriate underpinning and justification.

An interim state can be followed by continuous or deferred decommissioning, i.e. a decision may be taken to work towards the next interim state or to pause (see Decommissioning). Given that an interim

state is typically a stable state, it is important that the route to the next interim state is clear before starting to work towards it. Furthermore, in all but exceptional circumstances, facilities should not move away from a stable interim state until it is clear how waste arising will be managed.

Interim states are a good communication tool for internal and external stakeholders to align expectations, increase motivation and secure commitment to decommissioning plans. They allow SLCs to plan more effectively and can also be used as contract milestones.

Strategy Development

We will prepare guidance for SLCs on the optimisation of site end states. We are sharing our draft guidance with a subgroup of the Nuclear Energy Agency's Working Party for Decommissioning and Dismantling, which is tasked with recommending approaches for the development of remediation, plans to enable timely delivery of interim and end states.

We will continue to work with the regulators to explore options for more proportionate regulatory control of decommissioning sites as they progress towards their end state. We are seeking to ensure that the regulatory regime is flexible enough to accommodate a range of end states and that residual controls do not restrict future use of the land unnecessarily, deter developers or impair local amenity. On behalf of government, the NDA and regulators are exploring alternative approaches that will afford the same level of protection for people and the environment and enable beneficial re-use sooner rather than later, for example making better use of our well-established land use planning regimes.

See p83

We will work with key stakeholders to agree the information that should be recorded by our SLCs about interim and end states to ensure that assets are used appropriately and safely by current and future users. Accessible records will play an important role in ensuring the control of risks to people and the environment from residual hazards (see **Information Governance**).

Delivery

The NDA has issued a new specification for the Winfrith site that moves the end of physical decommissioning and remediation from 2048 to 2021, thereby accelerating the opportunity for beneficial re-use as publically-accessible heathland by over 20 years. Consequently the site end state needs to be defined in more detail in consultation with stakeholders. This gives the SLC an opportunity to ensure the right balance between removing hazards and controlling risks to people and the environment.

At other sites, the focus is on developing appropriate interim states. For example, Sellafield Ltd is reviewing its decommissioning strategy and proposes to describe options in terms of interim states, which will aid stakeholder engagement in due course. Magnox Ltd is working with the NDA and regulators to determine the level of decommissioning and remediation that is required to make each site safe for decades of quiescence.

5. **Do you agree it is appropriate for us to stop remediating a site where further remediation will do more harm than good, and use administrative controls to protect people and the environment from residual hazards?**
6. **For sites where the end state will not be achieved for many decades, do you agree that the end state definition should be high-level rather than detailed, and that we should focus on interim states to define the decommissioning and remediation journey?**

Case Study

Winfrith

Located near the Dorset coast, Winfrith was opened in 1961 to provide additional space for the UK's civil nuclear research programme.

Located near the Dorset coast, Winfrith was opened in 1961 to provide additional space for the UK's civil nuclear research programme. The site hosted a number of experimental reactors and other fuel cycle research facilities. A substantial amount of decommissioning has already taken place and a significant proportion of radioactive waste has already been removed from the site. The remaining facilities include the DRAGON reactor and a prototype Steam-Generating Heavy Water Reactor (SGHWR), which ceased generating electricity in 1990.

Our plan for the Winfrith site is to complete all physical decommissioning and remediation work in the near term. We refer to this target as an interim end state and it represents a specific type of interim state.

The reference to physical work is important because after the physical work, natural processes will continue to work towards reaching the conditions required to deliver the site end state. We are working with Magnox Ltd to understand where there are opportunities to reduce the amount of physical work now, which may include leaving some residual contamination in situ to take advantage of radioactive decay and natural degradation of contaminants. This could also have the benefit of reducing the amount of material that will need to be imported to the site to bring about the interim end state.

These decisions will be subject to demonstrating that conditions at the interim end states are safe for people and the environment and will be supported by continuation of the useful discussions that have already taken place with stakeholders.

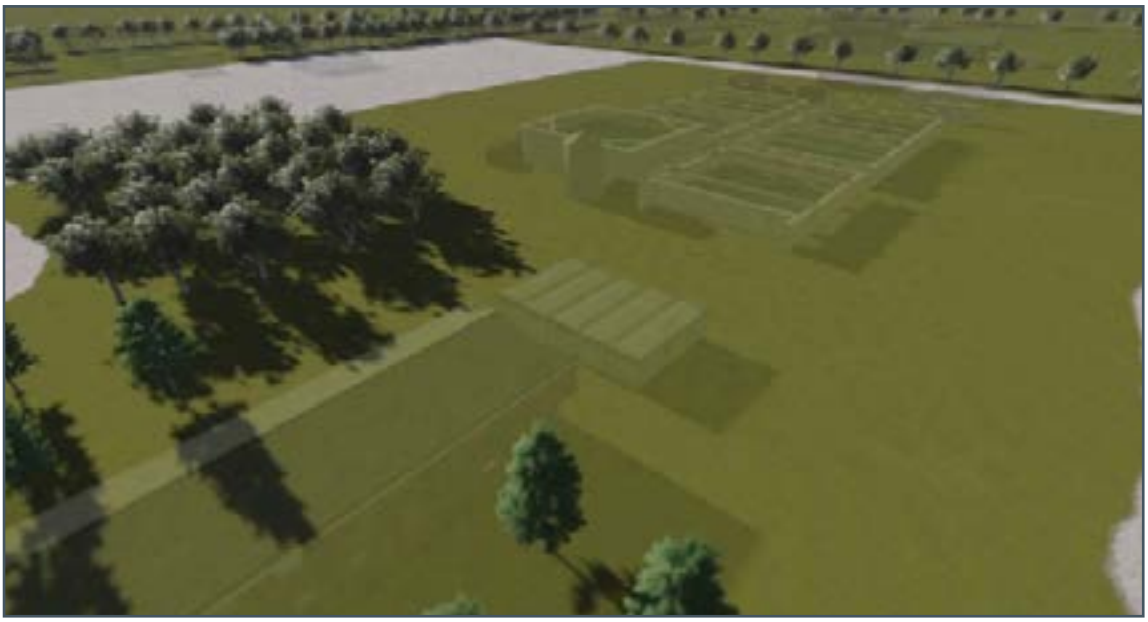
Our plans for the Winfrith site are therefore different to the Magnox reactor sites where the near-term target is an interim state after which there will be a period of quiescence (for some decades) followed by further physical decommissioning and remediation will be required to deliver the site end state.

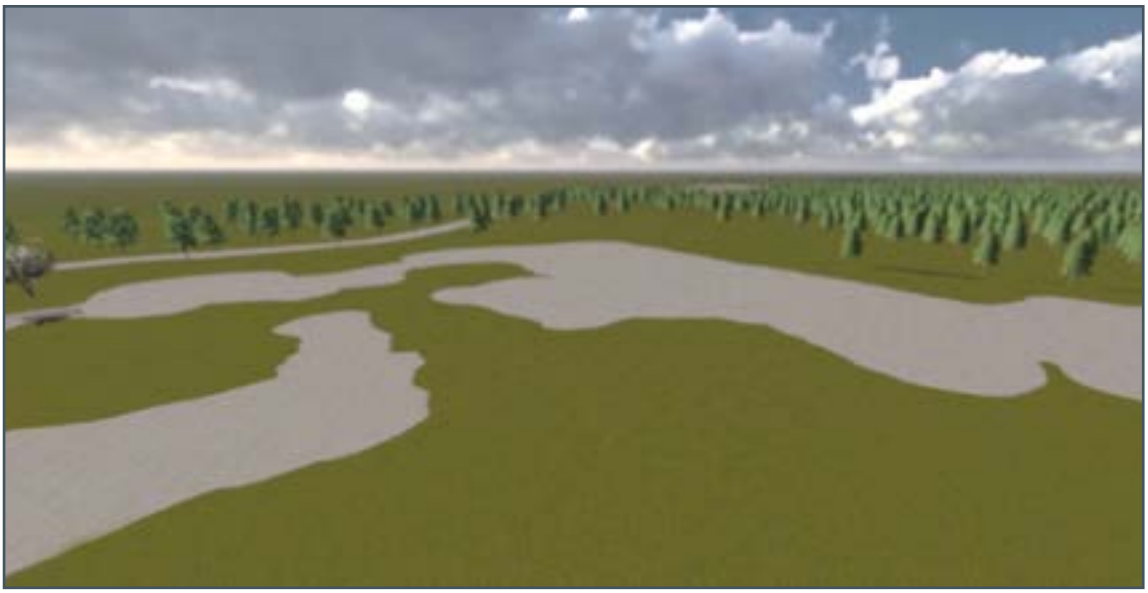
Once the interim end state has been achieved it is likely that the Winfrith site will still be subject to regulation, particularly in areas where residual contamination is being managed, and will remain designated to NDA under the Energy Act 2004 *(ref 1)*, despite there no longer being any facilities on the surface. However, it is our aspiration that, even with these regulatory controls, we will be able to deliver the site to its next planned use as heathland open to the public for recreational purposes.

The management of the site once the interim end state has been achieved will be an important area of work over this strategy period and in particular will require close working with regulators to ensure that their expectations are met and that the management of the site is compliant with the relevant regulations. Within the NDA estate there are examples of licensed land where there is public access, however, it is recognised that reaching this state for a whole site will be a first for the UK.

Winfrith will be the first reactor site in the NDA estate to be 'cleared' and provides an important opportunity for NDA and Magnox Ltd to demonstrate that we can clear sites and make a whole site available for its next planned use. This is important to us because it has the potential to set a precedent for the future remediation of other sites in the NDA estate.

Following the commencement of a new contract for the Magnox sites (including Winfrith and Harwell) the Lifetime plans are currently under review. As a consequence the milestones dates indicated against these sites are subject to change as the plans are further optimised.





Artist's impressions showing how the Winfrith site will eventually return to heathland.

3.4 Land Use

Objective:

To optimise the re-use of NDA sites.

See p30

See p34

See p96

Our **Site Interim and End States** strategy describes the condition to which our designated land and associated structures and infrastructure need to be taken. In support of this, our **Land Use** strategy explores how our sites can be used either when our mission is complete or during interim periods in decommissioning and remediation activities. Our **Land and Property Management** strategy describes how our land is managed and divested.

Previous discussions with stakeholders about site end states have highlighted the important link between end state and land use. For example, it is important to understand whether the burden of achieving a specific end state can be justified by the value a land use provides.

The 'value' a user can get from land can be measured in many ways. Typically it is measured by how much income can be achieved from a land use. However, there is recognition of the wider socio-economic and environmental benefits land can provide *(ref 14) (ref 15)*. With an understanding of these benefits, we may be able to use them to drive early land release or support a different remediation approach.

The link between end state and end use has been further highlighted by the recent work undertaken at the Winfrith site as it moves closer to its interim end state when all physical works will be completed. To facilitate this work it has been necessary to provide greater detail to the end state definition; for example, should the roads be removed, should drainage of the site stop, etc. To enable these decisions to be made, the next use of the site needed to be understood.

Although it is helpful to assume a next land use when defining the site end state, we only have responsibility for defining the latter. The next land use will be defined by the next owner in accordance with the planning regimes and incorporating consultation with stakeholders as appropriate. However, to enable decommissioning and remediation to progress and offer greatest value for money, it is necessary to understand which land use(s) would be credible for our sites. We can therefore make decisions about which structures and infrastructure should be removed and what is the most appropriate way to manage residual contamination or dispose of waste.

A further benefit of understanding credible next land use(s) for our sites is to support the release of land and property. It can also lead to identifying opportunities for interim use(s) that could provide income for our mission or for the socio-economic benefit of the local community. An example of where this has already happened is the re-use of the former Berkeley Technology Centre by South Gloucestershire and Stroud College as a renewable energy, engineering and nuclear centre. Where a next use is identified, this may influence the priority and pace of site decommissioning and remediation to facilitate early re-use.

Many things can affect how a site could be used. Of significance is the location of the site and in particular its distance from towns and transport links. Other factors to consider include the physical characteristics of the site, commercial interest and local planning policy. Evaluating these factors is important to defining the end state, especially for sites where the next owner, and consequently the next use, is unknown.

Our Strategy

See p96

We recognise that land is a national asset which supports society's ability to grow and prosper. It is a finite resource and we must use it wisely. In our Land and Property Management strategy we therefore commit to promoting the re-use of land and property which has become surplus to our mission or, when appropriate, during interim periods of decommissioning and remediation.

We commit to encouraging the re-use of brownfield land over the development of greenfield land. This is in line with government policy *(ref 16) (ref 17) (ref 18)* and the principles of sustainable development.

Rather than waiting for the next use to be identified through market interest, we want to be aware of the re-use opportunities. This ensures we can encourage the re-use of our land and property in a timely manner and improve our decommissioning and remediation activities to support its re-use. This will also enable us to identify potential interim uses.

Understanding how a site can be used also supports identifying an approach to land quality management, and the extent to which controls can be used. Controls could include physical barriers, planning conditions, environmental permits or restrictive covenants. These controls do not stop the land from being re-used but control the risk presented by any residual contamination that may remain. This approach is widely used in the development industry.

Strategy Development

To ensure we can promote the beneficial re-use of our land and property we have undertaken initial research, data gathering and stakeholder engagement to identify the factors that influence land use. We will continue this work with the ultimate aim of informing the optimisation of site interim and end states by our SLCs.

Working with key stakeholders, we will develop our understanding of the appropriate controls that should be in place to ensure our sites can be re-used where residual contamination is being managed.

Delivery

In response to our guidance on the factors to consider when identifying suitable next use(s) of our sites, the NDA and SLCs will gather information to increase our understanding of credible next use options and hence credible site end states.

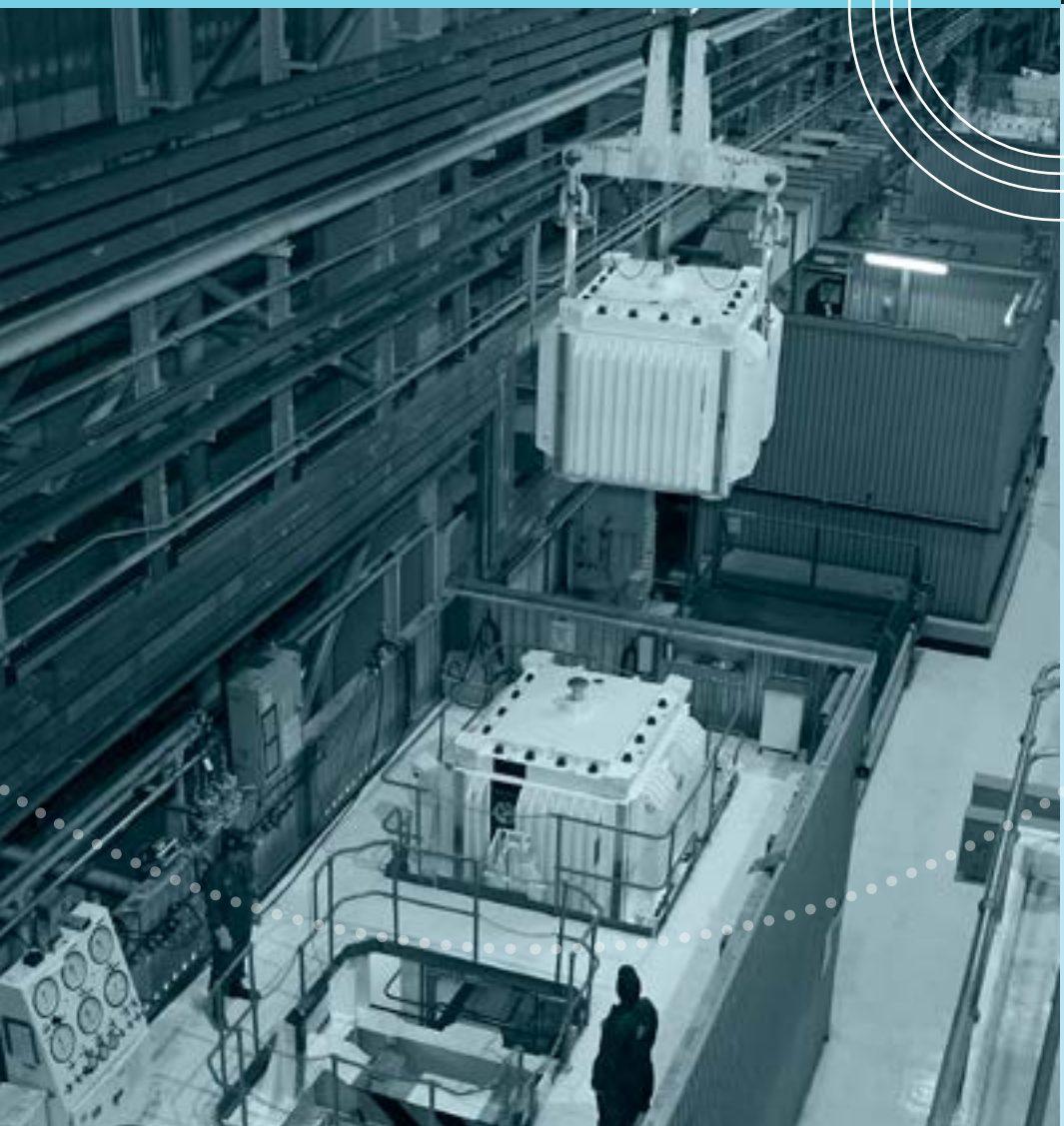
To facilitate beneficial re-use, we will identify the socio-economic and/or environmental benefits as well as the commercial value of our land. This will be consistent national and international best practice for assessing the non-commercial value of land.

7. Land Use is a new topic strategy; do you find this a helpful topic?

4.0 Spent Fuels

Objective:

To ensure safe, secure and cost-effective lifecycle management of spent fuels.



Top right - Multi-element bottles being removed from the THORP pond
Bottom left - Inside the Fuel Handling Plant at Sellafield

4.0 Spent Fuels

The NDA inventory of spent nuclear fuels consists of large quantities of Magnox and oxide fuels, along with smaller quantities of non-standard and diverse fuel types which we refer to as 'exotic fuels'.

UK government policy *(ref 19)* states that spent fuel management is a matter for the commercial judgement of its owners, subject to meeting the necessary regulatory requirements.

See p57

Historically the UK's approach has been to reprocess separating the spent fuel into its component parts of uranium and plutonium, various waste streams and authorised discharges.

Plutonium recovery is no longer required for either civil or military purposes. However, some fuels continue to be reprocessed to support ongoing electricity generation and some because they are unsuitable for long-term storage.

See p66

An alternative approach to reprocessing is to store spent fuel in purpose built ponds or dry stores.

Where spent fuel is subsequently declared as waste it will be consigned to a geological disposal facility (GDF) in line with UK government policy *(ref 20)* (see Radioactive Waste).

Managing our spent fuels effectively is essential to enable us to remediate our sites and release them for other uses. We will ensure effective solutions for the management of spent fuels and, where appropriate, meet the contractual commitments of our customers.

Reprocessing of spent fuels gives rise to permitted liquid and gaseous discharges which must be managed in line with the UK discharge strategy commitments (see Liquid and Gaseous Discharges).

Our Strategy

Our strategy is to secure and subsequently implement the most appropriate management approach for spent Magnox and oxide fuels and, where possible, take advantage of these approaches to manage spent exotic fuels.

In making strategic decisions we consider the lifecycle of the fuels, their products, wastes and discharges and all of the existing or potentially new facilities that are required to manage them. We engage with government, regulators and stakeholders on the strategic options before finalising our strategic decisions and implementing them.

We aim to complete the reprocessing of Magnox fuel as soon as is practicable. Magnox fuel reprocessing is expected to complete by around 2020.

For our oxide fuels, we aim to reprocess the contracted amount of spent fuel in Thermal Oxide Reprocessing Plant (THORP), and for the remaining and future arisings of Advanced Gas Cooled Reactor (AGR) spent fuel we plan to place them into interim storage pending disposal to a GDF. We intend to consolidate all of our exotic fuels at Sellafield. Some of these fuels can be managed in much the same way as our bulk Magnox and oxide fuels. But some exotic fuels present particular challenges which may require specifically tailored solutions for their long-term management and final disposition.

See p72

In the next five years we expect that the THORP and Magnox reprocessing plants will complete their committed reprocessing programmes. The completion of the Magnox and oxide reprocessing programmes represents a major milestone in our long-term mission.

There are risks with both Magnox and oxide reprocessing that mean we could reprocess less than the scheduled amounts before operations cease. It may simply not be possible to reprocess all of the fuels that are currently scheduled to be reprocessed. We will, therefore, continue to invest in developing alternative options and contingency plans in the event that our reprocessing and storage facilities cannot fulfil their current commitments, or are not available. In some cases, where the Magnox fuels have degraded in storage, this could mean integrating their management plans with those for legacy fuels and materials arising from the Legacy Ponds and Silos (LP&S). This is because the technologies and approaches being developed for managing legacy fuels and materials may be applicable to the management of relatively small quantities of fuel remaining at the end of reprocessing.

We will continue to undertake research to support the development of alternative options (see Research and Development). By having these alternative options available we will be able to bring the reprocessing programmes to a timely conclusion and ensure the continued safe, secure and cost-effective management of the remaining fuels. We will continue to work and engage with government, regulators and stakeholders before finalising future strategic decisions and implementing them.

4.1 Spent Magnox Fuels

Objective:

To ensure the safe management and disposition of spent Magnox fuel, completing Magnox reprocessing as soon as practicable.

The Magnox reactors were the first generation of commercial nuclear power stations to operate in the UK. All twenty six reactors are scheduled to have been shut down by the end of 2015.

The NDA has the responsibility to defuel and decommission all of the Magnox reactors. Prior to decommissioning spent fuel is removed from reactor cores and sent to Sellafield, resulting in significant reduction in radioactivity and hazard at the reactor sites. We aim to transfer the fuel to Sellafield as soon as practicable. Only three power stations are left to defuel: Calder Hall, Oldbury and Wylfa.

Right from the start Magnox fuel has been reprocessed because of its susceptibility to corrosion. As of March 2015 there remains less than 2,500 tU of Magnox fuel to reprocess, which means over 95% of Magnox fuel has now been reprocessed. Based on typical plant performance, reprocessing is expected to complete around 2020. Further details of the delivery of the strategy are included in the Magnox Operating Programme (MOP) *(ref 21)*.

In 2011 we took the decision to transfer Dounreay Fast Reactor (DFR) material from Dounreay to Sellafield for reprocessing and this material has now been included in the MOP inventory. Sellafield has the facilities and capability to manage this material and consolidation there also enables Dounreay to achieve its interim end state.

In 2014 we decided to retrieve legacy Magnox spent fuel from the First Generation Magnox Storage Pond (FGMSP) at Sellafield and consolidate it alongside buffer stocks of Magnox spent fuel scheduled for reprocessing. This material is heavily degraded and not suitable for reprocessing, however, it will need to be safely managed along with the inventory associated with MOP.

Defuelling at Calder Hall in readiness for reprocessing

Our Strategy

Our strategy is to reprocess all Magnox fuel in line with the MOP. Delivery of the MOP requires consistently high performance of reactor stations, transport infrastructure (see **Transport and Logistics**) and the ageing reprocessing facilities at Sellafield. Due to the age of the facilities there are inherent technical and engineering issues, (see **Asset Management**) which may lead to gradual loss of performance or sudden, acute failure. These issues could result in delay to the MOP and additional costs; because of this we continually monitor the health of our strategy.

See p90

See p77

We have published our contingency options for the management of spent Magnox fuel including the status of the technology for drying Magnox fuel. The development of drying technology to manage wetted Magnox fuel in particular, is now at an advanced stage and there is high confidence that this option is deployable if required. Further technologies to dry store and/or immobilise Magnox fuels continue to be developed as part of the programmes to manage materials held within Legacy Ponds and Silos (LP&S) at Sellafield.

An economic assessment of the Magnox contingency options compared with continued reprocessing has been undertaken. Continued reprocessing has been shown to be much more cost-effective compared to the contingency options and there is greater certainty associated with it.

For these reasons we consider that no case for change exists with regard to the Magnox strategy and we remain committed to the completion of Magnox reprocessing operations as soon as practicable in line with the MOP.

Strategy Development

For a number of reasons it may not be practicable to reprocess all of the spent Magnox fuels in the MOP inventory. When Magnox reprocessing operations cease there are likely to be relatively small amounts of fuels left over to manage. Projections of this inventory range from a few tonnes to a few hundred tonnes of fuel depending on a number of factors including reprocessing performance and the amounts of fuels recovered from legacy facilities.

We are working with the relevant Site Licence Companies (SLCs) to develop alternative options (see **Research and Development**) to treat these fuels, so that any remaining fuel can be safely and cost-effectively managed to the point of disposal. We aim to complete an analysis of these options by the end of 2016 and will discuss them with government and regulators.

See p72

This work will inform how the MOP is optimised to balance the types and amounts of unreprocessed fuel, if any, at the end of reprocessing. This may result in a future revision to the MOP once the analysis has been undertaken and the options developed and assessed.

Delivery

The MOP is designed to deliver the NDA strategy to reprocess all Magnox spent fuel. In our previous Strategy we set out our aim to complete the MOP around 2016. Due to a number of technical and operational difficulties this has not been possible. In 2012 we revised our forecast for completion of reprocessing with the publication of our most recent MOP. This explicitly recognises the operational and throughput uncertainties associated with Magnox reprocessing due primarily to the age of the plants involved which has led to variable delivery performance. Based on a lower bound performance of 450 tU pa, Magnox fuel reprocessing will complete by December 2020.

We will continue to closely monitor performance and plant condition. To sustain and improve reprocessing performance levels a Magnox Throughput Improvement Plan (MTIP) was launched at Sellafield in 2011. This developing programme targets investment in existing infrastructure including key assets.

We will also continue to invest to maintain the readiness of our contingency options in the event of sudden, irreversible failure of Magnox reprocessing by undertaking research and development where appropriate.

8. What factors should the NDA consider in deciding when to conclude Magnox reprocessing operations?

4.2 Spent Oxide Fuel

Objective:

To ensure management and disposition of UK owned oxide and overseas origin fuels held in the UK, and to complete THORP reprocessing as soon as practicable.

When we took over the UK's legacy nuclear liabilities, we inherited a range of spent fuel management contracts with domestic and overseas customers.

We are contractually committed to receive and manage all of the spent fuel arising from the seven EDF Energy (EDFE) AGR power stations in England and Scotland. The management of AGR spent fuel is a major source of commercial income for the NDA. (see Revenue Optimisation).

See p98

See p92

EDFE has publically declared its intention to operate these stations for as long as it is safe and economic to do so and to seek significant life extensions for its AGR reactors. We must maintain the capability at Sellafield to receive and manage AGR spent fuel from EDFE in line with our contractual commitments to them (see Non-NDA Liabilities).

Fewer than 150 tonnes of overseas origin Light Water Reactor fuels remain at Sellafield which are scheduled for reprocessing in THORP.

A Sellafield employee working within THORP

Our Strategy

In our previous Strategy we committed to undertake a study to determine how much spent fuel we should reprocess in THORP and how we should manage any remaining fuels including future arisings of AGR spent fuel.

Our options were set out in our Credible Options paper for oxide fuels, assessing them against a number of criteria. We concluded that the delivery of the current strategy – to reprocess the contracted amount of spent fuel in THORP – remains the most viable and cost-effective option and confirmed our position in 2012.

In delivering the current strategy we will have created sufficient space to receive and manage all the AGR fuel from EDFE power stations, which avoids having to build additional storage capacity for AGR fuel. If we were to extend reprocessing we would have to gradually replace many of the plants that support THORP's operations at great expense. This would potentially divert resources from our core mission of nuclear clean-up and waste management.

After the closure of THORP our plans for the remaining AGR and other oxide spent fuels are to store them pending packaging for disposal in a GDF.

With the agreement of UK government we will, if requested, continue to supply advice and information to third parties involved in the UK's nuclear new build programme.

Strategy Development

In 2012 we highlighted the risks that could impact on the delivery of our strategy to complete the THORP reprocessing contracts. For some overseas origin fuels it will not be economic or not possible to reprocess them before we cease commercial operations in THORP. We proposed to UK government that these fuels should be retained in the UK and that products and wastes allocated and, where appropriate, returned to customers in line with contractual commitments. Following public consultation the UK government approved our proposal. We will therefore implement this approach where these fuels cannot be reprocessed economically in THORP.

We will continue to work with EDFE and stakeholders to optimise our plans for receiving AGR spent fuel in line with EDFE's intentions to operate and defuel their AGR power stations.

We are still many years from making a final decision about the design of a GDF in which spent oxide fuel would be placed. We will continue to work with Sellafield Ltd and Radioactive Waste Management Limited (RWM) on the storage, packaging and disposal of oxide fuels, including work on dry storage as an alternative to wet storage.

Delivery

When we published our first Strategy THORP was expected to complete the reprocessing contracts by 2010. However, due to operational and throughput difficulties at Sellafield this has not been possible. THORP is now expected to complete the reprocessing contracts in 2018.

See p57

The future performance of THORP and supporting plants remains uncertain and is therefore a significant concern. Nevertheless, current throughputs in THORP remain at the rates required to complete the strategy. Additional facilities being built at Sellafield to support decommissioning can also be used to support the completion of THORP reprocessing (see Completion of THORP Reprocessing).

See p42

We aim to ensure THORP reprocesses sufficient AGR spent fuel to avoid building further interim spent fuel storage capacity at Sellafield. Even with significant lifetime extensions to EDFE's AGR fleet, our strategy for the receipt and management of AGR fuel remains robust.

Sellafield Ltd has continued to develop its approach for the interim wet storage of AGR spent fuel to the point of packaging for disposal (see Radioactive Waste). This approach is based on the considerable operational experience and technical knowledge base which Sellafield Ltd has accumulated over 30 years of managing AGR spent fuel.

We will continue to monitor performance and plant conditions and develop options to manage risks and uncertainties. We are working with Sellafield and key stakeholders to these ends and the outcome of this work will be shared with regulators.

9. Is our approach the right strategy?

Case Study

Completion of THORP Reprocessing

When our first Strategy *(ref 2)* was published our plans showed completion of reprocessing in the Thermal Oxide Reprocessing Plant (THORP) around 2010. This proved not possible due to the cumulative effect of several equipment failures in the THORP reprocessing plant and associated support facilities.

Our most recent strategy stated that 'we plan to complete the reprocessing contracts for the UK and overseas contracts are soon as possible' subject to a number of constraints. We also committed to undertake a study into the most cost-effective lifecycle management option and subsequently adopt it.

We published our credible options analysis for the management of oxide fuel in 2011 and gathered stakeholder views. As a result of this and further studies we identified our preferred option in 2012 and concluded that the delivery of the current strategy to reprocess the contracted amount of spent fuel in THORP remained the most viable and cost-effective option. We noted that to complete reprocessing in THORP we had to ensure that:

- there was sufficient capacity to store any fuel remaining, including future arisings, and that it could be safely and securely stored until final disposal
- the optimum storage conditions could be implemented for the fuel that remains at the end of reprocessing
- the site infrastructure could support the demand placed on it when reprocessing ceased.

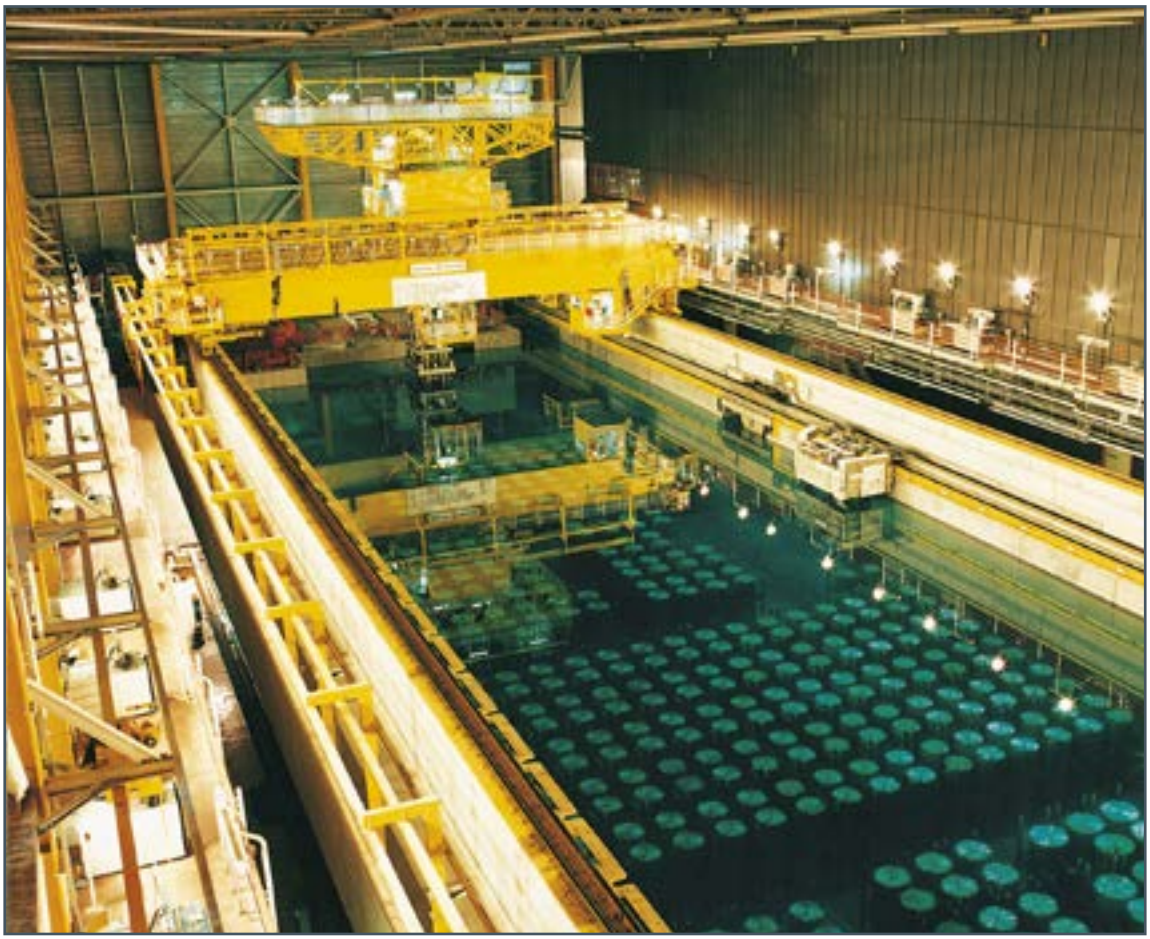
This strategy would see THORP reprocessing complete by the end of 2018. In delivering this strategy we will have created sufficient space to receive and manage all the AGR fuel from EDF Energy's power stations, which avoids having to build additional storage capacity for AGR fuel. If we were to extend reprocessing we would have to gradually replace many of the plants that support its operations at great expense. This would potentially divert resources from our primary focus of decommissioning and remediation.

We highlighted a number of performance risks that could impact on the delivery of the strategy. In some scenarios operational difficulties could result in the reprocessing of less than the currently planned amount of spent fuel by late 2018, the date by when reprocessing in THORP is expected to be completed. To manage these risks, we have continued to develop alternative options for relatively small amounts of fuels that cannot be reprocessed before THORP operations conclude.

The decision on when to complete THORP reprocessing has informed wider asset and investment decisions, in particular the High Active Storage Tanks (HASTs) which store the highly active liquor resulting from reprocessing. Earlier plans had assumed that new HASTs would be required to support ongoing reprocessing. A significant amount of work was undertaken by Sellafield Ltd to underpin the long-term asset condition of the existing tanks. Given the clear end of reprocessing, Sellafield Ltd determined that there are significant margins of safety and contingency with the current fleet of HASTs and that their replacement is not required for reasons of safety, as they provide no safety benefit. This resulted in a saving of c.£600 million.

This decision also signalled a clear end to reprocessing operations in THORP which, when taken together with the MOP, provides a clear transition point for Sellafield from an operational reprocessing site to a decommissioning and waste management site.

THORP reprocessing facility



THORP receipt and storage pond

4.3 Spent Exotic Fuel

Objective:

To ensure the management and ultimate disposition of all our exotic fuels, developing options for those fuels which cannot be effectively managed through our routes for Magnox or oxide fuels.

In addition to the bulk Magnox and oxide fuels we also manage a smaller inventory of non-standard fuels, commonly referred to as 'exotics'. These fuels include metallic, oxide and carbide materials and are a legacy we inherited from earlier nuclear industry activities such as the development of research, experimental and prototype fuels and reactors.

Examples of exotic fuel types include fuels arising from the Dounreay Fast Reactor (DFR), the Dounreay Prototype Fast Reactor (PFR), the DRAGON reactor, the Steam Generating Heavy Water Reactor (SGHWR) and highly enriched uranium (HEU) fuels.

See p98

Some, but not all, of these fuels share common characteristics with our bulk Magnox and oxide fuels and can be managed in much the same way, for example through reprocessing. However, although much smaller in quantity than our bulk fuels, some of the exotic fuels present their own particular management challenges due to their diverse and sometimes unique properties. In some cases specifically tailored solutions for their long-term management and disposition will be required.

We are also contracted to receive and store used fuels from the Ministry of Defence (MOD) arising from the development and operation of the UK's submarine defence programme (see Non NDA Liabilities).

Inside the Dounreay Fast Reactor preparing for fuel retrieval

Our Strategy

See p38

We have taken a series of decisions to transfer all of the exotic fuels to Sellafield for management. This strategy of consolidation provides better value to the UK taxpayer as it allows us to accelerate clean-up and decommissioning of the Dounreay and Harwell sites making it more cost-effective in the long-term. With this approach we can also optimise the use of suitable facilities, skills and capabilities at Sellafield to treat and manage these fuels (see **Asset Management** and **People**).

See p40
See p77+75

We have decided to reprocess specific exotic fuels alongside bulk fuels which have common characteristics. For example, we are reprocessing DFR fuel alongside **Spent Magnox Fuel**. This maximises the opportunity to use existing facilities and provides best value for money.

In other cases, such as the mixed oxide fuels from the PFR, we have decided to store this fuel alongside AGR fuel in THORP facilities (see **Spent Oxide Fuels**). This is because this fuel is compatible with the storage conditions for AGR spent fuel. For the DRAGON reactor fuel we have chosen to immobilise the fuel to simplify our approach to storage pending disposal.

Strategy Development

The individual nature of exotic fuels means that the approach for managing each fuel type is made on a case-by-case basis. We have arranged our exotic fuels into groups and will develop business cases to manage each fuel group.

See p61

Consolidation (see **Case Study Consolidation**) of the exotic fuels at Sellafield will provide a cost-effective approach to managing these fuels until final disposition options can be developed and implemented. It will not be possible to reprocess all of the exotic fuels using existing facilities so alternative management options will need to be developed. For each option we are working to better understand the issues associated with their storage, treatment and in some cases disposal. Specifically tailored solutions for long-term management and disposition could be required.

The recovery and transfer of all of DFR material is expected to be complete within the operating timeframe of the Magnox reprocessing plant.

However, in case of delays to retrieval or issues with Magnox reprocessing, we will develop a contingency option for the DFR material so that it can still be managed at Sellafield.

We currently receive and interim store irradiated fuels on behalf of the MOD in specialised facilities at Sellafield. These fuels are owned by the MOD and the decisions and strategy for their long-term management and disposition, beyond interim storage, rests with the MOD. We will continue to work closely with the MOD to support them in developing options for the long-term disposition of these fuels. Due to the nature of these fuels there is likely to be very limited opportunity to use existing facilities to provide a final disposition route. Where there is potential benefit to the UK taxpayer to manage these fuels alongside the NDA owned fuels, we will explore options with MOD and use the skills, capability and, if appropriate, planned-for facilities at Sellafield to provide an optimised solution.

Delivery

All of our exotic fuels are being safely and securely stored while plans for their final disposition are implemented or developed, as appropriate. Development of these plans may require or be supported by research (see **Research and Development**).

See p72

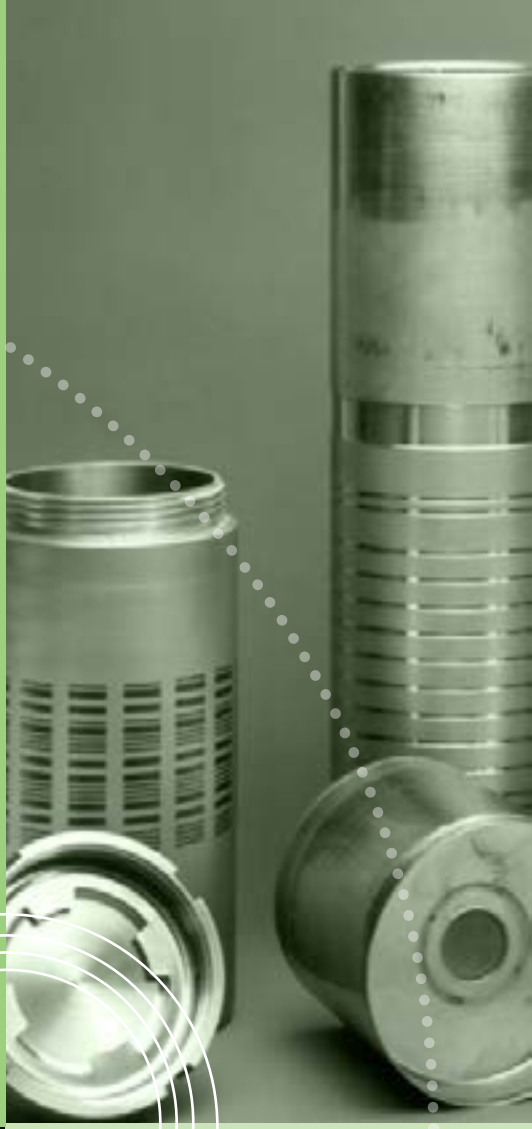
The exotic fuels at Dounreay and Harwell are progressively being transferred to Sellafield for management. We have started the transfer of DFR material from Dounreay to Sellafield for reprocessing. Work is continuing to develop detailed plans for the transfer of the remaining irradiated fuels held at Dounreay.

Some of the exotic fuels at Sellafield such as the Steam Generating Heavy Water Reactor (SGHWR) are scheduled to be reprocessed. However, some exotic fuels are not suitable for reprocessing in our current facilities before they cease operations due to the small quantities, their physical properties or level of enrichment. These fuels will continue to be safely and securely stored pending development of final disposition options.

We have also received fuel from the CONSORT reactor at Imperial College. We are continuing to store this fuel alongside other materials we hold of similar properties.

We are continuing to receive and store fuels on behalf of the MOD until the strategy for their long-term management and disposition is decided.

10. Is our proposed approach the right strategy?



5.0 Nuclear Materials

Objective:

To ensure safe, secure and cost-effective lifecycle management of our nuclear materials.

Top right - Plutonium containers
Bottom left - Getting containers ready for lifting within the uranics store at Capenhurst

5.0 Nuclear Materials

The NDA manages large stocks of civil uranium and plutonium arising from fuel cycle activities such as reprocessing and enrichment. The majority of these stocks are UK owned. However, some of the nuclear materials managed by the NDA are foreign owned.

See p57
See p70
See p98

The priority for UK government policy *(ref 22)* is to provide a solution that puts the vast majority of UK held plutonium beyond reach. This is because of the continuing and extensive safety and security (see **Health, Safety, Security, Safeguards, Environment and Quality**) arrangements needed for the storage of these materials alongside international non-proliferation objectives to reduce separated plutonium stocks worldwide. Whilst we continue to support the development of UK government policy on plutonium, we will continue to implement our strategy of safe and secure storage.

Our stocks of uranium have the potential to be re-used in nuclear fuel for generating electricity. Accordingly, our uranics stocks are held in storage at nil value pending the development of disposition options. If it were decided that some of these materials have no future value they may need to be managed as waste (see **Radioactive Waste**).

Foreign owned nuclear materials (see **Non-NDA Liabilities**) are the responsibility of the owners. These materials are managed in line with UK and the foreign government policy requirements, contractual commitments and customer requirements.

Implementing a solution for the management of all of our nuclear materials is essential to enable us to restore our sites and deliver our mission. In the meantime our nuclear materials are managed in safe and secure facilities in line with regulatory requirements.

Nuclear Materials

Our Nuclear Materials strategy is made up of Plutonium and Uranics topic strategies. Our strategy is to safely and securely store our nuclear materials while we develop cost-effective lifecycle solutions for their management in line with UK government policy.

Our nuclear materials are held at a number of sites in the UK. In our previous Strategy *(ref 3)* we proposed that it may be appropriate for reasons of security and economy to consolidate the storage of some of our nuclear materials. Since then we have taken a number of decisions to consolidate nuclear materials at sites which we consider are best suited to their safe, secure and cost-effective management.

Yellow cake uranium

5.1 Plutonium

Objective:

To ensure the safe and secure management of separated plutonium stocks held by the NDA and to support the government to develop its preferred approach for putting separated plutonium in the UK beyond reach.

On completion of reprocessing operations there will be around 140 tonnes of civil separated plutonium stored safely and securely in the UK. The NDA manages all of the civil separated plutonium in the UK. The vast majority of this material is held at Sellafield, with a relatively small amount currently held at Dounreay arising from historic activities at this site.

Implementing a solution for the management of all our plutonium stocks is essential to enable us to deliver our mission.

THORP Product Store showing safe and secure storage of plutonium

Our Strategy

In 2011, informed by our strategic options work, the UK government proposed a preliminary policy view to pursue re-use of UK civil separated plutonium as Mixed Oxide fuel (MOX). This would see the vast majority of UK plutonium converted into fuel for use in civil nuclear reactors. The remaining plutonium that was unsuitable for conversion into MOX would be immobilised and treated as waste for disposal (see Radioactive Waste).

See p57

In addition, the UK government decided that overseas owned plutonium in the UK, which remains the responsibility of the owners, could be managed alongside UK plutonium or transferred to UK ownership subject to acceptable commercial terms (see Revenue Optimisation).

See p92

Whilst re-use of plutonium is the preferred policy position there is currently an insufficient understanding of the options to confidently move into implementation. In the meantime, our strategy for plutonium stocks is to continue to safely and securely store them on our sites in suitable facilities in line with regulatory requirements.

Following engagement and consultation we have taken the decision to consolidate at Sellafield the plutonium stocks currently held at Dounreay. This means that all significant stocks of civil plutonium will be stored at Sellafield. A strategy of consolidation helps to optimise the safe and secure storage of UK held plutonium stocks and enables the decommissioning and remediation of the Dounreay site. The consolidation of materials at Sellafield can be achieved without compromising decommissioning activities at this site.

Strategy Development

We are continuing to support UK government in developing strategic options for the implementation of policy by undertaking further strategic work on its behalf.

In 2014 we published an update detailing our progress on approaches to the management of separated plutonium which included our plans for significant future work with three potential suppliers of re-use technologies.

See p72

Since then we have further developed our understanding of the re-use options as well as immobilisation of plutonium.

We continue to work with technology suppliers, utilities and UK government to establish how each of the options could be secured and implemented. This work is focused on technical and commercial risks and uncertainties and will enable us to develop an approach to the acquisition and procurement of the re-use option that meets UK government policy requirements and delivers best value for money.

We are also continuing to fund technology development for the immobilisation of plutonium as an alternative strategy in the event that re-use cannot be successfully implemented in line with UK government requirements (see Research and Development).

The schedule for the development, selection and acquisition of the preferred option is dependent on many factors, and it will be for UK government to make a decision on how to progress.

We will continue to engage with regulators and stakeholders on the options for the management of plutonium due to the importance of this strategy and its relevance to national policies and international arrangements. We will report on our progress in line with UK government expectations.

Delivery

Our stocks of plutonium are contained in custom built stores that ensure safe and secure storage. Over the past five years we have continued to retrieve materials from older stores and consolidate them in state of the art facilities such as the Sellafield Product and Residue Store (SPRS).

We are in the process of consolidating, at Sellafield, the relatively small stocks of plutonium currently held at Dounreay. A specialised facility to treat and package materials to prepare them for transport is required at Dounreay to support this strategy.

In late 2011 we took the decision to close the Sellafield MOX Plant (SMP) because it was no longer commercially viable as a consequence of the Great East Japan earthquake and its subsequent impact on the Japanese nuclear industry. This decision was made in order to ensure that the UK taxpayer does not carry a future financial burden from SMP.

To optimise the management of overseas owned plutonium we have reached commercial settlements with some of our European customers and taken ownership of their plutonium. Discussions are continuing with overseas organisations and utilities on how to manage their stocks of plutonium held by the NDA in line with UK policy *(ref 22)* and that of relevant foreign governments.

11. In your opinion, how urgent is the plutonium disposition challenge and what factors are important in determining the pace for the management of separated plutonium?

5.2 Uranics

Objective:

To ensure the management and disposition of our uranics inventory.

Uranics are materials containing uranium which have been produced from fuel cycle operations such as enrichment, fuel fabrication and reprocessing since the 1950s.

We manage significant stocks of uranics which are held safely and securely at several locations. We own the majority of the uranic materials on our sites, while the remainder is owned by others including Ministry of Defence (MOD), EDF Energy (EDFE) and overseas utilities. We manage our customer-owned uranic materials in accordance with the terms of those contracts (see Revenue Optimisation and Non-NDA Liabilities).

See p92

See p98

The NDA-owned inventory comprises the following groups:

- Magnox Depleted Uranium (MDU), a product of spent Magnox fuel reprocessing
- Uranium Hexafluoride tails (UF6 tails, also known as 'Hex'), a by-product of legacy uranium enrichment
- THORP Product Uranium (TPU) in the form of UO3, a product of spent oxide fuel reprocessing
- High Enriched Uranium (HEU) from research reactor fuel development and production
- low-enriched, natural and depleted unused uranium in a variety of forms as recovered materials from fuel manufacturing processes.

Our uranics inventory will change as we continue to reprocess spent fuels, sell our uranic materials, where possible, and return it to customers according to their requirements.

Our Strategy

Our Strategy will ensure the safe and secure management of our uranic materials while continuing to provide best value for the UK taxpayer. We will also foster collaboration between our sites and international entities to ensure continued application of best practice (see International Relations).

See p94

We will continue to manage our customers' uranics material in line with contractual obligations and UK government policy *(ref 23)*.

Owing to the diverse nature of our uranics inventory there is no single preferred management option for the whole inventory; the preferred option will need to be determined on a group-by-group basis.

The management options are:

- continued safe and secure storage
- sale to a third party for re-use
- conditioning to an appropriate form for disposal.

Strategy Development

Continued storage does not provide an end point for our uranics and so our overall decommissioning mission. Where our uranics have commercial value we will return them to the fuel cycle through sale to a third party.

For a significant part of our inventory, such as the depleted uranium arising from enrichment and reprocessing, there is currently very limited opportunity to sell this material. Work is underway to define how uranic material with no foreseeable resale value could be disposed of.

Through our subsidiary Radioactive Waste Management Limited (RWM), we are evaluating the possible inclusion of uranic materials into the design and development of the geological disposal facility (GDF). This work is planned to identify the preferred disposal options for uranics.

This work will inform whether alternative approaches to the disposal of uranic materials should be developed and provide input to any future UK government decision on its policy for uranics.

Delivery

To support continued storage, we have contractual arrangements in place with our site operators who are required to maintain the assets used to store our uranic materials including the storage buildings, containers and security arrangements (see Contracting). The maintenance regime includes regular inspections to ensure the packaging meets the required containment standards and to identify potential degradation mechanisms in advance (see Asset Management).

See p79

See p77

To optimise the management of uranics we are consolidating the storage of our uranics inventory (other than TPU and HEU) at Capenhurst (see Case Study Capenhurst Hazard Reduction) alongside MDU and the oxide from converted Hex. The transfer of uranic materials from Harwell and Dounreay is planned to be complete by 2018/19. TPU is stored in purpose-built facilities at Sellafield and we aim to consolidate our HEU stocks at Sellafield alongside our plutonium stocks.

See p52

We are utilising existing infrastructure to recover uranium from residues at Springfields and materials from Harwell and Winfrith to make it more manageable or saleable. Materials not sold are being transferred to Capenhurst for storage. We will continue to evaluate opportunities for further such processing and sale.

Subject to NDA estate-wide funding and hazard reduction priorities we will reduce the hazard and improve the security associated with the continued storage of uranics such as Hex.

In line with our customers' requirements we are continuing to export THORP product uranium for sale or recycling. Over 500 tonnes of TPU has been exported since publication of our previous Strategy.

Magnox Depleted Uranium (MDU) drums in storage at Capenhurst

12. Should the NDA consider alternative disposal routes than to GDF to better inform a UK decision to declare its inventory of depleted uranium to be a waste?

Case Study

Capenhurst Hazard Reduction

The Capenhurst site historically consisted of two licensed sites, operated by Sellafield Ltd and URENCO, surrounded by a single site boundary. The site stores approximately 20,500 tU of our tails uranium Hexafluoride (Hex), in approximately 10,000 storage cylinders as well as Hex owned by URENCO.

These cylinders are the highest hazard on the Capenhurst site and we committed to converting our stored Hex into uranium oxide, which is much less hazardous and more suitable for long-term management.

To deliver a sustainable future for the Capenhurst site, while maximising the return from our asset holding, we decided to enter into modified contractual arrangements for managing the site and the material stored there.

In 2012, following a significant transformation and transition process, the NDA site was transferred to URENCO with consolidation under a single nuclear licensee. Existing activities undertaken by Sellafield Ltd have been assigned to URENCO.

The NDA and URENCO also signed agreements for the deconversion of our Hex at a Tails Management Facility (TMF) constructed at the Capenhurst site. TMF is being designed to process tails Hex from URENCO's normal enrichment activities stored in modern cylinders. However, most of our Hex is in cylinders of an obsolete and ageing design and some contain impurities which may not be compatible with TMF.

To address this we have agreed for a facility to be built on our behalf to transfer Hex from the legacy cylinders into new cylinders and to address the issues arising from impurities. The process of repackaging and deconversion will take some 25 years. Once deconverted, the inherent hazard will have been removed and the resulting materials will be packaged and stored alongside URENCO's deconverted material in a modern, purpose-built store.

These agreements reduced our net liabilities for managing and clearing the site, while also making it possible for URENCO to invest in new facilities on the site.

'Hex' containers in storage at Capenhurst

Capenhurst site

6.0 Integrated Waste Management

Objective:

To ensure that wastes are managed in a manner that protects people and the environment, now and in the future, and in ways that comply with government policies and provides value for money.

Top right - Inside Trawsfynydd ILW store
Bottom left - On the Vitrification Store charge floor

6.0 Integrated Waste Management

Nuclear site operations and successful site decommissioning and remediation depend on the availability of a robust, sustainable waste management infrastructure. Effective waste management is an essential requirement for the delivery of our mission and is a significant part of our programme.

Waste management is not a straightforward process of retrieval and disposal. It includes a series of lifecycle steps: pursuing opportunities for waste minimisation, re-use and recycling, waste processing, packaging, storage, records management, transport and then final disposal where required. This theme includes the full spectrum of waste types from solid radioactive wastes, gaseous and liquid discharges to non-radioactive wastes. The solid radioactive waste management topic aims to integrate the following strategic areas: Higher Activity Waste (HAW) and Low Level Waste (LLW) management.

The NDA needs to ensure that effective waste plans are being implemented across our estate, recognising the need to manage risks and pursue opportunities at a site and estate level. To help with this process we require our sites to deliver an Integrated Waste Strategy setting out their approaches to managing the full range of waste they generate.

We continue to support UK government and devolved administrations in the development of their radioactive waste management policies and provides essential waste management services for the UK as a whole. Radioactive Waste Management Ltd (RWM) is a wholly owned subsidiary of the NDA and is responsible for implementing UK government policy on geological disposal of higher activity radioactive waste in England and Wales *(ref 20) (ref 24)*. Scottish policy for the management of HAW is long-term management in near-surface facilities (ref 25). We are also responsible for the implementation of the UK Nuclear Solid Low Level Wastes Strategy *(ref 26)*, which is being delivered by Low Level Waste Repository Limited (LLWR Ltd) with support from Site Licence Companies (SLCs) and the wider nuclear industry.

Our Strategy

The development and implementation of each of the strategies within the Integrated Waste Management theme are informed by the following key principles:

- supporting key risk and hazard reduction initiatives by enabling a flexible approach to long term waste management. For some wastes it may be necessary to adopt a multi-stage process to achieve a final disposable product; this could include the separate management of bulk retrievals and residual material to support hazard reduction programmes
- take into consideration the entire waste management lifecycle, including how waste management is needed to support other NDA strategic or wider-UK initiatives such as large scale decommissioning programmes
- applying the waste hierarchy (figure 7), which is recognised as good practice and should be used as a framework for waste management decision-making enables an effective balance of priorities including value for money, affordability, technical maturity and the protection of health, safety, security and the environment
- promoting early and timely characterisation and segregation of waste, which delivers effective waste management
- where appropriate, provide leadership giving greater integration across the estate and the supply chain, in particular by seeking opportunities to share treatment and interim storage assets, capabilities and learning
- supporting and promoting the use of robust decision-making processes to identify the most advantageous options for waste management
- enabling the availability of sustainable, robust infrastructure for continued operations, hazard reduction and decommissioning.

6.0 Integrated Waste Management contd

See p54
See p20
See p36
See p46

Integrated waste management involves a number of steps taking the waste from a raw form to final disposal. The key strategic stages within the lifecycle are:

- planning & preparation
- treatment
- storage
- disposal.

Successful delivery of waste management solutions is dependent on the implementation of the four stages highlighted above. Current UK policy classifies radioactive waste into three categories depending on their radioactive concentration and whether they generate heat or not. The NDA (with support from the nuclear site regulators) is advocating an approach where wastes are managed based on their best means of disposal rather than what waste category they fall into. Consideration of radioactive waste management as a whole will lead to greater optimisation rather than the application of a waste categorisation led approach.

Strategies for HAW and LLW are defined by the requirement to achieve disposability where synergies are being explored at waste category boundaries. The requirements for near-surface disposal differ from those for geological disposal although both are dependent on an assessment of risk-based acceptance criteria.

Diverse radioactive waste management and disposal solutions are being pursued where these offer benefits over previous arrangements. We continue to investigate opportunities to share waste management infrastructure across the estate and with other waste producers where we can see benefit. These will be managed on a case by case basis. We engage with interested parties from an early stage, irrespective of whether such developments represent new investments proposed by us or by other organisations on our behalf. We work with key organisations, for example local authorities, to build on the feedback we have received on how this engagement happens and continue to develop and implement a framework for engagement.

We recognise that in the near future the radioactive waste management landscape will change, particularly as our sites progress into quiescence and a decreasing number of sites will have ongoing waste management programmes. Integrated Waste Management interfaces with all strategy areas and is a key enabler for Site Decommissioning and Remediation and supports Spent Fuels and Nuclear Materials when considering different management options including treatment and disposal. As we develop our waste management strategies we will need to be flexible in order to properly consider the following activities:

- support ongoing legacy waste management
- entry into quiescence known as Care and Maintenance for the Magnox reactor sites
- waste management routes to enable site clearance
- long-term storage arrangements
- determine the most appropriate disposal options
- support to other waste owners.

Figure 7. Summary of the Waste Hierarchy

13. What are your views on the waste management principles described in this strategy?

[1] Out of scope wastes are wastes containing levels of radioactivity that are below specified clearance levels and are not subject to regulatory control. Effectively 'out of scope equates to 'not radioactive'.

6.1 Radioactive Waste

Objective:

To manage radioactive waste and dispose of it where possible, or place it in safe, secure and suitable storage, ensuring the delivery of UK and Devolved Administrations policies.

The successful implementation of radioactive waste management strategies requires effective delivery by the SLCs with support from RWM, LLWR Ltd and the wider supply chain.

See p94

Radioactive waste is split into two main categories: HAW and LLW, which have specific definitions (see Glossary). The interface between the current HAW and LLW topic strategies is an important development area for the NDA that requires careful management and may deliver significant opportunities. The existing HAW and LLW strategies are described below as well as our position in respect to category boundary wastes, e.g. Intermediate Level Waste (ILW) and LLW.

We encourage innovation and open market solutions, and sustain research and development matched to the challenges of waste management both by direct investment and indirectly through the programmes of our SLCs. We also track international developments as a benchmark and collaborate with other countries to share good practice (see International Relations). We also support and lead a number of radioactive waste management fora and as part of this overall approach to strategy development we will review these fora and ensure they continue to meet our current and future needs.

Waste retrievals at the Pile Fuel Storage Pond, Sellafield

6.1.1 Higher Activity Wastes

HAW includes High Level Waste (HLW), ILW and a relatively small volume of LLW that is unsuitable for disposal at the LLWR or the LLW facility at Dounreay.

HAW arises from a broad range of activities including storage of legacy wastes, management of spent fuel and decommissioning (See Spent Fuel and Decommissioning). The NDA has published an overview report on HAW management which provides detailed information on waste types, volumes and management routes *(ref 27)*. This overview is being updated.

See p36
See p24

For HAW, the long-term management policy of the UK government is to package and hold wastes in secure interim storage facilities until they can be transferred to a geological disposal facility (GDF). The 2014 White Paper on Implementing Geological Disposal sets out the UK government's framework for managing HAW in the long term through geological disposal recognising that a GDF will be 'implemented alongside ongoing interim storage and supporting research'. The Scottish government published its policy on HAW in January 2011 and its associated implementation strategy *(ref 28)* where the policy is for long-term management in near-surface facilities.

See p36

We are also accountable to Department for Energy and Climate Change (DECC) for ensuring the UK has a route for the disposal of redundant sealed sources.

See p24

The principles of the Waste Hierarchy apply equally to HAW as to all other forms of waste. However in some cases alternative options for HAW may not be possible due to the levels of radioactivity and/or the condition of the materials to be managed or the facilities within which they are held.

HAW management is multi-faceted and as well as considering the different types of waste to be managed it is important to appreciate how the wastes are currently being managed or are to be generated in the future. In the development of our strategy we are addressing the following three areas:

Legacy wastes – raw wastes in storage which are typically wet or mobile ILW that need to be retrieved from ageing facilities and converted into a passive form suitable for long-term interim storage and/or disposal. In some circumstances it may not be practicable to achieve a disposable product in a single conditioning step especially where there is an overriding need for risk reduction. Other ILW streams are considered in this area although inherently they are less hazardous, e.g. graphite fuel element debris, scrap metal. Our current priority is to expedite the retrieval of HAW from ageing facilities.

Operational wastes – wastes associated with current operating facilities that have a clear and underpinned waste management route in place, including the continued operation of vitrification and encapsulation plants to support reprocessing (see Spent Fuels).

Decommissioning wastes – typically, large volume solid ILW and graphite wastes associated with decommissioning including Sellafield active plant and equipment and Magnox reactors. Many of these waste streams may not arise for many decades and are dependent on the Decommissioning strategy. Due to the high volumes of decommissioning waste arisings and the timescales involved, there are potentially significant strategic development opportunities to be realised for integrated waste management.

Our Strategy

Our overarching strategy is to treat and package HAW into a form that can be safely and securely stored for many decades. Our current planning assumptions are that, at the appropriate time, the stored waste in England and Wales will be transported to and disposed of in a GDF or long-term management in near-surface facilities for HAW arising in Scotland. Overseas owned HAW products are being returned to foreign customers under existing contracts, which includes waste substitution. In support of policy implementation and subsequent development we are preparing a stand-alone HAW Strategy which will be published in spring 2016.

Our strategy of treatment and packaging followed by storage is well-developed. The strategy remains focused on realising opportunities, addressing key delivery risks and improving the baseline delivery programme by considering potential improvements at all stages of the waste management lifecycle. Strategy development is being pursued on a project basis and undertaking supporting research and development activities. We will continue to develop an estate-wide integrated approach to waste management and as appropriate, seek collaborative working opportunities with other waste owners.

Strategy Development

We are pursuing HAW strategy development in a number of key areas where there is the potential for beneficial change to the reference position. In particular there is a need to place greater emphasis on consideration of the entire waste management lifecycle and to undertake strategic tasks or support SLC practices that have a greater impact on the earlier stages of the lifecycle.

Applying the waste hierarchy is good practice. Taking waste management requirements into account early in the design phase of new facilities, using decay storage, and applying sorting and segregation processes are recognised ways of avoiding HAW generation. Effective and timely characterisation of waste and material that will become waste is an enabler for alternative waste treatments that

could help to minimise waste volumes and provide long-term value for the UK. We could establish a national Best Available Technique (BAT) position for certain waste types or groups, (e.g. small volume problematic wastes and concrete). We are also working to realise the synergies between HAW and LLW management and aim for better integration between the two areas.

Waste treatment technologies: The baseline treatment option for radioactive wastes is often cement encapsulation, which is unlikely to be the optimal solution for all future waste streams. We are therefore keen to continue to support the development of a range of waste treatment technologies for future programmes with the strategic aim of reducing overall volumes and making best use of current and future planned treatment assets. An NDA Integrated Project Team has been launched which is aiming to coordinate and support a range of thermal treatment R&D initiatives to enable technology transfer to the industry. We will continue to sponsor activities in support of wider HAW treatment applications including R&D tasks, monitoring of SLC related programmes and studies investigating specific decay storage opportunities and the treatment of problematic wastes.

Boundary wastes: We acknowledge that the boundary between the different routes needs careful management, e.g. some LLW may not be suitable for disposal to a near-surface environment due to radionuclide and/or chemical content and as such would require geological disposal. Similarly some HAW, particularly containing short lived radionuclides may be managed more appropriately in a near-surface environment. An upper bound estimate has been made for boundary waste which is in the region of 10% of the total ILW and LLW inventory *(ref 29)*. The key issue with these wastes is that management decisions based purely upon the radiological categorisation may be sub-optimal from the perspective of cost, environmental consequences and volume. The management approach of HAW and LLW at the classification boundary should be closely aligned and an optimised approach to radioactive waste management can be applied to make best use of capacity and capability within the industry. We will work with SLCs and regulators to help determine the main opportunities for alternative management of wastes at the ILW/LLW boundary and continue to sponsor work, including joint working between LLWR Ltd and RWM. SLCs are also expected to work with LLWR and RWM to highlight any areas of opportunity.

Alternative disposal options in support of UK and Scottish government policies: Both Scottish government and UK policies on the long-term management of HAW aim to investigate alternative disposal options for some of the inventory where Scottish policy does not support deep geological disposal. We expect to have a leading role in determining the credible options for the management of HAW in the near-surface environment where we will work with other waste owners and secure expert support from RWM and our SLCs including LLWR. We will report our proposed options to Department for Energy and Climate Change (DECC), Scottish government and the regulators. As the work progresses we will engage with key stakeholders to ensure any issues are highlighted and addressed.

Delivery

Our SLCs will continue to package HAW into a form that is suitable for storage and disposal. New storage facilities are being built across the estate to store HAW until the disposal routes become available. Our plans for new and existing stores need to include maintenance programmes, refurbishment and if required, replacement of some older stores. To support this planning process we developed industry guidance for longer-term storage of HAW. The current generic approach for waste treatment is to immobilise the waste and store it within purpose-built facilities.

At facilities where our immediate priority is near-term risk reduction we are prepared to retrieve wastes and provide waste storage (containerisation) arrangements knowing that further waste treatment steps will be necessary prior to disposal. We will continue to work with RWM and our SLCs to improve this important risk reduction programme at Sellafield.

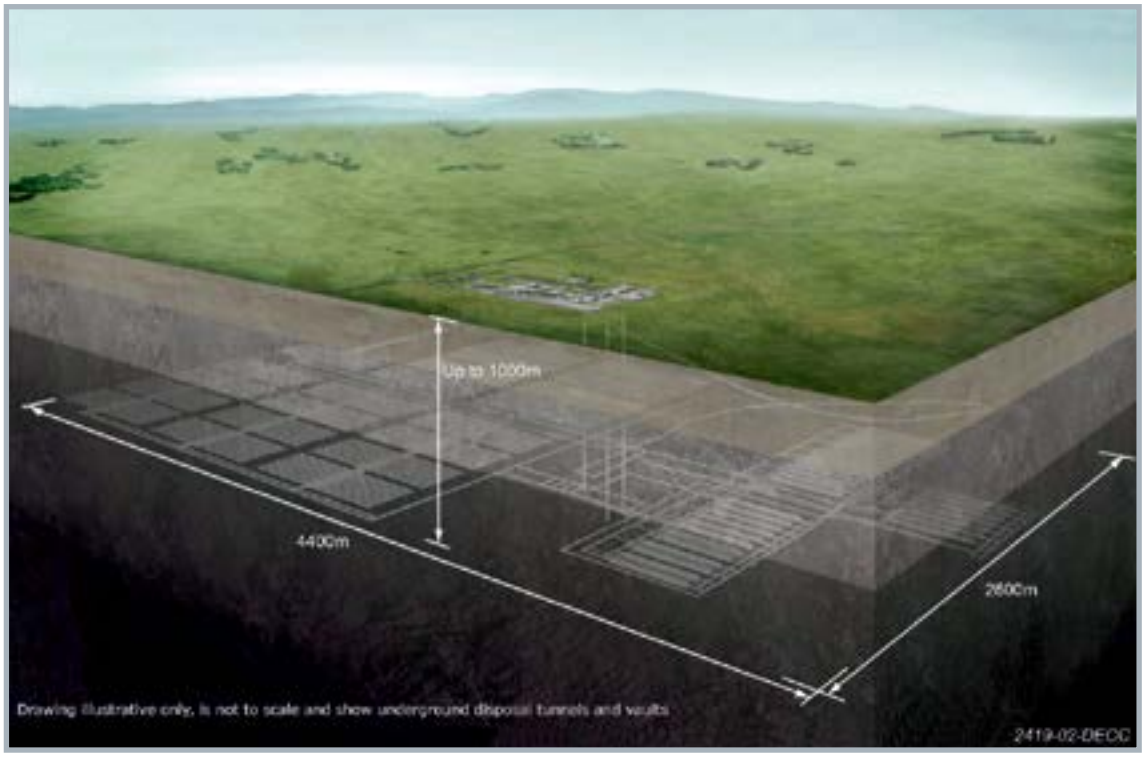
Our HLW treatment and storage programme is mature. We use vitrification technology to reduce the hazard posed by highly active liquor created by spent fuel reprocessing at Sellafield. The vitrified HLW products are being stored at Sellafield prior to geological disposal and a proportion of HLW is being returned to foreign customers under existing contracts.

RWM supports wider programme integration by providing support to NDA strategy and working with waste producers in applying the waste hierarchy to waste management practices being carried out on site today to consider the whole lifecycle of the wastes from retrieval, treatment, packaging and storage to ensure optimised and cost effective solutions.

14. Do you agree that the proposed new approach to move towards the development of a single radioactive waste strategy is correct?

15. What specific issues do you think we should address?

Geological Disposal Facility



An illustration of what the Geological Disposal Facility may look like

In July 2014, UK government published the Implementing Geological Disposal White Paper *(ref 51)* setting out its framework for the long-term management of higher activity radioactive waste. The White Paper reaffirmed UK government's policy for geological disposal of higher activity waste and its commitment to a voluntarist approach based on working with communities that are willing to participate in the siting process.

The NDA's wholly-owned subsidiary, RWM, is the developer for a geological disposal facility (GDF). A number of initial actions were set out in the White Paper and these will be undertaken by UK government and RWM.

The initial actions are:

- to establish an upfront process of national screening, based on known geological information
- bring GDFs, and the borehole investigations that support their development (in England), within the definition of 'Nationally Significant Infrastructure Projects' under the Planning Act (2008) *(ref 52)*
- develop a generic (i.e. non-site specific) National Policy Statement to support the planning process
- provide the framework within which the decision to construct a GDF will be taken, and further upfront information to inform discussions with communities
- establish a process for engagement and working with communities.

Formal discussions between interested communities and RWM will not begin until the initial actions set out in the White Paper have been completed.

Case Study

Consolidation

We have considered waste and nuclear materials storage consolidation opportunities since our inception in 2005 and it was an important commitment in our first Strategy *(ref 2)*.

Early on it was identified that waste storage consolidation may result in:

- **reduction in site footprint –** early de-licencing or de-designation of parts of an existing site may lead to reduced overhead and support costs and potential commercial opportunities
- **hazard and security level reductions –** minimising the number of sites storing nuclear materials, spent fuel and other high hazard Higher Activity Waste (HAW) can give a clear reduction in security and hazard levels while not having a significant impact on the recipient site
- **optimal use of infrastructure –** an opportunity to develop an industry-wide approach to optimising the waste management lifecycle by reducing the number of storage and treatment facilities and creating capabilities that address key issues such as waste characterisation, mobile treatment facilities, mobile workforce, transport and logistics
- **early site clearance –** progressing the mission at one or more sites sooner than declared in lifetime plans resulting in significant lifetime cost savings and safety, security and environmental impacts should be neutral or even positive.

The effect of any proposed waste transfer on the recipient site(s) needs to be accounted for and should consider; programme schedule, regulatory positions, planning consents and the views of local stakeholders.

In 2009 we published the UK HAW Storage Review *(ref 30)* which gave detailed consideration to waste consolidation opportunities. It was noted that there is limited scope to affect the overall ILW interim storage position because the proportion of ILW disposal units that might be affected by the application of alternative storage consolidation options is only a few percent of the total ILW interim-stored inventory across our sites.

Our previous Strategy continued to highlight the importance of waste consolidation and spent fuel co-location where opportunities can be realised. We have sponsored work focussing on the opportunities across our estate, and where appropriate broader opportunities from working with other waste owners.

Waste consolidation strategic projects include:

- Exotic Fuels, Nuclear Materials and Waste Management – Harwell, Credible and Preferred Options *(ref 31)*
- Intermediate Level Waste Storage Solutions - Central and Southern Scotland *(ref 32)*
- Optimising the number and location of ILW Storage and FED Treatment (Dissolution) Facilities in Magnox Ltd *(ref 33)*.

As stated above, the inventory suitable for waste consolidation is relatively small and therefore the number of further opportunities is limited. We continue to engage with stakeholders and any updates are presented at relevant fora.

Packages of ILW inside the Bradwell store

6.1.2 Solid LLW

Containers of LLW arriving at the repository by train

LLW from the nuclear industry is divided into operational and decommissioning waste. Operational LLW arises from routine monitoring and maintenance activities and includes wastes such as plastic, paper, clothing, wood and metallic items. LLW from decommissioning mostly comprises building rubble, soil and various metal, plant and equipment (see Decommissioning and Land Quality Management).

See p24
See p28

In March 2007, the UK government published its policy for the management of solid low level radioactive waste. This tasked the NDA with the production of a UK strategy for the management of solid low level waste from the nuclear industry, to establish treatment and disposal routes to support past, present and future site restoration activities and manage operational LLW that continues to be created by the nuclear industry.

The implementation of the UK strategy has proved successful and has resulted in the development of a number of alternative waste management routes and diverted significant volumes of LLW away from the LLWR. However the UK is predicted to generate significantly more LLW than the planned disposal capacity at the LLWR and focus on the implementation of the LLW strategy needs to be maintained to ensure success.

Our Strategy

Our strategy for managing solid LLW, which includes very low level waste (VLLW), is to implement the UK Nuclear Solid Low Level Wastes Strategy. The successful delivery of this strategy will provide capability and capacity to manage LLW for many decades. The UK LLW strategy was reviewed and the update will be published in September 2015. The review demonstrated that the key strategic themes are still valid:

- application of the waste hierarchy
- development of alternative waste management routes
- best use of existing assets.

Delivery

Central to the delivery of the strategy is the long-term provision of a robust, sustainable waste management infrastructure underpinned by the availability of appropriate characterisation and waste forecasting/inventory information. This will enable waste management decisions to be made in a transparent manner and underpin strategy implementation.

Diverse radioactive waste management and disposal solutions are being pursued where these offer benefits over previous arrangements. We continue to investigate opportunities to share waste management infrastructure across the estate and with other waste producers where we can see benefit and these will be managed on a case by case basis. A range of LLW treatment routes are available for metallic and combustible wastes to support the implementation of the LLW Strategy. These routes are made available to the NDA estate through the LLWR Ltd Waste Services Framework.

See p30
See p28

Some wastes such as very low level contaminated soils and rubble could potentially be re-used on site either as landscaping or void fill materials subject to suitable assessment and evaluation (see Site Interim and End States and Land Quality Management).

The NDA Radioactive Waste Strategy – A lifecycle approach

The NDA is now moving towards a single radioactive waste strategy for its estate that will need to demonstrate how it will support all relevant policies in the UK.

The NDA is now moving towards a single radioactive waste strategy for its estate that will need to demonstrate how it will support all relevant policies in the UK. Our radioactive waste strategy will not replace the use of existing waste categories (e.g. ILW, LLW). It will also need to take into account the nature of wastes (radiological, chemical and physical properties) and the most appropriate waste management route while recognising the challenges posed by waste classification boundaries. Considerable stakeholder engagement will be required as the strategy develops over the next few years.

As a first step, the NDA is highlighting a lifecycle approach to waste strategy that involves the following key steps: Planning and Preparation, Treatment and Packaging, Storage and Disposal. Figure 8 shows these key steps in the lifecycle for the main categories of waste including out of scope[2] and the opportunities to provide greater integration at the classification boundaries.

This lifecycle approach to waste management is not new and is supported by all our existing UK waste strategies and the IWM principles including the Waste Hierarchy. The main difference will be in developing a single radioactive waste management framework for all our sites that should provide greater clarity of our strategic needs, promote cross-category opportunities and support a risk-based approach to waste management.

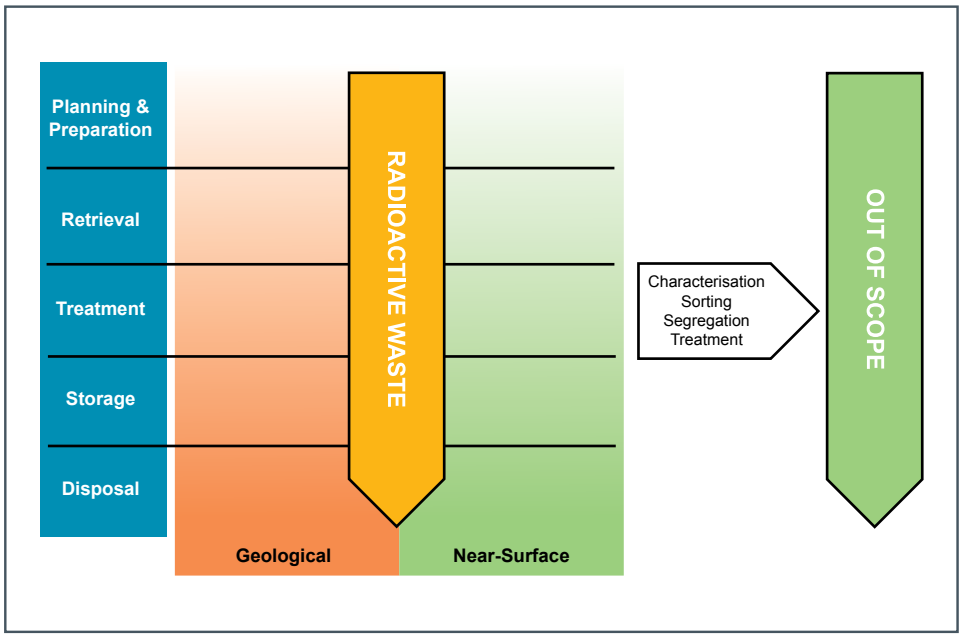


Figure 8. The Waste Management Lifecycle

Planning and Preparation

Planning and preparation is an essential process for successful waste management. We need to ensure that effective waste plans are being implemented across our estate, recognising the need to manage risks and pursue opportunities at a site and estate level. Waste producers should seek to identify and implement opportunities for managing wastes as soon as reasonably practicable, in accordance with the Waste Hierarchy, good practice and in ways that optimise value and benefit. Waste producers recognise that there are options throughout the lifecycle where some deliver benefits now and others could accrue benefits in the future. For example, a proportion of HAW could be managed safely and securely in a near-surface environment by applying a risk-based approach rather than by radiological classification. For some wastes reclassification may be possible through natural decay and the NDA expects SLCs to implement this in response to NDA strategic guidance.

[2] Out of scope wastes contain levels of radioactivity that are below specified clearance levels and not subject to regulatory control. Effectively 'out of scope equates to 'not radioactive'.

The NDA Radioactive Waste Strategy - A lifecycle approach contd

Characterisation plays an important role in decommissioning of nuclear facilities. It is the basis for planning, identification of the extent and nature of contamination, assessing potential risk impacts, cost estimation, implementation of decommissioning and waste management, radiation protection, protection of the environment, as well as supporting decisions to release the site and buildings.

To support planning for LLW our SLCs will continue to produce Joint Waste Management Plans in accordance with the National LLW Programme requirements.

Appropriate waste characterisation data and forecasting estimates are key to underpinning waste management plans. The NDA is responsible for managing the compilation of the UK Radioactive Waste and Materials Inventory on behalf of DECC, currently on a three yearly basis. It is the latest national record of radioactive wastes and materials in the UK, including data from both NDA and non-NDA estate producers. Information contained within the inventory helps us to plan appropriate waste and material management routes, communicate with stakeholders and ensure that the UK can meet its international reporting obligations.

Treatment & Packaging

The main purpose of treatment and packaging is to process raw waste into a form that is suitable for long-term storage and/or disposal and will cover a number of steps and technologies including:

- **retrieval of waste –** the safe removal of waste from temporary storage facilities or legacy storage facilities for further management. In some circumstances it may not be possible to remove the entire inventory in a single step and in such exceptional circumstances SLCs may consider alternative options for residual waste including in situ treatment to support decommissioning programmes
- **sort and segregation –** an activity where types of waste or material are separated or are kept separate on the basis of radiological, chemical and/or physical properties to facilitate waste handling and/or processing
- **size reduction –** a treatment method that decreases the physical size of a waste item;
- **decontamination –** chemical or physical
- **thermal/chemical/physical treatment –** operations intended to benefit safety, security and/or economy by changing the characteristics of the waste
- **conditioning/ immobilisation –** operations that produce a waste package suitable for handling, transport, storage and/or disposal. Conditioning may include the conversion of the waste to a solid waste form, enclosure of the waste in containers and, if necessary, provision of an overpack.

Storage

Storage is defined as the holding of radioactive waste or material in a facility that provides for its containment, with the intention of retrieval. New storage facilities are being built across the estate to store HAW until disposal routes become available.

Our plans for new and existing stores need to include maintenance programmes, refurbishment and if required, store replacement for some older stores. To support this planning process we developed industry guidance for longer-term storage of HAW. The current typical approach for waste treatment is to immobilise the waste in cement and store within purpose-built facilities. However, we continue to support innovation that would help NDA sites to optimise treatment, waste packaging and storage.

At times it will be necessary to store containerised raw waste in modern interim storage facilities, which may place different demands on the storage system that will need to comply with SLC safety procedures. We are reviewing our guidance on HAW interim storage and we will publish an update when it is complete.

Radioactive decay during storage could lead to a change in the category of the waste or in the way the packaged waste may be handled, (i.e. remote handled to contact handled). The SLCs should identify any storage opportunities as early as possible and as appropriate, share learning with the wider industry.

The NDA Radioactive Waste Strategy - A lifecycle approach contd

Disposal

Disposal of wastes is the final stage in the waste lifecycle and involves the emplacement of waste in an appropriate facility without the intention of retrieval. Disposal of radioactive wastes is based on a risk-based approach. The NDA owns the UK LLW Repository which is managed by LLWR Ltd on our behalf. Some of our SLCs also carry out on or near-site disposal of LLW and/or VLLW. DSRL Ltd operates a VLLW and LLW disposal facility adjacent to their site and Sellafield Ltd operate an on-site VLLW disposal facility. A number of commercially available landfill sites capable of accepting low activity LLW are also available through the LLWR waste services framework.

The NDA and RWM will continue to provide effective support for UK government's Implementing Geological Disposal Programme. RWM is responsible for the programme that delivers a GDF and will continue to develop as an effective delivery organisation for geological disposal. RWM actively engages with the wider nuclear industry to help deliver waste packaging solutions. The NDA will continue to support Scottish government in delivering its Implementation Strategy for the long-term management of HAW. RWM will review its current Letter of Compliance process in support of the development of near-surface disposal concepts for wastes arising in Scotland.

Waste is transported in suitably designed and approved transport packages. The maintenance of an appropriate range of packages and an efficient transport infrastructure is essential to the long-term implementation of the radioactive waste strategy.

Waste is transported in suitably designed and approved transport packages

6.2 Liquid and Gaseous Discharges

Objective:

To reduce the environmental impact of radioactive liquid and gaseous discharges in accordance with the UK Strategy for Radioactive Discharges.

Liquid and gaseous discharges are generated by SLCs during operations and decommissioning. Such discharges are generated at all stages of the nuclear fuel cycle. Discharges are primarily associated with fuel fabrication, spent fuel storage, decommissioning and most significantly spent fuel reprocessing (see Spent Fuels and Decommissioning).

See p36

See p24

In June 2009 the government published its revised UK Strategy for Radioactive Discharges *(ref 34)* to inform decision-making by industry and regulators. This sets out how the UK will implement its obligations in respect of the OSPAR Radioactive Substances Strategy 2020 intermediate objective[3] *(ref 35)*. We have a significant role in its implementation and consequently do not believe that a separate strategy for the NDA estate is either required or would add value.

Our Strategy

We require our SLCs to implement the UK Strategy for Radioactive Discharges and comply with relevant UK legal requirements. These are driven by the following general principles:

- unnecessary introduction of radioactivity into the environment is undesirable
- sustainable development
- use of Best Available Technology (BAT) in England and Wales and Best Practicable Means (BPM) in Scotland
- the 'precautionary principle' which allows for decisions to be made in situations where there is evidence of potential harm in the absence of complete scientific proof
- the 'polluter pays' principle where those responsible for producing the waste bear the costs of prevention, control and reduction measures
- the preferred use of 'concentrate and contain' in the management of radioactive waste over 'dilute and disperse' in cases where there would be a definite benefit in reducing environmental pollution.

The UK Strategy for Radioactive Discharges includes the anticipated arisings from UK sites. Spent fuel reprocessing represents a significant factor in the delivery of the UK strategy and it is important that we monitor our ability to achieve this in the light of developing strategy and operational performance. Should issues arise that threaten our ability to deliver, we will need to engage with government and other stakeholders early to determine the appropriate way forward.

Strategy Development

The UK Strategy for Radioactive Discharges updates government policy and describes how the UK will continue to implement the agreements reached at the 1998 OSPAR Ministerial Meeting and subsequent OSPAR meetings on radioactive substances, particularly the Radioactive Substances Strategy (RSS) *(ref 36)*.

Current understanding is that there will be a review of the UK Discharge Strategy commencing in 2015/16 and the production of the UK's 7th BAT report to the OSPAR commission. We will continue to support government in the production and implementation of a revised UK Discharge Strategy and BAT report.

Delivery

Liquid and gaseous discharges must be managed alongside other radioactive and non-radioactive wastes on a nuclear site. We also need to recognise the potential for significant waste volumes to arise from the management of contaminated ground and groundwater (see Land Quality Management).

See p28

Waste management decisions remain the responsibility of the SLCs, in accordance with the regulatory framework. This requires robust decision-making based on a wide range of criteria, informed by UK policy and strategy. Outcomes of such decisions will be captured in site level Integrated Waste Strategies, developed by the SLCs.

16. Is our proposed approach the right strategy?

[3] By the year 2020, the OSPAR signatories will ensure that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero.

6.3 Non-radioactive Waste

Objective:

To reduce waste generation and optimise management practices for non-radioactive wastes at NDA sites. This includes hazardous and inert wastes.

NDA sites generate non-radioactive waste including demolition rubble, packaging, paper and food waste. Some non-radioactive waste is hazardous, such as asbestos, process chemicals, oil and other general waste. The nuclear industry's contribution to total UK waste volumes is very small compared to that of UK households and non-nuclear industry, (approximately 0.2 % of hazardous waste and 0.04 % of other Directive waste). This strategy also covers waste that has radioactivity levels which are so low that they do not require specific regulatory controls as radioactive wastes. These wastes are termed 'out of scope' wastes under the Environmental Protection Regulations 2010 in England and Wales and the Radioactive Substances Act 1993 in Scotland. Out of scope waste is managed to meet the requirements of conventional waste legislation.

Our Strategy

The UK has a well-established, comprehensive and prescriptive regulatory regime for the management of non-radioactive waste. Waste management strategies have been developed at national, regional and local level by UK government and Devolved Administrations, local and regional authorities. We have collated the established practices and principles that underpin these strategies, which we implement across our estate:

- adopt and implement the waste hierarchy for non-radioactive hazardous and non-hazardous waste management
- adopt, where appropriate suitable decision-making criteria, (e.g. BAT) to ensure effective application of the waste hierarchy
- apply a rigorous approach to waste characterisation and segregation;
- identify and use appropriate waste treatment routes
- consider the proximity principle which aims to manage wastes in the nearest appropriate facilities
- consider incentivising desirable waste management activities.

These practices and principles set out the appropriate strategic context to ensure effective management of these wastes from our sites. We require our SLCs to follow these principles and industry practices to ensure full regulatory compliance.

Strategy Development

This strategy is established and no further strategy development work is anticipated. We have reviewed how our SLCs manage non-radioactive wastes and did not identify any strategic issues. We will continue to work with SLCs, stakeholders and regulators to monitor and review implementation.

Delivery

Our SLCs manage their waste in accordance with the principles set out above. In doing this they continue to use the well-established capability that exists in the wider waste industry as well as within their own sites. Plans for how wastes will be managed are set out by the SLCs in their Integrated Waste Strategies.

17. Is our proposed approach the right strategy?

7.0 Critical Enablers

Objective:

To provide the stable and effective implementation framework that enables the delivery of our mission.

Our Critical Enabler theme comprises of the following topic strategies:

7.1 Health, Safety, Security, Safeguards, Environment and Quality

7.2 Research and Development

7.3 People (incorporating skills and capability)

7.4 Asset Management

7.5 Contracting

7.6 Supply Chain Development

7.7 Information Governance
(including information & knowledge management)

7.8 Socio-Economics

7.9 Public and Stakeholder Engagement

7.10 Transport and Logistics

7.11 Revenue Optimisation

7.12 International Relations

7.13 Land and Property Management

7.0 Critical Enablers

Delivery of our strategy is only possible if a stable and effective implementation framework exists. This framework must ensure that once the 'right thing' has been identified it can be delivered effectively and efficiently.

The Energy Act (2004) *(ref 1)* recognised this and gave the NDA responsibility to deliver skills (People), research and development (R&D) and supply chain development and to operate with due regard to socio-economics and stakeholder engagement. In addition to these specific responsibilities, it is important that we define our approach in a number of other areas. These areas of strategy development are critical toour overall mission and provide best value for assets owned by us. These responsibilities and strategies are known as Critical Enablers.

See p20
See p36
See p46
See p54

In our previous Strategy *(ref 3)* we had a separate theme of Business Optimisation with an objective "to create an environment where existing revenue can be secured and opportunities can be developed against criteria agreed with government". This theme comprised two topics, Revenue Optimisation and Land & Property Management. The theme has been removed from this Strategy and the two topics have been included in the Critical Enablers theme.

Critical Enablers' strategies apply across our other strategic themes and enable their delivery. The future pace of development will be driven by the needs and influences of our strategic themes for Site Decommissioning and Remediation, Spent Fuels, Nuclear Materials and Integrated Waste Management.

Our Strategy

The Critical Enablers' strategies differ in maturity and in urgency. In the development of this Strategy we have taken the opportunity to review all the underpinning Critical Enabler strategies taking into account the fundamental changes in the landscape, that have affected us over the last five years and recognised that the NDA has a wider leadership role in some areas.

We recognise that there is an urgency to progress some of our Critical Enabler topic strategies to secure an early benefit to delivery of the near-term programmes and achieve enduring risk reduction. Health, Safety, Security Safeguards, Environment and Quality (HSSSEQ) topic strategy is fundamental to our mission, and we recognise that we need to be more proactive in addressing HSSSEQ issues associated with risk and hazard reduction. A working Transport & Logistics strategy is necessary for the delivery of our mission in the near term and in the future. For instance to ensure working transport systems are in place we need to better understand our transport assets and future transport requirements, which are driven by the topic strategies of Site Decommissioning and Remediation, Spent Fuels, Nuclear Materials and Integrated Waste Management.

See p20
See p36
See p46
See p54

As we deliver our mission, we need the supply chain to deliver the skills and capabilities outside our core tasks. Our Supply Chain Development strategy has created a sustainable supply chain, but we recognise that we need to understand the supply chain better to ensure capability and quality. The issue of capability ties the Supply Chain strategy to the People strategy, the importance of which is clearly understood as we try to develop and retain the skills and capabilities required for the delivery of the mission. Our People strategy and similarly, our Research and Development (R&D) strategy are implemented mainly through others, and their urgency is mitigated by their clear implementation plans, which is reflected in the maturity of these strategies.

This review process is ongoing and the consultation feedback will be used to develop the Critical Enabler topic strategies further. Where appropriate, the development and implementation of Critical Enablers will follow the Strategy Management System (SMS) (ref 7), as described in Appendix A.

18. What opportunities and risks do you anticipate with our Critical Enablers' Strategies?

7.1 Health, Safety, Security, Safeguards, Environment and Quality

Objective:

To reduce the inherent risks and hazards of the nuclear legacy, by proportionate application of contemporary standards and improving environment, health, safety and security performance across the NDA estate.

The Energy Act (2004) *(ref 1)* requires the NDA to put in place approaches that ensure safe, secure, sustainable and publically acceptable hazard and risk reduction on the sites that we own. We have particular regard for the protection of the environment, the health and safety of people, and nuclear and information security. In delivering our mission, we look to secure the adoption of what we consider to be good practice.

We discharge our HSSSEQ obligations through the monitoring, audit and review of environment, health, safety, security and safeguards at Site License Company (SLC) and subsidiary level. Good performance and effective management systems are contractual obligations and assist in the implementation of our strategy. This approach allows us to manage our operational risks, and maintain oversight of the NDA estate. In security and safeguards, we have acknowledged the changing environment and worked with government, Office for Nuclear Regulation (ONR) and Centre for Protection of National Infrastructure (CPNI) to respond to new and emerging risks implementing relevant government policy and good practice together with the Civil Nuclear Constabulary (CNC).

In our last Strategy, we identified and embedded strategic principles to ensure delivery of our HSSSEQ obligations. These principles provide a foundation for the implementation of our HSSSEQ strategy.

Whilst we are confident that the systems already in place meet our HSSSEQ obligations, our wider role is to provide leadership to our SLCs and subsidiaries and across the decommissioning sector. We will do this by developing a clear understanding of where current regulatory requirements have the potential to result in conflicting demands, and ensure that we influence the development of legal and regulatory approaches.

The integration of HSSSEQ into NDA processes comes through application of the Value Framework (see Appendix A).

Our Strategy

See p77

Our strategy is to apply proportional approaches to HSSSEQ across our estate by requiring the application of contemporary standards which allow and promote accelerated risk and hazard reduction.

We will work proactively with our SLCs to support their delivery of site outcomes. This means working collaboratively with our SLCs, regulators and government and on occasion challenging the interpretation of regulations to ensure our work delivers benefit to our mission and value to society. For instance, we recognise that to deliver the NDA's mission we will need to accept near-term increases in risk in order to achieve enduring risk and hazard reduction. Any decision to accept an increase in risk must be entirely conscious and fully compliant with the legal obligation to exercise an appropriate degree of control (see Decommissioning). In making a decision we will consider work practices that avoid harm or loss, the condition of the asset and its ability to tolerate the scope and methods of working (see Asset Management), and the overall benefits of the work, with respect to value for money and public acceptability.

See p24

See p94

We will work with regulators and government in responding to new and emerging threats to nuclear and information security.

We have drafted our cyber security policy and are developing our capability through number of ongoing projects. To support our policy we will enhance the sharing of intelligence in the civil nuclear sector through our involvement with the Cyber Security Information Sharing Partnership (CSISP).

In the broader context, we need to understand the effect of emerging technical and legislative approaches many of which have international origins (see International Relations). We will work to influence their development and adoption.

Strategy Development

This strategy is evolving and is designed to build on the progress made in our previous strategies.

We have identified that we need to be more proactive in supporting our SLCs. We will focus particularly on effective collaboration with our SLCs, subsidiaries, regulators and government to ensure the adoption of proportionate approaches for accelerated risk and hazard reduction opportunities. In doing so, we will respect the responsibilities and obligations of each party, make full use of the existing legal framework, and consider programmatic approaches to assessment and permissioning.

There are opportunities to use new technologies for example remote cutting techniques, (see NDA's R&D investments deliver benefits) to improve HSSSEQ performance, but also an ongoing requirement for effective management systems that deliver high quality, high value benefits. We will encourage these approaches, by seeking good practice and securing its adoption, and by engaging with regulators, nuclear and other industry sectors.

We will support the move to outcome-focused regulation for security by engaging with our SLCs, subsidiaries, regulators and government in the development of the next version of the National Objectives, Requirements and Model Standards *(ref 38)* document, and be proactive in the development of robust, evidence-based assurance processes for security arrangements across the estate, which are in line with regulatory expectations.

Delivery

We consider that there is a clear division between work that we will do, and work that will be carried out on behalf of the estate by our contractors, SLCs and subsidiaries.

Operational responsibility for HSSSEQ and the associated regulations lies with our contractors, individual SLCs and subsidiaries. To ensure that HSSSEQ practices are identified, shared and embedded across the estate we will continue to develop cultural maturity by building on the recent safety *(ref 39)* and security (Secure 3) survey outcomes.

To provide greater transparency and clarity to our estate and regulators, we will expect our SLCs to take the lead in identifying appropriate decommissioning standards, and we will facilitate the capture and codification of good practice.

To drive better HSSSEQ performance, we will require environment, health, safety and security improvement plans from our SLCs at site level, and we will ensure that these plans meet our expectations for performance, delivery and affordability.

To support the identification of accelerated risk and hazard reduction opportunities we will promote the development of programmatic As Low As Reasonably Practicable (ALARP), Best Available Techniques (BAT) and Best Practicable Means (BPM) assessment approaches which we will develop in cooperation with regulators, SLCs and contractors.

We will exercise our cyber security policy and improve the capability of our estate to respond to cyber security incidents.

19. Have we identified the right areas for strategic development in HSSSEQ?

7.2 Research and Development

Objective:

To ensure that the delivery of the NDA's mission is technically underpinned by sufficient and appropriate Research and Development.

Under the Energy Act (2004) *(ref 1)* the NDA is required to promote and, where necessary, carry out research in relation to its primary function of decommissioning and clean-up. There are close links to other Energy Act (2004) *(ref 1)* requirements such as supply chain development and developing skills (see Supply Chain Development and People).

See p81

See p75

See p94

Research and development (R&D) is fundamental to ensuring the 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 improve safety and security and reduce costs, timescales and environmental impact. We have seen significant advances in key technical areas such as the mobilisation of sludge in legacy ponds and silos, the deployment of innovative characterisation technologies in challenging environments and the development of advanced cutting tools that have improved our knowledge and reduced schedules.

See p83

Our strategy is mature and recognises the technical basis of our mission. It reflects the NDA's role as a key UK funder of nuclear R&D in relation to our mission. Our approach continues to develop through more detailed supporting work captured in our University R&D and Technical Innovation strategies. We will continue to review whether the scope of the R&D strategy is appropriate and consider how best it supports wider issues such as supply chain development, technical skills development and supporting the export of UK technologies abroad (see International Relations).

Recently we have successfully collaborated with other key UK R&D partners to fund innovation relevant to our mission. This has delivered sustained funding to enable us to foster the right environment for technical innovation to succeed and has brought innovators and end users together accelerating deployment on our sites. There is now a vibrant supply chain working in this area including established organisations and new entrants to our market. Gaining and sharing good practice is essential and we recognise the important role effective communication plays in this (see Information Governance). We have published and shared our work more widely including through our own R&D publications and will continue to do so.

Our Strategy

Our strategy remains that, where possible, R&D is undertaken by our SLCs, subsidiaries and their supply chains as it is an integral part of delivery plans. Where necessary, we will directly maintain a strategic R&D programme (see Site Decommissioning and Remediation, Spent Fuels, Nuclear Materials and Integrated Waste Management). Overall strategic coordination for R&D is provided by the NDA.

See p20

See p36

See p46

See p54

Using an integrated and transparent approach, and working closely with our SLCs, we will ensure that technical needs, risks and opportunities are identified and managed in order to deliver progress on our sites. We will seek to create an environment where innovations can be realised on a timely basis and that the relevant technical skills are available when required.

Our strategic R&D programme, where required, will focus on R&D to inform strategy, deliver innovation across multiple sites and/or maintain and develop vital technical skills. Our approach is flexible to ensure we can adapt to support the wider UK and international nuclear R&D portfolios as required.

The NDA and our estate will continue to work with other organisations to encourage and leverage investment in R&D. This includes research councils and academia, other government organisations such as Innovate UK, National Laboratories (e.g. National Nuclear Laboratory (NNL), National Physical Laboratory (NPL), Culham Centre for Fusion Energy (CCFE)), Ministry of Defence (MoD) and the wider supply chain including EDF Energy (EDFE) and in particular SMEs. We will seek to pursue collaborative programmes and match funding opportunities to promote gaining and sharing of experience and avoid duplication, thus reducing costs. These collaborations could be within the UK and beyond and in other related markets (e.g. defence, oil and gas). This will bring additional benefits in supporting UK businesses in exporting technologies abroad. Communication of our R&D requirements as well as the progress achieved is central to implementing this strategy. This will be particularly relevant in the short- to medium-term as technologies are successfully implemented and ensure the knowledge gained from those experiences is shared across our estate.

Strategy Development

The strategy is mature. Ongoing developments include:

- continuing to seek opportunities for collaboration and innovation in the UK and internationally to reduce costs
- working with government to ensure our R&D work is part of the wider UK nuclear R&D picture to ensure effective spending of UK funds
- continued active gaining and sharing of experience and expertise between and beyond our sites
- ensuring that delivery of this strategy is supported by the required technical facilities
- considering how our R&D strategy supports UK organisations' competitiveness abroad.

Delivery

Our approach to delivery of the strategy is flexible. Implementation of the strategy will identify where and who undertakes the following activities in relation to R&D:

- lead and commission (i.e. fund)
- collaborate (e.g. co-fund, provide technical supervision or access to facilities)
- influence (e.g. through dialogue or via other parties)
- observe (ensure we maintain a good understanding of the current landscape and emerging issues in relation to our needs).

See p94
p81 + p75

We have established governance routes for decommissioning R&D including the NDA's independently chaired Research Board and the Nuclear Waste and Decommissioning Research Forum (NWDRF). The latter is a key communication channel to share common R&D needs, risks and opportunities, share good practice and work collaboratively on innovation. The NDA and our estate also attend key UK nuclear R&D meetings such as the Nuclear Innovation and Research Advisory Board (NIRAB). This ensures opportunities for collaboration are maximised and the potential for duplication removed.

Delivery of the R&D strategy supports delivery of other key enabling strategies such as International Relations, Supply Chain Development and People. Our Strategic R&D portfolio supports strategy development and implementation.

Remote technology for use in radioactive areas

20. What role should the NDA's R&D strategy play in promoting UK decommissioning technologies abroad?

21. Should the NDA's R&D strategy do more to support science, technology, engineering and maths (STEM) development at school level as well as our existing activities in further education?

Case Study

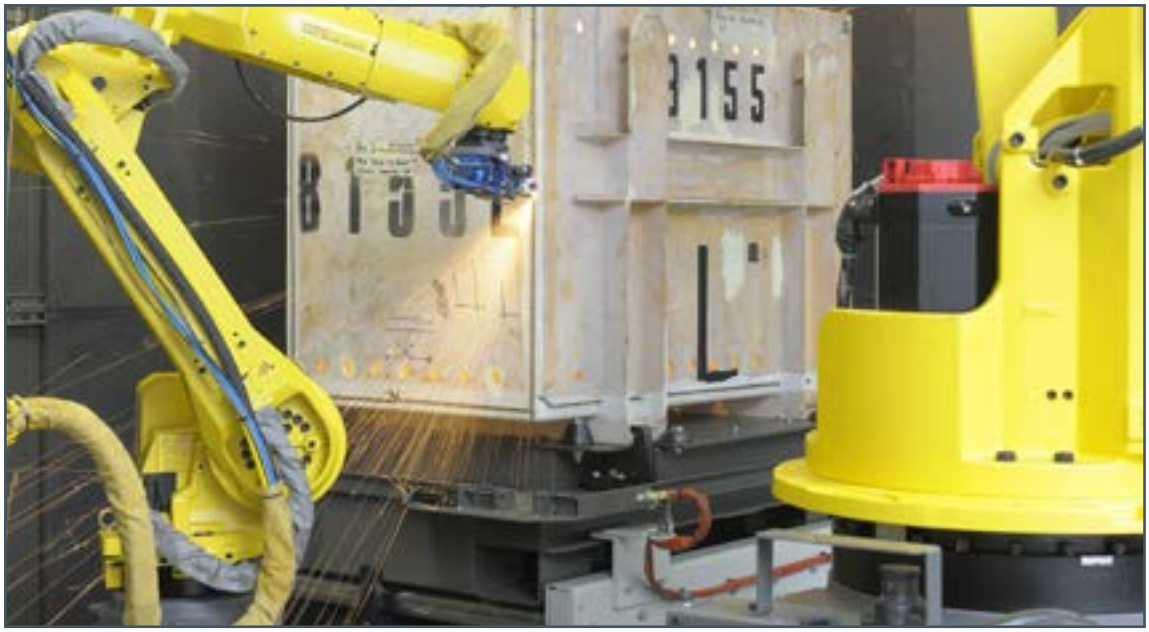
NDA's R&D investments deliver benefits

Innovation has the potential to address the challenges we face more effectively, more efficiently and where possible, for less cost. The NDA has worked collaboratively with other UK R&D funders to deliver maximum opportunity for innovations to be realised across our mission on a timely basis.

Since 2012 the NDA has contributed up to £6 million of funding to support more than 25 decommissioning-related projects with Innovate UK. Through our investment programme we are supporting growth in the UK supply chain, particularly with SMEs and bridging the gap between innovators and end-users.

Laser cutting

An investigation into the use of lasers as an alternative to conventional cutting technologies was supported by the NDA at an early stage This technology has matured significantly over the last few years and has recently been successfully used at a Magnox Ltd site to cut up fuel skips. This has been done more quickly, for less cost and reduced dose to operators highlighting the improvements in safety and security that innovation can bring. Under the NDA collaborative programme with Innovate UK this technology is being combined with snake-arm robot technology to provide a flexible and highly manoeuvrable lightweight tool.



Magnox fuel skip being cut with laser for disposal

Radiation mapping

Following an early investment from the NDA, Createc developed a new software system combining mapping of gamma radiation with laser scanning and dose modelling. This information can better inform delivery of future decommissioning projects. The technology has been deployed in the UK at Sellafield and is now being used internationally to support clean-up at the Fukushima Daiichi nuclear power plant.

On-site characterisation of concrete

An NDA-funded PhD, with help from UK micro-company Viridian Partnership, Sellafield Ltd and NDA innovation investment, developed ViridiScan a technology to determine contamination levels in concrete on site rather than sampling and removing material. This highlights the benefit of funding research to develop and maintain skills, and the benefit of NDA innovation funding in ensuring the progress of fundamental research through to technology demonstration.

7.3 People (incorporating Skills and Capability)

Objective:

To ensure that the NDA, its subsidiaries and the estate can attract and retain the necessary skills, diversity of talent and capability to deliver the NDA mission efficiently and effectively through leading the estate-wide People Strategy

The Energy Act (2004) *(ref 1)* requires the NDA to "promote and to secure the maintenance and development in the UK of a skilled workforce able to undertake the work of decommissioning nuclear installations and of cleaning up nuclear sites".

Successful delivery of our mission requires people with appropriate skills and capabilities. It is our experience that in order to address the resourcing, attraction, retention and development of skills, we need to address the processes and conditions and understand the demands of our estate in a wider context. The sharing of good practice across our estate builds on collaborative approaches to people issues.

Even though the overall demand for skills is forecast to reduce over the coming decades (figure 9), the predicted impact of an ageing workforce and competition from nuclear new build, major national and international infrastructure projects and from other regulated industries will lead to an increase in the civil and defence nuclear workforce of 35% by 2021. To address these challenges we need to grow workforce capability and attract and retain a mobile, skilled and diverse workforce.

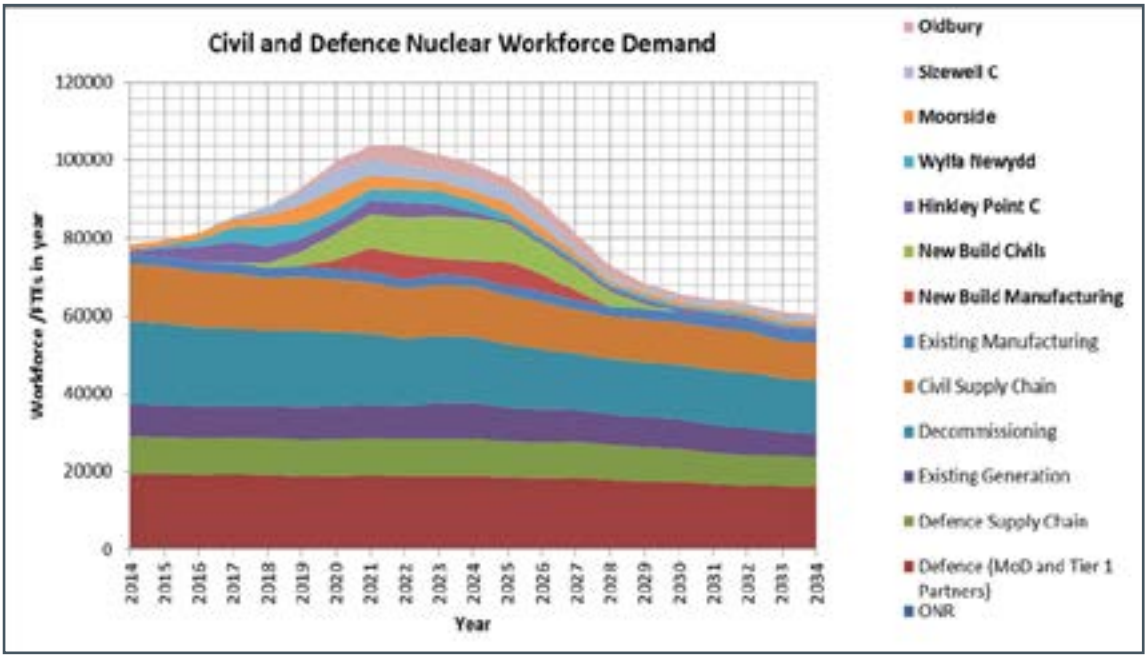


Figure 9. A graph showing civil and defence nuclear workforce demand over the next 20 years

See p81
See p94

The UK Nuclear Industrial Strategy *(ref 4)* asserts that the 'UK will once more be at the forefront of global revival in nuclear interest and is well positioned to reap the very considerable dividends that will result from a resurgent nuclear sector'. To realise this opportunity a nuclear industry wide workforce with the appropriate skills, capability and capacity is required (see Supply Chain Development and International Relations). In this strategy we explore the opportunities for growing the workforce with our strategic partners within our estate and throughout the wider nuclear industry.

Our Strategy

Our strategy is to mitigate the risks of skill shortages and wage inflation caused by current labour market challenges. We acknowledge it is important to retain and develop the skills and talent we need and optimise the ability to utilise the people who already work for our estate through improved mobility. This can be summarised in three strategic priorities:

- ensure the attraction and supply of the right people in the right place at the right time at optimum cost and quality
- retain, maintain and develop a competent and skilled workforce across the estate
- enable the mobility and transferability across our estate and within the wider nuclear industry including nuclear new build.

Our strategy and the strategic priorities have been developed together with our strategic partners – the Parent Body Organisations (PBOs), SLCs, subsidiaries, National Skills Academy for Nuclear (NSAN), Nuclear Industry Council (NIC) and Cogent. We are the strategic authority for development of the People strategy, but we share the responsibility for its implementation with our estate, subsidiaries, nuclear new build and key strategic partners.

Strategy Development

See p83
See p72
See p86

This strategy is mature and has been designed to build on the progress made in our previous strategies. We will continue to work in collaboration with our strategic partners to gain a better understanding of skills shortages in the future, and to raise the skill levels of the UK's nuclear workforce. (see Research and Development and Socio-Economics).

We will work with our estate to ensure that appropriate knowledge management arrangements are in place to support retention of skills and resourcing to deliver our mission (see Information Governance).

Delivery

We have helped to deliver major skills and training facilities across the UK including; Energus, a nuclear skills training centre in west Cumbria; the Dalton Cumbrian Facility, a world-leading nuclear research facility also in west Cumbria; the Engineering Skills Centre at North Highlands College in northern Scotland; the Energy Skills Centre at Bridgwater College in Somerset; and the Energy Centre at Coleg Menai in Wales. These facilities are key in growing the skills needed by the future nuclear industry.

Through our work with Cogent we have delivered a comprehensive Nuclear Workforce Assessment Model facilitating clear identification of future workforce demand and skills 'pinch points'.To address demand, we have increased our intakes of both graduates and apprentices and redesigned jobs in areas with skills shortages to maximise the use of existing skills while growing skills for the future.

To improve collaboration and resource/vacancy sharing across the wider nuclear industry we are using the Talent Retention Solution (TRS), which promotes the successful transfer of critical skills.

Building on our success and looking at the future challenges we will address our strategic priorities to:

- ensure the attraction and supply of the right people in the right place at the right time at optimum cost and quality; we will focus on collaborative resourcing solutions; estate wide forecasting principles and a targeted yet diverse attraction strategy, branding the nuclear decommissioning industry as a clear choice for new entrants by emphasising transferrable skills, well-defined career paths and interesting challenges in a safe working environment
- retain, maintain and develop a competent and skilled workforce across the estate; we will work together with our estate to close priority skill gaps; deliver synergies that ensure return on investment and focus on the targeted deployment of industry-wide solutions and defined career paths for professions
- enable mobility and transferability across our estate and within the wider nuclear industry we will work together to enable transfer conditions, standard operating principles and shared transition and redeployment processes which deliver value for money solutions.

In collaboration with our strategic partners (PBOs, SLCs, NSAN and Cogent), we continue to work with all sectors of the nuclear industry to raise the skill levels of the UK's nuclear workforce. We will focus on the retention of skills and resources needed to deliver our mission in the light of increased requirements from others in the nuclear sector including nuclear new build and major infrastructure projects.

22. Are the three strategic priorities that we have identified the right ones?

7.4 Asset Management

Objective:

To secure reliable, value for money performance by making the best use of UK assets thereby enabling delivery of the site end states.

The Energy Act (2004) *(ref 1)* requires the NDA to secure environmentally considerate and cost effective asset performance in the delivery of its mission.

Good practice asset management will provide improved safety, security, and environmental performance through reliable asset lifetime performance (see HSSSEQ). It can reduce the lifetime cost of achieving the respective end states (see Site Interim and End States), while providing improved confidence in asset lifetime plans, investment decisions and funding.

See p70

See p30

Many of our assets have far outlived their functional lifetime, others are still operational while some are not yet in use. In some instances we will need our older assets to remain functional for many years to come (Spent Fuel, Nuclear Materials and Integrated Waste Management). Good practice management of assets focusses on risk-based performance, and demonstrates asset reliability and value for money.

See p36

See p46

See p54

Over the last five years the asset management strategy has successfully delivered its commitment to improve capability of our SLCs and enabled risk-based, reliable asset performance. These developments have been supported by the regulators.

Our strategy continues to address the enduring risk that asset performance adversely impacts our mission, but there are many other challenges to asset management. Our experience has demonstrated that to ensure asset management performance we need to build on and sustain value adding SLC capability improvements and develop justifiable, integrated asset plans which enable the delivery of our mission.

Our Strategy

Our Strategy is to secure and sustain asset management capability within SLCs and subsidiaries utilising Publically Available Specification – 55 (PAS-55) *(ref 40)* to provide objectivity across all aspects of good asset management. We rely on independent professional supply chain experience coupled with appropriate contracts, incentives and performance management to achieve a fit for purpose, strategically aligned asset portfolio and reliable performance of critical assets.

In addition to implementing our strategy we will continue to work collaboratively with SLCs, subsidiaries, regulators and other industry sectors, to maintain a common understanding and application of good practice.

Strategy Development

Our strategy is mature, but we will continue to work towards reliable asset performance through the application of PAS-55 *(ref 40)*. As asset performance improves, we will be in a position to consider the development of an integrated asset management strategy which will bring together the condition of assets, associated risks, cost of asset maintenance and performance of assets across our estate (see Decommissioning).

See p24

A new international suite of standards ISO 55000 *(ref 41)* has been published and we will assess the benefits of adopting this as an alternative to PAS-55.

Delivery

We will secure and maintain value for money, good practice asset management, capability and asset performance through contracting and incentivisation and by collaborating with regulators, SLCs and subsidiaries. We will also take advice from independent professional experts.

See p83

Improved asset capability and knowledge presents opportunities for us to push the boundaries beyond immediate asset issues and lead at a strategic level. The plan is to:

See p75

See p86

- develop approaches to better inform asset management decisions and strategies based on asset condition, risk and lifetime costs. This will enable the best use of existing assets, minimise new assets and earlier decommissioning of redundant assets
- consider UK assets as an opportunity to optimise delivery (e.g. manage wastes through to final disposition)
- actively collaborate with other strategies to reduce as far as is practicable the number of NDA assets by:
    1. unifying asset information to enable consistent decision-making across the estate (see Information Governance)
    2. devising and implementing common asset management competencies, also supporting our skills and socio-economic agendas (see People and Socio-Economics)
- facilitate the development of nuclear industry specific asset management guidance consistent with wider industry good practice (e.g. PAS-55 and ISO 55000)
- learn from decommissioning in other sectors
- continue to lead good practice meetings appropriately expanded to incorporate subsidiaries and learn from other industry sectors e.g. oil and gas.

Dounreay WRACS compactor - a piece of equipment transferred under the Asset Transfer Scheme

23. Do stakeholders agree with the continued use of PAS-55 as a working standard in light of the publication of ISO 55000?

24. Are there any essential asset issues not dealt with that require further consideration?

7.5 Contracting

Objective:

To ensure that the NDA procures the best capabilities the market has to offer, through contracts which represent value for money, particularly in respect of appropriate transfer of risk. We will manage these contracts effectively and use contractual incentives, both positive and negative, to optimise outcomes.

During the development of our previous Strategy, we had an approved programme of key competitions to appoint PBOs for the SLCs. The existence of this programme meant that 'competition' was taken to mean simply 'PBO competition' and that there was a medium term resource requirement which could be planned for and retained as the organisation moved progressively from one PBO competition to another.

See p48

Since our previous Strategy, the PBO/SLC contracts for Dounreay and Magnox & RSRL have been placed. Our experience has shown that the ability to bring fresh commercial thinking to each new competition has brought continued improvements in value for money and risk transfer. Both these contracts are based on an outcome specification – for example the achievement of the interim end state for Winfrith (see Winfrith) and defined interim states for the other sites. They are also based on an incentivised Target Cost which offers the opportunity to save over £2.5 billion for the taxpayer over the life of the two contracts.

See p32

In 2014 a decision to change the management model at Sellafield was taken by UK government with support from the NDA. Under the new arrangements Sellafield continues to operate the site, but will no longer be under the temporary ownership of a PBO. Instead ownership will belong to the NDA and Sellafield will acquire market support to assist in the delivery of its programme.

See p75

We have also changed our contracting approach at Capenhurst where in 2012, following a significant transformation and transition process, the site was transferred to URENCO along with the existing activities. Additionally the NDA and URENCO signed agreements for the deconversion of our Hex at a Tails Management Facility constructed at the Capenhurst site (see Capenhurst Hazard Reduction). These agreements reduced our net liabilities and enabled URENCO to invest in new facilities on the Capenhurst site.

See p52

All of these arrangements are designed to endure for the lifetime of this Strategy and beyond. However the recent decision for model change at Sellafield has highlighted the importance of providing an agile response to developing solutions, and supporting our SLCs. Meanwhile other projects apart from those relating directly to the SLCs may come onto the horizon, (e.g. plutonium re-use), which would entail a major procurement (see Plutonium).

In terms of continuing contract management the Low Level Waste Repository Limited (LLWR Ltd) contract has been renewed with a revised fee structure taking on board the lessons learnt from the first five years of operation, and designed to increase alignment with our long-term objectives. In particular fee earning is now based on the achievement of targets, and reflects LLWR Ltd's contribution to the national Low Level Waste (LLW) programme as well as to the running of the Low Level Waste Repository at Drigg. This contract will be up for renewal in 2018.

It is clear that contracting is critical to us, as we spend 95% of our funding externally. Contracting in its widest sense is an important capability for the whole estate to retain (see People). This capability includes the ability to provide effective governance for the contracting lifecycle. The combination of Competition and Contracting and Incentivisation topic strategies into one topic strategy reflects commercial best practice whereby the full acquisition lifecycle is managed coherently from identification of need through procurement, into contract management, lessons learnt and planning for the next steps once the contract term ends.

Our Strategy

Our strategy is to retain the capability to act as an effective contracting authority through a period of uncertainty about specific requirements. We recognise that a single contracting strategy does not exist in isolation but generates a series of individual contracting strategies developed to meet the needs of individual projects.

Strategy Development

See p79
See p81

Our strategy is mature and we have identified and captured critical success factors and lessons learnt from the PBO competition programme. We understand and are realistic in assessing resources both internal and external required in procurements, which will ensure that future procurements can be run effectively from scratch.

We will continue to develop our contracting practice. We will refer to external sources for best practice. This will include both general professional standards (e.g. from the Chartered Institute of Procurement and Supply) and UK government specific standards available in Cabinet Office Procurement Policy Notes *(ref 42).*

We will integrate the **Contracting** and **Supply Chain Development** strategies, working with SLCs in particular to foster an effective supply chain for the decommissioning sector. We will also engage with and develop the Tier 1 market appropriately.

We will work with our SLCs to understand availability of resource internally and externally should there be a need to embark on a new major procurement project.

Delivery

The delivery of this strategy directly impacts upon the delivery of the projects which are supported by procurement.

To deliver the Contracting strategy we will:

- resource and manage future procurements effectively, identifying early those projects with a significant procurement element
- regularly review existing contracts such that there are 'no surprises' when questions of renewal/funding have to be considered
- continue to actively manage existing contracts as part of benefits realisation, in particular adjusting incentivisation through the contracts to optimise outcomes in support of our objectives
- recognise that incentivisation can be applied to behaviours as well as to the delivery of milestones
- maintain experienced and effective governance for major procurements, ensuring a future programme of NDA procurements is identified and adequate plans and resources are in place
- ensure that the contracting and incentivisation aspects of projects and programmes proposed by the SLCs for approval by the NDA are appropriately scrutinised at the Technology and Delivery Option Selection stage.

All ongoing NDA internal procurement must be legally compliant, conform with Cabinet Office controls and achieve value for money.

Magnox/RSRL Share Transfer Event, September 2014

25. Do you think having a range of Contracting models including the PBO model is appropriate?

26. Should the NDA look to have collaborative working as part of its contracting practice?

27. What aspects of the NDA's contracting approach do you believe needs modifying and in what way?

7.6 Supply Chain Development

Objective:

To ensure that the supply chain available to the NDA estate is optimised to enable a safe, affordable, cost effective, innovative and dynamic market to support our mission, and for the NDA estate to be seen as a nuclear client of choice.

Since our previous Strategy, two significant external events have occurred: the financial crisis which has led to an increased focus on collaboration, Small and Medium Enterprises (SME) and the UK Growth agenda and also the domestic nuclear new build programme.

Our supply chain development initiatives have resulted in a collaborative procurement programme amounting to £2.8 billion of spend and delivering over £140 million savings since 2010. We have provided suppliers with access to even more information (e.g. annual procurement plans and early market engagement sessions) to enable better planning, and to support easier entry into the supply chain we have implemented SME-friendly payment terms and reduced some of the contractual burdens by simplification and standardisation of Terms and Conditions.

The Health of the Supply Chain study *(ref 43)* concluded that the Supply Chain Development strategy "was largely found to cover almost all of the factors and issues affecting the health of the supply chain, indicating that the focus is correct". The areas highlighted in this study requiring additional attention were covered under the Shared Services Alliance (SSA) Strategy 2013-16 *(ref 44)* and the SME Action plan 2013 as updated in 2014 *(ref 45)*. These included areas such as consideration of SMEs in procurement strategies, standardisation and simplification of processes.

The estate's dependency on a safe, affordable, cost-effective, innovative and dynamic market represents both a risk and an opportunity. The NDA's role remains associated with the broader estate position and influencing wider government policies. The challenge for individual SLCs remains their ability to enable successful contracting at portfolio, programme and project level. This will require the continued attention and support of the NDA to ensure that good decisions are made both by the SLCs and also, critically, the Tier 2 community where the majority of spend and performance occurs. Across our estate we need the SLCs to take to market requirements which support and or create competitive solutions with appropriate and proportionate risks and rewards that enhance supply chain performance, growth, sustainability and diversity, with a 'right first time' approach. We therefore need SLC procurement teams to be proactive and help drive value through working with project teams, engineers and suppliers.

Due to fluctuations and uncertainty in the market, there are a number of sectors that have been identified with capability and capacity issues associated with people and infrastructure/assets. Where our estate is the dominant client, and where the activity has the ability to directly impact upon our mission, we will work with the SLCs and other bodies to enhance these areas and encourage new entrants.

Our Strategy

See p79
See p86
See p75
See p72
See p94

Our strategy is to help maintain and, where necessary, create and develop a healthy, vibrant, effective and competitive supply chain. Such a supply chain will be successful, deliver value for money, be affordable, and manage risk and opportunities appropriately.

This strategy has been expanded to reflect the need for our estate to be seen as the nuclear client of choice. To achieve this we will seek to remove inefficiencies for both the supply chain and our estate. This reflects the importance of the supply chain to our mission (the largest proportion of the NDA's total budget is spent at Tier 2 level in the supply chain) and the challenge from a resurgent global nuclear industry for supply chain capability and capacity while recognising our role and that of the estate in helping to enable the supply chain to be successful.

Delivery and success of this strategy will also rely on the continued support of and alignment with the following critical enabling strategies: **Contracting**, **Socio-Economics**, **People**, **R&D** and **International Relations**.

Strategy Development

To monitor the success of our strategy we will undertake supply chain capability and capacity analysis. We will establish an integrated and common approach to key supplier management with our SLCs and government. We will also apply category management and in doing so support longer term growth, of the supply chain, where appropriate.

See p94

We will integrate the Supply Chain Development and Contracting strategies, working together with procurement teams across our estate to foster an effective supply chain for the decommissioning sector.

We will undertake and publish periodic Health of the Supply Chain reports and represent the UK supply chain abroad to support UK export opportunities (see International Relations).

Delivery

This strategy is being delivered in collaboration with our SLCs and subsidiaries. The delivery of the supply chain strategy is an important enabler for NDA performance and delivery of our driving strategies (see Site Decommissioning and Remediation, Spent Fuels, Nuclear Materials and Integrated Waste Management).

See p20
See p36
See p46
See p54

Through the implementation of our strategy we seek to make sustained savings via collaborative procurement. We will promote greater coordination and cooperation in the nuclear supply chain (e.g. by hosting annual supply chain events) and continue to remove blockers to a healthy, vibrant and integrated supply chain.

We will also seek to better integrate supply chain management across our estate, create a new SME programme and seek specific opportunities to work with other government departments on common supply chain issues.

Opportunity to network at the Supply Chain Event 2014

27. What changes in NDA contracting approaches would make the biggest positive impact to encourage innovation?

7.7 Information Governance (including Information and Knowledge Management)

Objective:

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.

The NDA owns most of the information contained in our estate. With ownership comes legal and regulatory accountability for all this information, regardless of its location, current custodian, age or condition. We are obliged to improve information governance and associated services across our estate in line with government and regulatory requirements.

The absence of a consistent approach has resulted in our information assets and data being retained unnecessarily and in isolation, often in bespoke systems. This represents a risk in terms of obsolescence and information recovery and leads to additional costs and missed opportunities. An uncoordinated approach does not allow us to work in an open and transparent manner and will result in the inappropriate release or loss of information.

To address these issues we have developed a comprehensive and robust Information Governance strategy and we are delivering this through the Information Governance National Programme.

Our Strategy

Our strategy is to promote the efficient management and re-use of NDA information assets. We will achieve this by establishing estate-wide communities who share business processes, collaborative procurement opportunities, procedures and policies and by adopting common standardised technologies and solutions for information governance where it is practical to do so.

Our Information Governance strategy consists of five interdependent strands:

1. **Information Management** to ensure compliance, promote wider openness and transparency and reduce risk and baseline costs.

2. **Knowledge Management** to improve business efficiency by sharing information and encouraging learning; capturing and transferring that knowledge which is necessary to the decommissioning mission.

3. **Information Risk Management** to improve information assurance and reporting by building confidence in our ability to manage risk effectively.

4. **Information & Communication Technology** to use common standards and technologies, enabling collaboration through shared solutions and procurement strategies.

5. **Intellectual Property Management** to protect information, knowledge and know-how and exploit its value where appropriate.

Strategy Development

Our overarching Information Governance strategy is developing and the individual strands are at different stages in their development and implementation.

See p20
See p36
See p46
See p54
See p68 + p94

Our Information Management and Knowledge Management strands are mature, but they apply to all our strategic themes through statutory duties on information management and Energy Act (2004) *(ref 1)* requirements on sharing of good practice (see **Site Decommissioning and Remediation**, **Spent Fuels**, **Nuclear Materials** and **Integrated Waste Management** and **Critical Enablers**). We will continue to discuss these strategic needs and issues in our internal development meetings and in estate-wide fora to encourage greater collaboration.

The remaining strands are still evolving. We will develop our Information Risk Management strand through continual review of information assurance assessment criteria across our estate (see HSSSEQ). We will further develop shared solutions and procurement strategies enabling the use of common standards and technologies, as required by our Information & Communication Technology strand. We will continue to develop our Intellectual Property Management strand to establish the extent of intellectual property owned by our estate and support the strategic direction of **International Relations** and International Nuclear Services (INS).

Delivery

We are delivering this strategy together with our SLCs and subsidiaries. Through the Information Governance National Programme we have established an estate-wide knowledge management policy and delivered appropriate training and tools (e.g. NDA Knowledge Hub and Knowledge Management Maturity Assessment). To support Information Management across our estate we have published a Records Retention Schedule (46) and associated guidance for the management of NDA-owned records and established the NDA's Information Asset Register and Publication Scheme (see **Research and Development**).

See p72

To support the implementation of information risk management we have instigated an Information Risk Management Assurance programme across our estate.

We have established an estate-wide approach to Information & Communication Technology by publishing the NDA Information & Communication Technology Strategy *(ref 47)*, and establishing a collaborative procurement programme seeking to provide appropriate ICT support contracts across our estate.

To manage the huge amounts of information accumulated across our estate, we have commenced construction of the NDA Archive in Caithness. The archive will be managed by an appointed commercial partner under contract with the newly established NDA subsidiary NDA Archives Limited. Through the development of the NDA Archive we will create a fit-for-purpose Place of Deposit for information currently held across our estate.

To improve information management we will ensure that suitable rules and tools are in place for the effective management of information in an open and transparent manner while protecting sensitive nuclear and personal information.

We also recognise that there is a need for better knowledge management across our estate, and we will develop systems, practices and solutions that enable efficient information and knowledge capture, management, transfer and exchange optimising value wherever possible.

28. Is our proposed approach the right strategy?

Case Study

NDA Nuclear Archive

A vast number of civil nuclear records, plans, photographs, drawings and other important data and information, some dating back to the second world war, are currently stored in various locations around the country.

A vast number of civil nuclear records, plans, photographs, drawings and other important data and information, some dating back to the second world war, is currently stored in various locations around the country. Some at individual NDA sites and others with a variety of commercial organisations. Very few of these collections, however, are managed to the standards required of the NDA as a public authority; some of them are even stored in buildings scheduled for demolition. The NDA is accountable for these and has been developing a solution to preserve relevant records ensuring that they remain secure, that their integrity remains intact (many of them will be required for hundreds of years) and that they are accessible in line with legislation and the relevant regulations. The NDA therefore embarked upon a project, initially launched in 2005 following a careful evaluation of the options and costs, to consider how best to manage these records.

A decision was quickly made to find a single UK home for all the relevant material and accordingly the NDA focused the search for a suitable site within its four priority regions, where ageing nuclear sites have long been a dominant influence in the local economy and where, therefore, site closures will have greatest local impact. Caithness, with 2,000 people working in decommissioning, was selected as the region most likely to benefit, as the effective closure of its major employer, Dounreay, is set to become a reality by 2029/30. The Archive will be located near Wick Airport, not far from the Dounreay site, and will be built to all of the relevant archive standards in the UK today, with the aim of developing a base for training archivists and offering apprenticeships, linking up with the University of the Highlands and Islands, and North Highland College. Much of the information will eventually be digitised and made available for electronic research.

The Archive will also provide a permanent home for the existing North Highland archive which has outgrown its current location above the Wick library. This archive is a popular attraction for visitors and tourists seeking information about their and others' Scottish heritage and the NDA hope to sustain and add to this level of interest in local history. Around 20 full-time jobs will be created within the Archive, while the construction phase is likely to generate dozens of additional temporary posts and will lead to opportunities for local contractors. Planning permission was granted in March 2015 and a commercial partner, to operate the facility on our behalf, was appointed in July 2015. The development of the design and build of the Archive is led by NDA Properties Limited on behalf of the NDA and NDA Archives Limited with support from Highland Council and other key stakeholders.

An artist's impression of the NDA Nuclear Archive in Caithness

7.8 Socio-Economics

Objective:

To support the maintenance of sustainable local economies for communities living near our sites and, where possible, contribute to regional economic growth objectives.

The Energy Act (2004) *(ref 1)* gave the NDA a socio-economic role, recognising the importance of delivering the decommissioning programme in a socially responsible way, and learning from other industry sectors.

While the overarching principles of our socio-economic strategy remain the same, our experience over the last ten years, and the evolving circumstances in which we are operating, means that it is an opportune time to review and refresh our approach to socio-economic activities and interventions.

Historically, much of our socio-economic activity has been in the form of funding support, delivered either directly or via our SLCs, to whom we have delegated increasing amounts of funding and decision-making responsibility. They use their local knowledge and closer working relationships with local economic development organisations to make investment decisions that support local needs and the UK government growth agenda. We have made significant socio-economic contributions since the launch of our first *Strategy,* including but not limited to the Albion Square development in Whitehaven; the construction of new further education centres; supporting our workforce into alternative local employment; investment in key local infrastructures, such as the Port of Workington and Scrabster harbour and local supply chain support, including support to the £40 million West Cumbrian Regional Growth Scheme.

Our ability to contribute to the socio-economic agenda is not limited to funding and it is this theme that we intend to pursue. Over the last ten years, the situation for many of our sites has changed considerably. We now see the real prospect of nuclear new build for at least three of our regions; Cumbria, North Wales and South West England, whilst in Caithness and the North Highlands the emerging renewable energy sector is creating new economic opportunities. At the same time, some of our Magnox reactor sites will enter quiescence shortly. Of those, some have adjacent EDFE stations which provide potential for redeployment. Some sites have neither new build prospects nor adjacent sites and will depend on access to alternative economic activity. Our strategy needs to take this dynamic, fluid situation into account, making the most of the significant opportunities, while minimising its adverse effects and supporting activities to enhance the achievement of our mission.

Our priorities of employment, education and skills, economic and social infrastructure and economic diversification remain unchanged. We originally identified West Cumbria, Caithness and North Sutherland, Anglesey and Meirionnydd and the Gretna-Lockerbie-Annan corridor as our geographic priorities as, at that time, those areas were where we judged the impacts of our programme to be most significant. We now have a better understanding and appreciate that our socio-economic response has to be flexible to meet the very different challenges in each of our communities. Going forward, we will increasingly tailor our socio-economic response to the specific needs of communities and look for opportunities to link our activities to regional economic growth strategies.

Our Strategy

Our strategy is to fulfil our socio-economic requirements under the Energy Act (2004) by facilitating and supporting economic development organisations in our communities. To help maintain sustainable communities leading up to and after site closure, where practicable we will support them to:

- enhance the opportunity for local people to be involved in decommissioning work and other economic activity through education, retraining and skills development (see People)

See p75

- increase the attractiveness of areas near NDA sites as places to live, work and invest in an effort to secure future economic sustainability
- work with nuclear new build and adjoining site organisations to ensure that the SLC workforce and local communities are best-placed to maximise the benefits and opportunities they present as our sites move towards closure
- support the diversification of local economies into other sectors – reducing the reliance of communities on nuclear sites for employment by increasing the number, variety and vibrancy of local businesses, promoting entrepreneurship and taking steps to attract new enterprises.

Strategy Development

See p75
See p81
See p96
See p72
See p83

We want to secure greater socio-economic benefit for communities around our sites. A number of strategies already deliver, or have the potential to deliver, socio-economic benefits. We will work together with People, Supply Chain Development, Land and Property Management, R&D and Information Governance strategies to develop tailored socio-economic strategies for communities and look for opportunities to link our activities to regional economic growth strategies.

To ensure that socio-economic impacts are better integrated into our decision-making we will include the Integrated Impact Assessment approach and the guiding questions of the Socio Economic Impact Assessment (SeA) in our Value Framework.

As well as integrating socio-economics into our Value Framework, we will increasingly expect our wider supply chain to contribute to the socio-economic agenda and will pursue contracting options that enable us to do that. This industry-wide pursuit of socio-economic benefit will make considerable difference to how much we are able to achieve.

Delivery

See p75

To deliver our strategy we work with our estate, suppliers, new build organisations and EDFE to develop and share best practice to create synergies in our socio-economic activity. We will also work with organisations in the wider nuclear industry e.g. the Nuclear Industry Council, in their initiatives and in their work to capture knowledge from the entire industry.

See p81

We require the SLCs to develop locally-tailored socio-economic plans and report on their delivery. The support we give, needs to consider the specific issues that communities around our sites face. For example, with no prospect of new nuclear activity near our Dounreay site, we are supporting that community to exploit opportunities in the oil and gas and renewables market. In North Wales, as Wylfa ceases electricity generation and Trawsfynydd moves towards closure, we need to work with Welsh government and the local authorities to help retain important skills in the region whether that be for the Wylfa Newydd project or other regional developments. In West Cumbria, the prospect of new nuclear build at Moorside in addition to the long-term programme at Sellafield presents the possibility of significant skills shortages.

See p75
See p72

We also work together with our local economic development organisations, particularly by funding specific projects linked to evidenced local needs; although this continues to be subject to Spending Review outcomes and the achievement of efficiency savings. Our experience over the last 10 years means that we have been involved with a number of successful schemes that have the potential to be rolled out to communities across the estate, as and when the need occurs. We will work with communities to share and support this best practice; particularly in the areas of:

Skills retention/transition/development: In order to deliver our mission we need to maintain sufficient skills in and around our sites, and this is addressed in our People Strategy. We will work with our PBOs and SLCs to ensure that apprenticeships are created locally and that apprentices are still attracted to working on our sites, because of the transferable skills they will gain (see People Strategy).

Re-use of NDA land: Decision making assisted by the Value Framework will enable socio-economic opportunities to be considered when making land use and divestment decisions.

Development of the local supply chain: A healthy local supply chain is a key factor in maintaining a sustainable community once a site has closed. Some SMEs are almost completely reliant on their local site and lack access, expertise and experience to compete more widely so that when the site closes their viability may be affected. We will work with the Supply Chain Development Strategy to explore what proactive support can be given to small, local suppliers to improve their competitiveness (see Supply Chain Development).

Improve links with education establishments: The long-term nature of our programme means that we have to look beyond the current available workforce and consider how we can ensure skills in the communities where we operate. To provide the skills and capability to deliver our mission, we need to engage more young people (with a particular effort to engage girls) in STEM. We will work with our SLCs and other nuclear industry organisations to develop their STEM offering (see People and Research and Development).

29. Our strategic priorities of Employment, Education and Skills, Economic and Social Infrastructure and Economic Diversification remain unchanged. Do you think they are still the right ones?

30. Do you agree that the four areas detailed in the Delivery section above are the right ones for the NDA and SLCs to focus on?

31. Are there any other issues that you think should be included?

32. How can we best measure and report on the impact of these activities?

7.9 Public and Stakeholder Engagement

Objective:

To build a better understanding of our mission with the public and stakeholders and maintain their support, confidence and trust.

Ten years on from our first Strategy, the NDA's mission, approach and objectives are much better understood. Our open and transparent approach to stakeholder engagement has helped us to deliver important strategic objectives for the NDA during that time.

The strength of our stakeholder engagement was recognised by the Major Projects Authority as an important feature of the Magnox/RSRL PBO Competition and the quality of our engagement throughout the competition process has been widely commended (see Contracting).

See p79

See p61

Effective public and stakeholder engagement is more than just engagement around our statutory documents. We regard public and stakeholder engagement as key to building the support, confidence and trust necessary for us to deliver our mission. It is important that our decision-making is informed by a diverse range of views, and that the rationale for major decisions and the processes by which they are reached is clear. This has been identified in our latest revision of the Value Framework.

The open dialogue with local stakeholders fostered by the creation of independently chaired Site Stakeholder Groups (SSGs) has allowed us to approach difficult subjects with communities, for example the consolidation of Intermediate Level Waste (ILW) storage (see Consolidation). Effective stakeholder engagement remains central to the NDA's approach and a key consideration for us as we move forward.

Our Strategy

Our strategy is to pursue the goal of open and transparent engagement that is tailored and proportionate to the topic or issue. Engagement can take various forms and it is important to be clear whether the purpose is to inform, engage or consult.

Inform: This is about how we communicate information to our stakeholders. The general goal of this type of engagement is to provide stakeholders with balanced and objective information to make them aware of and help them understand the issues.

Our approach is heavily reliant on digital and social media. We continually refresh and update our website to ensure content is clear and up to date and send out e-bulletins to those who have registered to receive them. We are increasing our use of social media such as Twitter and LinkedIn to try to reach out to a wider range of stakeholders. We also continue to develop stakeholder briefing documents to simplify more complex issues, such as Nuclear provision - explaining the cost of cleaning up Britain's nuclear legacy *(ref 48)*.

Engage: The goal here is to work directly with stakeholders who have a declared interest, on an ongoing basis to ensure that concerns and aspirations are consistently understood and considered.

We engage with stakeholders at the local level through SSGs and at the national level through our National Stakeholder Event. We also run a number of issue-led engagement processes when required such as selection of preferred options (see Appendix A). We continue to base our approach to engagement around a number of core principles. These include ensuring engagement is done at a time to enable influence, is presented in a clear, transparent and accessible way, and is proportionate for the subject matter.

Consult: We understand consultation to be the formal process of seeking stakeholder responses to statutory publications such as our Business Plan and Strategy.

Stakeholder discussion at a recent strategy event

Strategy Development

In reviewing our Public and Stakeholder Engagement strategy we have concluded that our approach is still relevant. However, we have identified the need to review the style of delivery. One of the main considerations is how we take forward our national engagement. Interest in our national stakeholder events has been waning in recent years and a number of stakeholders have expressed the view that the events are not meeting their specific needs. It is very difficult to ensure that a national event covers all issues of interest across our estate. There is also increasing interest and involvement of local authorities around our sites. In some cases, a lack of dialogue between them and the SSGs has resulted in us considering whether there are better forms of engagement.

To address these issues we will review our national engagement mechanisms to ensure we offer good opportunities for discussion with all those who have an interest in our activities.

We will also consider introducing a regional or SLC based approach to stakeholder engagement to generate interest from a wider range of stakeholders and to ensure that the conversations are tailored to the specific SLCs or regions.

Delivery

While the overarching strategy and principles of public and stakeholder engagement remain the same, our experience over the last ten years and the different circumstances in which we will be engaging in the future will result in some changes to the way in which we deliver our engagement.

See p32

See p26

See p28

At the local community level, we will see several Magnox reactor sites enter into quiescence, known as Care and Maintenance, and Winfrith reach its interim end state through the next strategy period (see Optimum Timing and sequencing of Magnox reactor dismantling). With activity shifting towards monitoring and surveillance on these sites during this period (see Land Quality Management), it is clear that the current structures and operation of SSGs will need to evolve to be appropriate to their changing circumstances. Some of these sites will have existing EDFE stations adjacent to them which themselves are heading, in due course, towards closure, defueling and eventual decommissioning. Also, in the same period we are due to see construction start on a new fleet of reactors on land adjacent to existing sites.

We have been considering the appropriate mechanisms for local engagement as our sites enter into quiescence and this will continue to be the subject of discussion with local stakeholders and the relevant SSGs. We do not believe that a 'one size fits all' approach is appropriate. Each community is unique with different challenges and we will work with each community involved to agree a bespoke solution that meets their aspirations. Given that some of these communities will have an EDFE station entering or preparing for decommissioning and some with new build under construction as well, there will clearly be a need for significant community engagement but with a decreasing focus on our sites. We propose to engage with EDFE and the relevant new build companies to exchange experience of community engagement to help map out appropriate solutions in partnership with each community.

To improve the development of our statutory documents, we will consider proposals aimed at increasing stakeholder engagement and involvement in the Business Plan process.

We will seek to improve our broader engagement and reach a wider audience by strengthening our online activities and use of social media.

33. Should the NDA consider regional, SLC based and topic led engagement?

34: When considering a regional approach to stakeholder engagement, we have identified three options that we could use:

Option 1 – Continue with the current format of national events and issue led engagement

Option 2 – Replace the National Event with a series of regional or SLC based events

Option 3 – Continue with the current format of National Events and issue-led engagement and add periodic events at Dounreay and Sellafield in conjunction with the SSGs

35: What factors should we consider when thinking about stakeholder engagement around Magnox reactor sites in quiescence known as Care and Maintenance?

7.10 Transport and Logistics

Objective:

To ensure the effective transportation of materials to enable the delivery of the NDA mission.

The previous Strategy identified that NDA mission depends on having integrated transport systems that work. Our experience has shown us that efficient delivery of our core mission relies heavily on the ability to transport radioactive materials (nuclear fuel, radioactive waste, contaminated items, etc.), bulk materials (spoil, concrete, new raw materials, etc.) to, from and between sites, during construction, operation and decommissioning.

The existing transport infrastructure, systems, processes and skilled workforce have been in place for a significant period of time to meet requirements of the nuclear industry. We have established the NDA Transport and Logistics Working Group (T&LWG) to help develop, promote, and review our transport and logistics strategy and to monitor progress of its implementation.

T&LWG considers both the ongoing plant and decommissioning operations, and these could involve both transporting waste from the site to an intermediate or final storage and disposal facility or transporting materials of construction for on-site facilities. Some of these are new operations for which new transport systems will need to be established.

As part of the strategic review and ongoing strategy development the strategic options presented in our previous Strategy for transport and logistics were reviewed by the T&LWG and they remain unchanged.

Our Strategy

Our strategy is to work with SLCs, subsidiaries and regulators to define principles under which transport services are procured to achieve integrated transport systems that work.

We require SLCs and subsidiaries to adopt the following principles in delivering the Transport and Logistics strategy:

- ensure the safety and security of material movements and protect people and the environment and consider the impact on the resulting carbon footprint
- optimise movements between sites considering all transport modes while enabling other strategic themes
- seek to reduce the adverse impact of all transport modes throughout the transport routes
- find common and reliable packaging and coordinate transport arrangements to support movement and disposal requirements
- use rail over road where practicable
- maximise the use of existing assets rather than develop new ones.

By following these principles we want to ensure transport takes place in a timely fashion to meet the implementation needs of the NDA mission. This requires us to work with other stakeholders to maintain and develop the key infrastructure transport systems.

Strategy Development

See p54
See p36
See p46

Strategy is developed in co-operation with the T&LWG which has membership across our estate. We have identified that strategic development is required in some key areas. We will maintain our fleet-wide package overview to ensure transport assets are available when required.

We will work with other government departments to secure that access and egress routes remain available for our sites.

See p75

We are aware that the Transport and Logistics strategy interfaces with many other strategiessuch as Integrated Waste Management, Spent Fuels Management and Nuclear Materials to improve our understanding of these interfaces which include, but are not limited to, movements of all forms of waste, spent fuel and nuclear materials.

Our intention is to ensure that sufficient transport and logistics skills and capabilities are developed and retained in the nuclear industry (see People).

Delivery

SLCs work with each other, the supply chain and our subsidiaries to ensure transport services will be available to enable the NDA mission to complete the effective delivery of ongoing plant operations and decommissioning operations.

We will continue to use the T&LWG as the main forum for transport and logistics-related issues across our estate, and to improve the communication of transport and logistics issues within member organisations. T&LWG will seek to optimise transport and logistics across the NDA estate by developing and maintaining a list of NDA transport assets, to help identify opportunities and cost-effective utilisation of these transport assets.

In implementing our strategy we will work with our SLCs and subsidiaries to engage with the public and all stakeholders in identifying the appropriate level of engagement to account for stakeholder and local community input for movements of all forms of waste, spent fuel and nuclear materials.

We will work with our supply chain and our SLCs to procure the required transport services and packages to deliver on our 'rail over road' strategic principle.

Following a NDA-led comprehensive review, led by the NDA, of transport assets and planned SLC and subsidiary requirements a list of issues for strategic development were identified:

- a Strategic Rail Asset Review to understand the forward requirements for asset and infrastructure
- working with RWM and the NDA estate through the GDF logistics working group to develop integrated transport solutions
- progressing a solution to supply plutonium contaminated material waste transport assets which to date have proved insufficient.

Transporting LLW by rail

36. Should the NDA continue to rely on SLCs and the supply chain to ensure the continuing availability of assets and routes or is there a viable alternative?

37. Do you think our existing strategy to promote rail over road is the right approach?

7.11 Revenue Optimisation

Objective:

To create an environment where existing revenue can be secured, and opportunities can be developed against criteria agreed with government.

The NDA is partly funded by UK government, the remainder being derived through income from commercial income generating activities, land and property. Unfortunately, future income is not guaranteed, as much of it depends on the operation of ageing facilities and infrastructure.

The combination of uncertain income from existing assets, the reduction in income due to the end of Magnox electricity generation by 2016 and the successful exploitation of opportunities to date means that executing our mission of decommissioning at the same rate will require an increase in UK government funding, unless additional revenue can be generated.

See p79

The development of commercial opportunities to maximise revenue from our existing assets, operations and people will continue. These opportunities may include:

See p98

- deploying existing facilities and resources to our commercial advantage;
- disposing of surplus assets and reducing liabilities;
- working with others to share costs to the benefit of the UK taxpayer.

Successful past examples of this approach are the sale of land for nuclear new build and the transfer of Springfields Fuels Limited and the Capenhurst site to the private sector (see Contracting).

Some further opportunities may arise from the UK's new reactor programme. However, expansive ideas for additional commercial activities remain out of scope without the express approval of government (see Non NDA Liabilities).

Our Strategy

See p44
See p46

The NDA inherited responsibility for the commercial contracts between British Nuclear Fuels Limited (BNFL), United Kingdom Atomic Energy Authority (UKAEA) and external customers. Our subsidiaries INS, Direct Rail Services (DRS) and Pacific Nuclear Transport Limited (PNTL) also have contracts which they manage on our behalf.

Our strategy is to honour these contracts and generate commercial revenue from:

- management of spent oxide fuels for domestic and overseas utilities;
- return of wastes and products to overseas customers;
- transport of nuclear fuels and materials;
- sale of electricity produced by our facilities.

Our revenue optimisation strategies include:

Spent Fuel Management: The NDA has historic contracts for the reprocessing and storage of AGR fuel for EDFE and reprocessing other fuels for overseas customers (see Spent Oxide Fuel and Non NDA Liabilities).

See p40
See p98

MOD Services: We provide storage facilities for MOD used fuels and nuclear materials (see Spent Exotic Fuels and Nuclear Materials).

Marine Transportation Services: INS and PNTL undertake international shipments of nuclear materials and will continue to provide safe and secure sea transportation services for fuel and radioactive waste products.

Rail Transportation Services: DRS provide safe and secure rail transportation services for nuclear and non-nuclear materials within the UK. DRS will continue to explore profitable opportunities in commercial markets.

Electricity Generation: none of the original 26 Magnox reactors continue to generate electricity from 2016. Other generating assets include Fellside combined heat and power plant and Maentwrog hydroelectric station in North Wales.

Strategy Development

The strategy is mature and is being implemented for each revenue stream. Because of its dynamic nature, this strategy needs to be responsive and requires constant review and adjustment.

We will periodically evaluate the opportunities to dispose of assets depending primarily on their potential value and alignment with our overall mission.

We will continue to discuss other options for additional commercial revenue with government. The UK's new reactor programme may offer commercial opportunities relating to the future ownership and management of UK nuclear infrastructure. Asset performance and condition remains a key risk to delivery of our contracts and influences the consideration of potential commercial revenue opportunities.

Delivery

See p77

See p52

See p96

Strategic delivery on commercial projects since the publication of our previous Strategy has included the initiative to maximise the return from our asset holdings at both Capenhurst and the land at Moorside, near Sellafield. The renegotiation of the option for the disposal of surplus land adjacent to Sellafield with NuGen for new nuclear build will generate approximately £200 million when concluded (see Land and Property Management).

We will manage our assets to ensure their performance and condition is maintained to maximise revenues from our commercial activities (see Asset Management).

A map showing the Moorside land adjacent to the Sellafield site

38. When evaluating the opportunities to dispose of assets or pursue additional commercial revenue, what factors are the most important for the NDA to take into account and why?

7.12 International Relations

Objective:

To ensure the NDA estate maximises the benefit of international experience in delivering its Energy Act requirements for adopting good practice, securing value for money and supporting government policy, through targeted collaboration with international organisations.

The NDA recognises the importance of making use of international experience to help deliver its mission. This was formalised in our previous Strategy identifying International Relations as a Critical Enabler in its own right, covering four main areas which largely derive from the requirements of the Energy Act (2004) *(ref 1)*:

- access to good practice through developing bilateral relationships
- understanding and influencing international technical and legislative developments
- maintaining good relations with overseas communities
- supporting government policy in international matters

These areas are still valid and implementation throughout our estate is well established. Since 2013 there has been increased activity on two fronts:

- working with INS in the delivery of their strategy, as endorsed by the NDA, with a focus on exploiting the NDA's intellectual property
- increased working with UKTI and INS in helping to promote UK nuclear industry interests in overseas markets.

In addition, we now liaise more closely with government and the regulators on aligning our respective strategies.

Our Strategy

Our strategy is to gain access to international good practice through developing targeted relationships, sharing know-how and collaborating with counterpart organisations in other countries to avoid duplication of effort and secure value for money.

See p88

To support our mission we need to understand and influence international technical guidance and legislative developments, while supporting relevant government policy to assist it in delivering its international commitments so that any potential opportunities can be realised. We will work with regulators and government to ensure a coordinated approach to the development of international technical guidance and legislation

See p92

In order to maintain good relations with overseas communities interested in our activities we work with government to provide balanced and objective information (see Public and Stakeholder Engagement).

We will exploit NDA intellectual property in accordance with our Revenue Optimisation strategy by enabling estate support for INS in the delivery of its strategy.

Strategy Development

We will work with government and the UK nuclear industry to coordinate efforts to promote UK overseas trade aspirations and the UK government's growth agenda.

We will influence the development of international legislation and guidance through appropriate representation at international fora, with the aim of minimising risk to our mission.

Delivery

We will continue to work with regulators and government to ensure a coordinated UK approach to international activities.

We will develop relationships with overseas counterpart organisations on behalf of our estate and ensure the benefits are available to all SLCs and our subsidiaries. These benefits include lessons learned from others' experiences, targeted joint R&D, benchmarking opportunities, process and technology advancements, promotion of UK experience and NDA intellectual property, peer review, joint working, and opportunities for developing our workforce.

See p88

We will take part in internationally coordinated joint R&D working groups or other collaborative mechanisms, such as through the European Commission's (EC's) R&D Framework programme (including the Technology Platform for Implementing Geological Disposal), International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development .

See p72
See p83

We will support international academic projects where we can see opportunities for skills development and transfer of knowledge and technology (see **Research and Development** and **Information Governance**). We will move to a more pro-active engagement and encourage our SLCs to do the same. We will further share best practice in innovation among UK national laboratories, SMEs and SLCs, and also exert strategic influence for the benefit of academia and UKTI's mission to support overseas business opportunities (see **Supply Chain Development** and **People**).

See p81
See p75

In coordination with DECC, we will engage with the IAEA, the NEA and the EC in helping them develop guidance and legislation in areas relevant to our mission.

We belong to international industry organisations such as the International Association for Environmentally Safe Disposal of Radioactive Material (EDRAM) and the European Union's Club of Waste Management Agencies. We will also take part in targeted international conferences, facilitate our UK stakeholders to engage in international networks and continue to host visits by overseas organisations to our sites.

We will engage at an appropriate level with overseas governments and non-governmental organisations and communities (see **Public and Stakeholder Engagement**).

We will work with INS to exploit our intellectual property in overseas markets. This may require resources from our estate. Any decision to divert resources will be made in such a way that there is no significant impact on programme delivery. We will work with INS to help leverage UK nuclear industry entry in overseas markets through UKTI and Scottish Development International.

We will also support DECC and other government departments in international nuclear matters including contributing to the clean-up following the Fukushima-Daiichi accident in Japan and the International Framework for Nuclear Energy Co-operation.

These and other aspects related to the delivery of the International Relations strategy are encompassed in a delivery plan which includes the engagement and communication requirements between all of the parties involved, identifies timescales, responsibilities, risks and key success factors.

A visit by NDA staff to Fukushima

39. What emphasis should the NDA put on international relations?

40. Where should the balance be between engaging with overseas organisations to support the NDA mission and undertaking broader international engagement (e.g. sharing our expertise, and helping to promote UK industry)?

7.13 Land and Property Management

Objective:

To manage our land and property in support of the NDA mission and to make it available for alternative uses which optimise revenue and socio-economic benefit.

See p20

The divestment of land and property ultimately demonstrates that the NDA has delivered its mission. We have a responsibility to properly manage our land and property.

The NDA owns about 2,800 hectares of real estate across the UK, a quarter which is designated under the Energy Act (2004) *(ref 1)*. All the designated land is leased to our SLCs and contractors for nuclear use. The rest of our land and property ranges from off-site offices, through to fields and woodland.

Our estate is complex, not least because land holdings which appear surplus to requirements are intrinsically linked to nuclear operations (see Site Decommissioning and Remediation).

Approximately 20% of our land and property has been divested through a process of reorganisation and rationalisation. All divestment decisions reflect the Government Estate Strategy *(ref 49)*.

Significant revenue has been raised from the divestment of that land and property.

Our Strategy

Our strategy is to retain the minimum land and property required to complete our mission and manage it in collaboration with our SLCs. We will only retain land for predicted future business requirements and potential re-use of our assets (see Land Use). Where land or property is clearly surplus to requirements, it will be divested commercially (see Revenue Optimisation) or for socio-economic uses (see Socio-Economics).

See p34
See p92
See p86

Where our decommissioning and remediation activities allow, our strategy is to encourage interim uses until the NDA mission is completed. This promotes the beneficial re-use of land.

Strategy Development

In order to promote the beneficial re-use of land we will review this strategy, particularly as decommissioning and remediation plans are realised.

We will not divest our nuclear designated land and property *(ref 49) (ref 50)* until after the site end state has been secured and remediation of land has been completed.

Delivery

In collaboration with our SLCs, we will review our land and property to enable beneficial re-use and identify divestment opportunities.

See p85

By 2019, we will have all facilities management contracts aligned and procured collaboratively with SLCs and other government partners who may wish to join us (see Contracting).

See p79

When required, NDA Properties Ltd will undertake non-nuclear property development work in support of the mission, such as the construction of offices, training facilities and the NDA Archive.

We will continue to follow UK government best practice guidance and conduct regular audits.

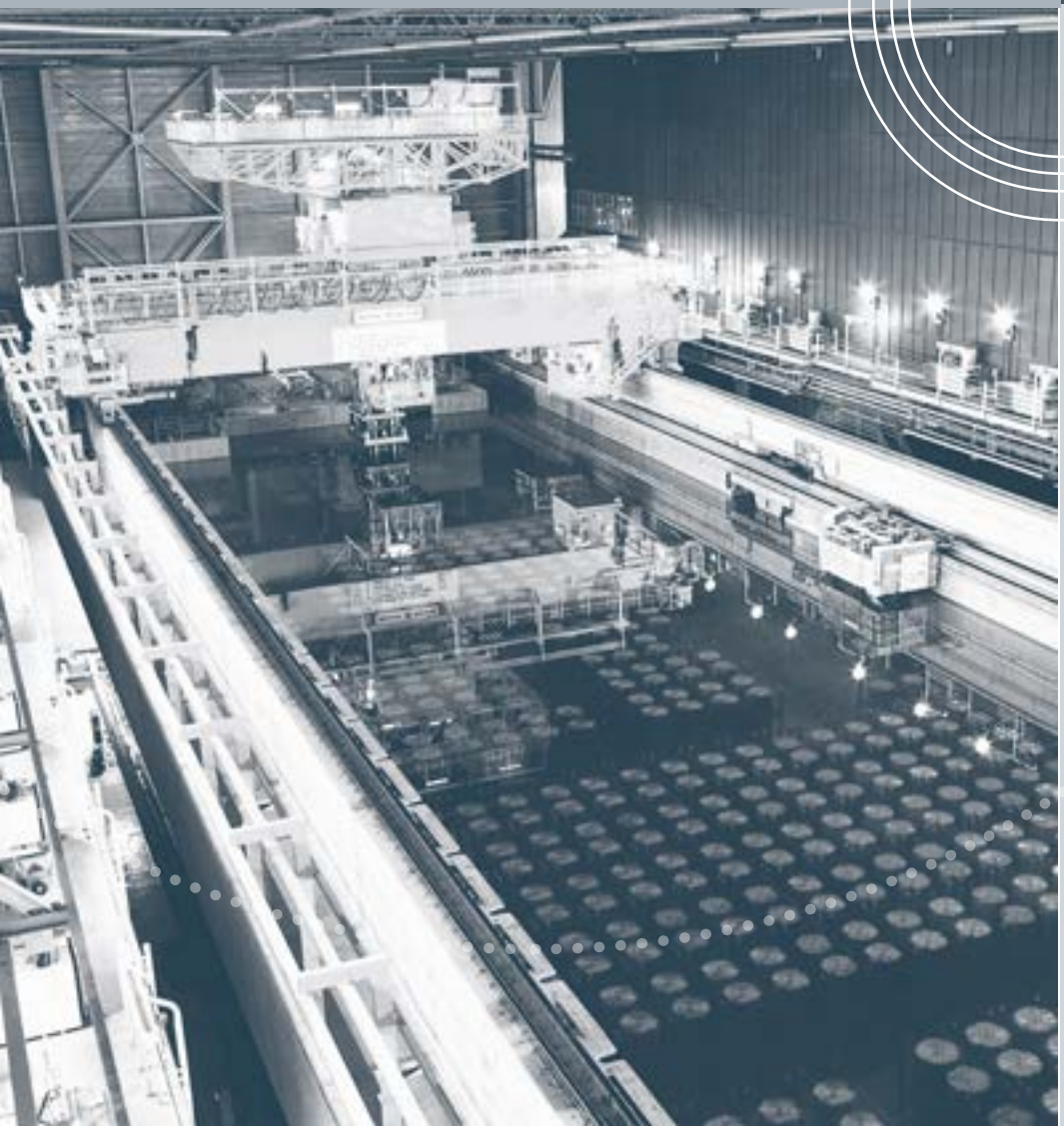
41. Recognising that the NDA has already sold over £500 million of real estate is our proposed approach the right strategy going forward?

Albion Square, Whitehaven, Cumbria

8.0 Non-NDA Liabilities

Objective:

To ensure that the NDA identifies, assesses the impact of and decides how to address third party nuclear liabilities within the current roles and accountabilities of all the organisations involved.



Top right - MoD submarine in dock
Bottom left - Storage of spent AGR fuel at Sellafield

8.0 Non-NDA Liabilities

The NDA's primary function is the decommissioning and clean-up of our sites. However, some of our sites have third party-owned nuclear assets and materials located on them as a result of historic activities and inherited contracts. These are collectively termed non-NDA liabilities.

See p36

See p92

The ownership of these liabilities remains with the third party, but where we are contracted to manage them, we will consider the owners' needs in developing our strategy and plans. These arrangements form the strategic specification to our Site Licence Companies (SLCs) and they are addressed through the appropriate strategic themes (e.g. Spent Fuel Management, Revenue Optimisation, etc.).

The strategy and management of non NDA liabilities is well understood and being implemented.

Our Strategy

Our strategy for the management of non NDA liabilities is centred on three key themes:

1. We will manage and deliver our existing contractual commitments. We will only consider or accept new liabilities where it is within the NDA's remit and its specific interest to do so.

2. We will also take on new liabilities work where we are required to do so by UK government.

3. We will work with other organisations in considering opportunities where there may be wider benefits to the UK and present these to government for consideration.

Where any new liability is identified to be beyond our current remit, this will be subject to governance and agreement. We are currently managing existing contractual commitments, and this is reflected in the Lifetime Plans (LTPs) of our SLCs.

Strategy Development

The strategy for non NDA liabilities is mature and is being implemented.

Delivery

New liabilities will be subject to a detailed assessment to determine their impact on our mission and other topic strategies. The assessment will identify the appropriate contracting options and pricing for the management of new liabilities to deliver value for money.

Opportunities with other operators that may provide a wider benefit to the UK will also be considered on a case by case basis.

9.0 Site License Companies and Designated Site and Installations

Sellafield Ltd

Sellafield site

Sellafield is a large and complex nuclear chemical facility located in West Cumbria. The site has played a pivotal role within the nuclear industry since the 1940s. Site operations include fuel reprocessing, fuel fabrication and storage of nuclear materials and radioactive wastes. Calder Hall, located on the site, was the world's first commercial nuclear power station. Electricity generation started in 1956 and ceased in 2003. Windscale, also located on the site, comprises three reactors. Two of the reactors were shut down in 1957 and the third one closed in 1981.

Sellafield Ltd is the SLC responsible for the operation of the Sellafield nuclear site (including Calder Hall and Windscale). A change to the management arrangements of Sellafield Ltd was proposed in 2014 following a detailed review which concluded that the complex, technical uncertainties at the Sellafield site were less suited to the Parent Body Organisation (PBO) model that is working well elsewhere in the NDA's estate. Under the new arrangements, Sellafield Ltd will be established as a subsidiary of the NDA and will acquire the support of a strategic partner or partners from the private sector to assist in its delivery. This decision was the result of careful consideration and review of various commercial approaches in use where the public and private sector comes together to deliver programmes.

Strategy Implementation

The next five years will see a notable change at the Sellafield site. Under the proposed arrangements, Sellafield Ltd will continue to operate the site but will no longer be under the temporary ownership of a private sector contractor. Sellafield Ltd will work together with a strategic partner or partners to implement our strategy and deliver the associated programmes.

Over the last strategy period the active commissioning of the Sellafield Product and Residue Store was completed allowing the long-term safe and secure storage of nuclear material on the site in line with current policy. This allows the transfer of material from older stores as they reach the end of their design life.

Significant progress has also been made in transferring spent Magnox fuel to Sellafield. Defueling of three of the nine stations has been completed and all Magnox fuel transfers will be completed by 2018. In addition Sellafield will continue to receive and safely store fuel from the Advanced Gas-Cooled Reactor (AGR) stations until their ultimate closure around mid-2030s.

Within the timeframe of this Strategy, reprocessing operations at Sellafield will be completed. The Magnox reprocessing programme is due to complete in 2020 and Thermal Oxide Reprocessing Plant (THORP) reprocessing will complete by 2018. As the reprocessing programme comes to an end, attention is turning to the decommissioning of the rest of the site. Plans are being made to allow this to commence, but the work has a lower priority than the work in Legacy Ponds and Silos (LP&S).

The focus for LP&S has been on creating the infrastructure to enable retrieval. Much of the early work to allow waste to be exported from the ageing storage facilities has been designed and some equipment is now being installed and will allow the commencement of sludge removal in the First Generation Fuel Storage Pond and fuel export to commence in 2016. In the Magnox Swarf Storage Silos (MSSS) the first fuel waste removal machine has been installed in readiness for availability of facilities to receive the retrieved waste.

As we make progress on risk and hazard reduction, and the start of broad front decommissioning gets closer, the end state for the site and the interim states that the site will go through will be defined in more detail. This will allow the best tools and techniques to be applied to the decommissioning programme going forward.

In the short term decommissioning activities will focus on areas where the buildings would need to be upgraded if decommissioning was not carried out in order to minimise the cost of the programme. This work will focus primarily on some of the buildings associated with the original Windscale site, including the pile chimney.

Site End State

The designated land at Sellafield has been divided into two discrete zones for the purpose of defining the site end state; the 'Inner Zone' and the 'Outer Zone'. The boundary of the Inner Zone is currently assumed to include the Separation Area and the Windscale Piles. It is envisaged that any new disposal facilities or long-term storage activities will be located within the Inner Zone.

The site end state to be secured by the NDA for the Inner Zone comprises the following:

- the Inner Zone will be subject to institutional controls to manage risks to people and the environment
- remediation infrastructure will be used as necessary to ensure groundwater quality is consistent with the requirements of the relevant regulatory regime
- structures and infrastructure will be made safe or removed where necessary.

The site end state to be secured by the NDA for the Outer Zone comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Hunsterston A pond being jet washed

Magnox sites include the Magnox reactor sites (Berkeley, Bradwell, Chapelcross, Dungeness A, Hinkley Point A, Hunterston A, Oldbury, Trawsfynydd, Sizewell A and Wylfa) and also the research sites Harwell and Winfrith (formerly part of Research Sites Restoration Limited). The PBO is Cavendish Fluor Partnership (CFP), a joint venture between Cavendish Nuclear and Fluor.

Magnox Ltd is the SLC responsible for the operation and management of the Magnox reactor sites and research sites to final site clearance. For the Magnox reactor sites this includes defueling the reactors, the preparations to enter into effective quiescence known as the interim Care and Maintenance phase.

Following the commencement of a new contract for the Magnox sites (including Winfrith and Harwell) the lifetime plans are currently under review. As a consequence, the dates indicated for key milestones against these sites are subject to change as the plans are further optimised.

Strategy Implementation

The last five years have seen notable changes at Harwell, Winfrith and the Magnox reactor sites, in particular how the SLC is operated to get the best results in delivering the NDA strategy, with the introduction of programmes to the business and a broad shift in focus from operations to decommissioning. During the last strategy period, electricity generation ceased at Oldbury and Wylfa will cease at the end of 2015, following successful extension to the planned life of the stations. The income from extended electricity generation has made a significant contribution to the decommissioning effort. Related to electricity generation, several Magnox reactor sites have been declared fuel free following the transfer of spent fuel to Sellafield for reprocessing.

Elsewhere, Magnox reactor sites have commenced retrievals of intermediate level waste from temporary storage and packaged waste so that it is in a more passive state suitable for final disposal. During the strategy period, interim storage facilities have been constructed to store this waste until the final disposal route is available.

Some site decommissioning and remediation work has been undertaken at most Magnox reactor sites. A key area has been the preparation of ponds for quiescence. During the previous strategy period the focus of decommissioning and remediation was at Bradwell and Trawsfynydd, with significant effort employed to accelerate the preparation of the sites for being put into a quiescent state. Alongside the physical work, extensive effort has gone into developing the approach, systems and regulatory interactions needed to manage a site in quiescence. The learning from all of these activities will inform future work as other sites are prepared for quiescence.

The Harwell and Winfrith sites have followed a similar path over the last strategy period, with waste retrievals and site decommissioning and remediation activities ongoing at both sites. At Harwell, parts of the site have been completely cleared and made available for their next use.

Key activities, directly aligned to strategy implementation, include the instigation of a programme of consolidation of waste, fuel and nuclear materials securing best value for money by moving material to the best location for them to be managed. For uranic materials this also includes enhancing the likelihood of recovery for re-use.

In the near-term, Magnox Ltd are working towards a target of placing three Magnox reactor sites into a quiescent state and the Winfrith site in a condition where no further physical restoration work will be required and an aspiration to make the site available for public access. Alongside these activities, Magnox will also put in place all the arrangements needed for managing the sites during the quiescence. Magnox Ltd will also support the NDA as we review the period of time that the sites will be quiescent in order to ensure that we plan for the best overall outcome.

Berkeley

Magnox

Berkeley site is located in Gloucestershire and was one of the UK's earliest nuclear power stations. Generation started in 1962 and ceased in 1989 with defueling completed in 1992. Work continues to prepare the site for entry into Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Berkley comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Sludge canisters being removed from the Berkeley vaults

Artist's impression of Berkeley in Care and Maintenance

Bradwell

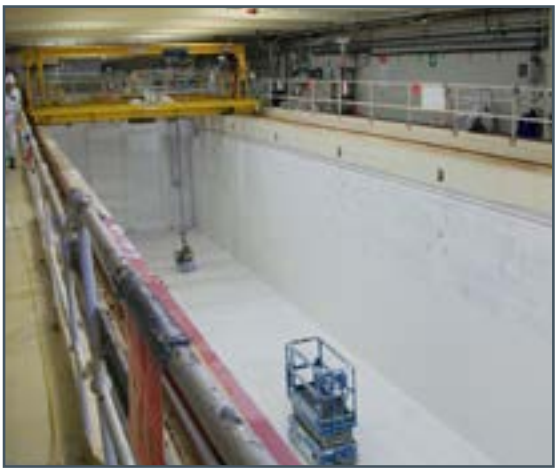
Magnox

Bradwell is another of the UK's earliest power stations and is located in Essex. Electricity generation started in 1962 and ceased in 2002 with defueling completed in 2006. Work continues to prepare the site for entry into Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Bradwell comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.



Bradwell ponds drained and cleared

Artist's impression of Bradwell in Care and Maintenance

Chapelcross

Chapelcross site is located near Dumfries in South West Scotland. It was the first Scottish nuclear power station, with electricity generation starting in 1959. Generation ceased in June 2004 and in 2007 the familiar landmark cooling towers were demolished. Defueling was completed in 2013 and now the site is preparing for Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Chapelcross comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Working on Europe's largest asbestos removal project completed at Chapelcross

Artist's impression of Chapelcross in Care and Maintenance

Dungeness A

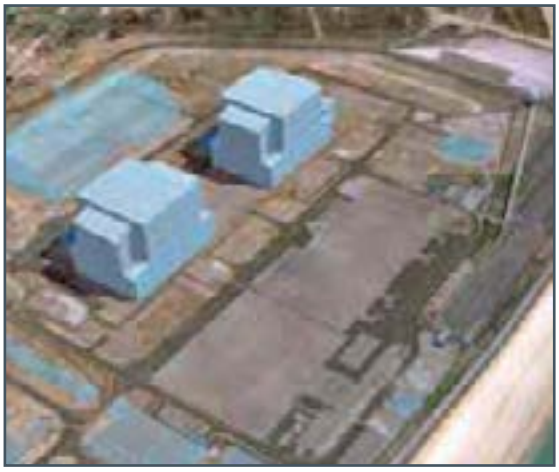
Dungeness A site is located in Kent. Electricity generation started in 1965 and ceased in 2006. Defueling was completed in 2012 and the site is now preparing for Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Dungeness comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Dungeness A turbine hall demolished



Artist's impression of Dungeness A in Care and Maintenance

Harwell

Harwell is located in Oxfordshire and was established in 1946 as the UK's first atomic energy research establishment. The majority of the facilities ceased operation in the early 1990s and decommissioning has been ongoing since then, with over 100 buildings and facilities removed from the site.

Site End State

The site end state to be secured by the NDA for designated land at Harwell comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Demolition of former liquid effluent treatment plant buildings

An impression of what the interim state will be: the science campus plus a small licensed area

Hinkley Point A

Hinkley Point A site is located in Somerset. Electricity generation started in 1965 and ceased in 2000, with defueling completed in 2004. Work continues to prepare the site for entry into Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Hinkley Point A comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Decommissioning redundant buildings at Hinkley

Artist's impression of Hinkley Point A in Care and Maintenance

Hunterston A

Hunterston A site is located in Ayrshire in South West Scotland. Electricity generation started in 1964 and ceased in 1989. Work continues to prepare the site for entry into Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Hunterston A comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Containers are moved into the new ILW store

Artist's impression of Hunterston A in Care and Maintenance

Oldbury

Oldbury power station is located in South Gloucestershire. Electricity generation started in 1967 and ceased in 2012. At that time it was the oldest operating nuclear power reactor in the world. The current focus at the site is on defueling and the retrieval, processing, storage and dispatch of waste.

Site End State

The site end state to be secured by the NDA for designated land at Oldbury comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Oldbury reactor one finishes defueling

Artist's impression of Oldbury in Care and Maintenance

Sizewell A

Sizewell A site is located in Suffolk. Electricity generation started in 1966 and ceased in December 2006. Defueling commenced in 2007 and was completed in 2014. The focus of the site is now on preparing the site for Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Sizewell A comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Sizewell control room is finally switched off

Artist's impression of Sizewell A in Care and Maintenance

Trawsfynydd

Trawsfynydd site is located at Trawsfynydd in Gwynedd, North Wales. Electricity generation started in 1965 and ceased in 1991. Reactor defueling was completed in 1995. The site continues to prepare for entry into Care and Maintenance.

Site End State

The site end state to be secured by the NDA for designated land at Trawsfynydd comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use
- the asbestos disposal facility will remain in place consistent with current planning consent for the site.

Decommissioning the sludge filtering and drying vessel

Artist's impression of Trawsfynydd in Care and Maintenance

Winfrith

Winfrith is located near Poole in Dorset. It was established by UKAEA in 1957 as an experimental reactor research and development site. Decommissioning activities began in the early 1990s and the last reactor was shut down in 1995. All the nuclear fuel and the majority of hazards have now been removed from the site. The focus of work now is to deliver the site to an interim end state, which includes full decommissioning of the Steam Generating Heavy Water Reactor (SGHWR) and Dragon reactors.

Site End State

The site end state to be secured by the NDA for designated land at Winfrith comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site during the preparation for the interim end state; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Decommissioning the DRAGON reactor

Artist's impression of Winfrith in its Interim End State

Wylfa

Wylfa power station is located on Anglesey in North Wales. It was the last and largest power station of its type to be built in the UK. Electricity generation started in 1971 and is scheduled to continue until the end of 2015.

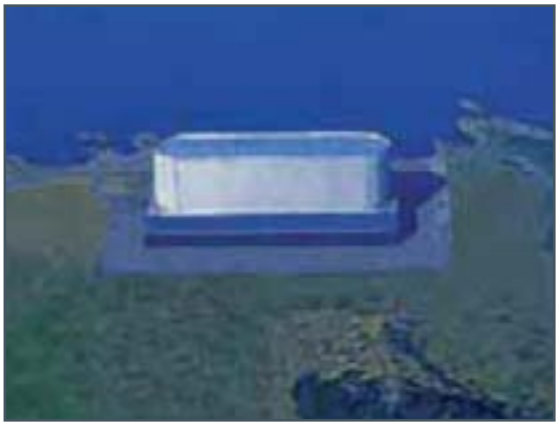
The NDA also has designated powers to manage and operate the Maentwrog hydro-electric power station, which was opened in 1928 and is situated near the Trawsfynydd site.

Site End State

The site end state to be secured by the NDA for designated land at Wylfa comprises the following:

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

On top of the last generating reactor



Artist's impression of Wylfa in Care and Maintenance

Dounreay

Dounreay site

Dounreay site has been the UK centre for fast reactor research and development since 1955 supporting a Materials Test Reactor (MTR) and two demonstration fast reactors as well as nuclear fuel reprocessing and fabrication. It has also supported commercial, world-wide, MTR fuel reprocessing and fabrication resulting in a range of nuclear and non-nuclear legacies including exotic fuels for conditioning & disposal, contaminated alkali metals, historic Intermediate Level Waste (ILW) and Low Level Waste (LLW) disposal sites and liquid ILW raffinates from the three distinctly different nuclear fuel cycles.

Dounreay Site Restoration Limited (DSRL) is the SLC responsible for the operation of the Dounreay site in Caithness, Scotland. The current PBO is Cavendish Dounreay Partnership Limited (CDP), a consortium comprising Cavendish Nuclear Ltd, CH2MHill and URS.

Strategy Implementation

DSRL continues to deliver the programme for reaching the defined interim end state by 2029 under a target cost closure contract. Over the last strategy period the mission of prompt decommissioning to an interim end state has seen significant increases in the scope of work. These changes have been as a result of increased security requirements and a change in the management of spent exotic fuels. The changes have not altered the fundamental strategy of risk and hazard reduction or the overarching objective to ensure that the restored site, along with any residual contamination, does not pose an unacceptable risk to human health or the environment.

Emptying the Dounreay Shaft and immobilising the highly radioactive liquid raffinate from Dounreay Fast Reactor (DFR)/ Prototype Fast Reactor (PFR) fuel reprocessing constitute some of the highest risks on Dounreay site. Good progress is being made in immobilising DFR and PFR.

Over the last strategy period, the removal of contaminated alkali metals and immobilisation of all MTR liquid raffinate streams has significantly reduced the hazard across the site. Work continues with residual alkali metal destruction in the PFR and DFR reactor vessels.

Significant hazard reduction is also achieved through the National Strategic Initiative to transfer all spent nuclear fuels to Sellafield.

Site decommissioning and remediation work is well underway with over 100 buildings already demolished. The dedicated LLW repository for Dounreay solid wastes, adjacent to the nuclear site, is receiving operational and demolition wastes and it is expected that final remediation of the site will be achieved by the interim end state date in 2029.

Looking forward, the key milestones associated with Strategy implementation are mainly to do with fuels disposition from the Dounreay site, liquid raffinate immobilisation to minimise the mobile hazard, shaft and silo emptying of ILW, demolition of reactors and fuel handling plants followed by a practical level of land remediation to take the site to an interim end state by 2029. No physical work is required from interim to final end state. However, the ILW Stores will need to be managed in accordance with Scottish government HAW policy *(ref 25)* and the developing implementation Strategy *(ref 28)*.

Site End State

The site end state to be secured by the NDA for designated land at Dounreay comprises the following:

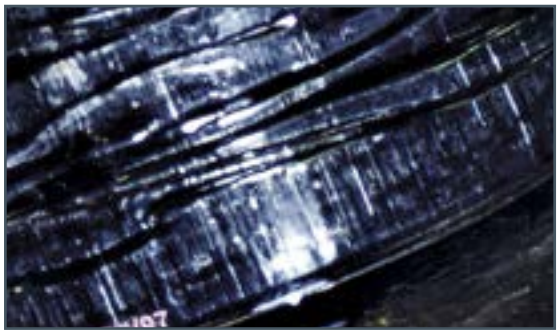
- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use
- existing waste disposal will either emptied or engineered for closure as determined by the relevant environmental safety case
- ILW will be stored on the site to comply with current Scottish government HAW policy.

LLW Facility ready to take waste

Artist's impression of Dounreay Interim End State

Low Level Waste Repository






Examples of Waste Management Services, top left - Metallic waste, top right - Packaging services, bottom left - Supercompactable wastes, bottom right - Combustible wastes

LLWR is located near Drigg in West Cumbria. The site has operated as a disposal facility since 1959 and is of strategic importance to most producers of low level nuclear waste (including hospitals and research laboratories) across the UK. Wastes are compacted and placed in containers before being transferred to the facility.

Low Level Waste Repository Limited (LLWR Ltd) is the SLC responsible for the operation of the LLW repository and delivering the National Programme for lower activity radioactive waste on behalf of the NDA. The PBO of the company is UK Nuclear Waste Management Limited (a consortium comprising AECOM, Studsvik, Areva and Serco).

Strategy Implementation

LLWR Ltd leads the implementation of the UK Solid LLW Strategy on behalf of the NDA. Key initiatives that LLWR have undertaken to implement the strategy include:

- development and implementation of a robust Environmental Safety Case
- opening up new waste routes so that LLW can be managed in ways other than direct disposal to LLWR
- stablishing a National LLW Programme to coordinate implementation of the strategy
- share best practice
- facilitate use of the new waste routes and demonstrate progress.

These foundations act to preserve capacity at the repository and support the embedding of a culture of good practice in LLW management within the industry. During 2013/14, 86% of LLW arisings were diverted from the repository, saving over 1000 Half Height ISO container equivalent of vault space.

Through the next strategy period LLWR will continue to implement NDA strategy at the site through key projects to complete clean-up and demolition of the plutonium contaminated material facilities and optimise operations at the site. LLWR will also continue with its national role implementing the UK Strategy for the Management of Solid LLW from the Nuclear Industry through the national programme.

Site End State

The site end state to be secured by the NDA for designated land at the Low Level Waste Repository is as follows:

- the disposed waste will remain in situ as determined by the site's Environmental Safety Case
- the physical state of the repository will reflect the optimised closure engineering described in the site's Environmental Safety Case
- access to the site will be managed in accordance with institutional controls
- the repository will remain subject to institutional controls for as long as required by the relevant regulatory regime to manage risks to people and the environment.

An artist's impression of Vault 9 after capping

Springfields

Springfields Fuels Ltd

Springfields site

Springfields is a nuclear fuel manufacturing site and is located near Preston in Lancashire. The site is used to manufacture a range of fuel products for both UK and international customers and for the decommissioning of historic uranic residues and redundant facilities.

Springfields Fuels Limited is the SLC responsible for the nuclear fuel manufacturing site decommissioning of historic uranic residues. The ownership of Springfields Fuels Limited was permanently transferred to Westinghouse Electric in 2010.

Strategy Implementation

The ownership of Springfields Fuels Limited allows Westinghouse Electric to set strategy for the site including the freedom to invest for the future under the terms of a new 150-year lease.

Springfields Fuels Limited is contracted to provide decommissioning and clean-up services to the NDA to address historic liabilities agreed prior to the sale. These services will be provided in accordance with NDA strategy.

A Residues Processing Agreement covers the processing of legacy uranic materials through a number of enriched and natural uranium processing routes.

A Decommissioning Agreement provides for the Post Operational Clean Out (POCO), Decommissioning and Demolition of historic facilities on the site.

Site End State

The site end state to be secured by the NDA for designated land at Springfields comprises the following;

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

Capenhurst

Capenhurst site

The Capenhurst site is located near Ellesmere Port in Cheshire and is home to both historic and operating uranium enrichment plants and associated facilities.

In 2012 the NDA-owned part of the site, containing legacy enrichment operations and materials, was transferred to URENCO UK, who were the owner/operator of the adjacent licensed site and undertook a process of amalgamation into a single nuclear licence.

Ongoing legacy-related activities previously undertaken by Sellafield Ltd have been contracted with Capenhurst Nuclear Services (a URENCO Group subsidiary and tenant on the site). This includes agreements for processing of NDA owned legacy materials, decommissioning of facilities and equipment and ongoing storage of material.

As part of the transfer some land had its Energy Act (2004) *(ref 1)* designations revoked and was sold to URENCO UK. Other areas remain designated and are leased.

Strategy Implementation

NDA strategy on the Capenhurst site is implemented through three main agreements signed with URENCO and Capenhurst Nuclear Services.

NDA and URENCO signed a Tails Management Agreement for the processing of UK government owned by-product/legacy material from uranium enrichment (known as Tails) through URENCO's Tails Management Facility. Decommissioning of legacy facilities and remediation of land is contracted through a decommissioning agreement, while the uranics storage agreement provides for the ongoing safe storage of nuclear materials on the site.

These agreements are in line with NDA strategy and it is anticipated that it will reduce NDA's net liabilities for managing and clearing the site while also paving the way for URENCO to invest in new facilities as required in order to meet future customer demand.

Site End State

The site end state to be secured by the NDA for designated land at Capenhurst comprises the following;

- radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land
- where the next planned use does not require a nuclear site licence the licence may be surrendered with any residual radioactive or non-radioactive contamination being subject to appropriate institutional control
- the physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.

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Appendices

A - Strategy Management System - Developing our Strategy

Strategy review and development is an ongoing process for the NDA and the options for delivering the strategy are continually evolving. To manage the complex interactions between the different parts of our Strategy we have a Strategy Management System (SMS) (7) which enables us to:

- develop strategy in a controlled fashion through distinct stages allowing us to engage effectively with government, nuclear regulators, SLCs and other stakeholders on its development and possible changes in strategic direction
- ensure the strategy is robust and coherent at all times, recognising the numerous interdependencies
- effectively respond to internal and external events that impact our strategy
- ensure compliance with the regulatory framework
- transparently underpin the decisions we make on preferred strategic options through the application of the Value Framework (5) (see Our Approach to Strategy).

The SMS approach allows us to respond to our strategic needs and manages the effects of internal and external influences. The SMS allows for NDA to manage its Strategy development in distinct stages to ensure that the ultimate strategy is robust and underpinned by rigorous business case analysis and the visibility of our rationale for decision-making is clear. We give great weight to stakeholder views and work closely with Site Licence Companies (SLCs), who will ultimately implement the strategies. Our SMS is staged process consisting of the following gates and stages:

Gate 0 – Research

The step wise process begins with research to define scope and confirm the overall objective and test how well the current strategy achieves that objective. The aim is to identify whether there are any issues or problems arising from the present strategy that might be overcome by a change in direction. In essence this stage sets out the strategic case for carrying out any strategic work and indicates the potential scope of the programme and key interfaces and boundaries.

Gate A – Credible options

Work carried out in the next stage identifies all the potential options that could achieve the stated objective along with screening criteria based on the Value Framework that are applied to develop a list of credible options for taking forward for further analysis and consideration.

Gate B – Preferred option

The purpose of the next stage is to assess and select the preferred strategic option. In selecting a preferred option we consider a wide range of relevant factors including health, safety and the environment, technical, financial, economic and social effects, including the impact on local communities. We call this combination of factors our Value Framework and which is designed to ensure value for money and build the requirements of statutory assessments into the heart of our strategy development and strategic decision-making.

Gate C – Approvals

The preferred option is taken forward for approval where funding and delivery mechanisms are considered in further detail.

Stage D – Implementation

Stage D is the first stage in the implementation of our strategy where our requirements are translated into action by means of specifications issued to the SLCs detailing what our strategy means for each site. Our strategic requirements are then translated into delivery plans by our SLCs, who are monitored and held to account for their performance against incentivised delivery milestones.

Gate E - Review

We continuously monitor the health of our strategy delivery and will review the continued appropriateness of the preferred option using strategic tolerances and periodic reviews.

The SMS is designed to ensure the development of a coherent and robust strategy for the delivery of our mission. The SMS has been used to develop the strategies covered in this document. The key outputs from the SMS are:

- the NDA Strategy which is subject to periodic review, formal public consultation and approval by ministers prior to publication (this document)
- individual topic strategies (Gated Papers) which define the NDA's strategic position on a particular subject
- Site Strategic Specifications and Client Specifications that are issued to our SLCs to ensure our strategic requirements are incorporated into our SLCs' Lifetime Plans and delivered.
- Strategic Tolerances for monitoring the deliverability of the strategy and a defined set of contingent strategies to mitigate against the consequences of a failure of strategy.

Direct Rail Services Limited

Direct Rail Services (DRS) is approaching its 20th year of operation, nine of which have been under the ownership of the NDA. DRS provides rail and road transport capability to the nuclear estate through arm's length contracts with nuclear generators, site licence companies, Tier 1, 2 and 3 contractors, International Nuclear Services and the Ministry of Defence as well as other commercial customers to the rail industry.

Strategy

DRS is owned by NDA in order to provide security of supply for nuclear movements. To help ensure sustainability, create a critical mass and reduce costs, DRS pursue non-nuclear transport opportunities where it can do so without negative impacts on the nuclear transport capability.

The strategy has the objective of minimising the environmental impact of transportation through the optimisation and coordination of rail movements between nuclear facilities. In addition value for money for the tax payer is delivered through key non-nuclear commercial agreements for other rail transport services.

In accordance with the NDA transport and logistics strategy DRS seeks opportunities to provide rail transport solutions over road where practicable utilising existing routes and assets as a preference.

Key to delivering the NDA's transport strategy is the maintenance of capability and expertise in road and rail transport within the DRS organisation in order to deliver the long-term needs of the NDA mission.

Transport of Low Level Waste to the Repository

International Nuclear Services Limited

International Nuclear Services Limited (INS) is a commercial management and nuclear transport company with extensive experience in contract management, international transport and packaging design and licensing.

INS manages the NDA's large portfolio of contracts for nuclear fuel management and nuclear transport services. In partnership with the Civil Nuclear Constabulary, INS also contributes to improving global nuclear security with its unique capability for high security nuclear shipments.

A newer portfolio of activities includes marketing the NDA's entire catalogue of intellectual property and lessons learned, as well as facilitating new relationships between UK firms and Japan's nuclear industry. INS is the majority shareholder and operator of Pacific Nuclear Transport Limited.

Strategy

INS's 10-year strategy is to support the NDA mission while growing a successful and profitable nuclear transport business. This strategy specifically supports the NDA mission by:

- repatriating nuclear waste at Sellafield to its country of origin, thereby reducing the overseas radiological inventory in the UK
- efficiently managing the NDA's portfolio of contracts with utility companies
- providing contract management services to the NDA including for Capenhurst and Springfields
- maintaining its shipping skills by undertaking transports not related to NDA obligations
- using its long-standing relationships with the Japanese nuclear industry to create commercial opportunities for UK plc; and more widely in the Far East to market the NDA's intellectual property.

Vitrified waste returns

NDA Archives Limited

The NDA owns all of the information (with a few minor exceptions) held within and generated by the subsidiaries and SLCs which comprise the NDA Estate. The NDA is obliged by various statutes, regulatory and business-led requirements to manage, protect and make available these records to the standards required of a responsible public body. The need to actively manage many of these records will outlive the organisation that created them resulting in a requirement for a centralised management solution and a compliant, secure and accurate system to ensure appropriate access to information to the next organisation responsible (e.g. waste records to an operator of a Geological Disposal Facility).

Strategy

Once operational the NDA Archives Limited Board will approve one and five year business plans submitted by the commercial partner and in accordance with the ongoing NDA Information Governance Strategy and underpinning National Programme. These business plans will form the basis of the day-to-day activities for both the core and non-core activities within the Archive.

This will also include the approval, or otherwise, of the Commercial Partner's plans to engage with other third-party contracts. It will also include the management plan for the Highland Council's North Highland Archive collection which will be co-located within the facility.

The Archive sod cutting ceremony in August 2015

NDA Properties Limited

The Company manages non-nuclear property assets within the NDA Group and develops selective property projects to support the NDA's wider objectives.

Pelham House, Calderbridge, Cumbria

Strategy

NDA Properties Limited strategy is to:

- manage and provide suitable land and property
- identify and deliver savings in expenditure on managing property assets
- continue the programme of surplus asset divestment
- develop selected sustainable assets according to best practice principles

Rutherford Indemnity Limited

Rutherford Indemnity Limited (Rutherford) is a regulated captive insurance company, licensed in Guernsey, and provides insurance to the NDA, NDA subsidiaries, SLCs and, in respect of certain risks, contractors and the Parent Body Organisations (PBOs). Its role is to assist in securing cost effective insurance cover for the estate, while providing some insulation to the NDA budget from the immediate financial impact of retained risks.

Strategy

Rutherford participates in a number of the NDA's insurance programmes providing protection against a variety of losses, including (but not limited to) property, nuclear liability and general liability. The company retains a prudent proportion of the risks underwritten where it makes financial sense to do so and sources reinsurance protection from organisations with approved security ratings for the more volatile risks. By demonstrating a significant financial commitment to the insurance markets, Rutherford is able to secure appropriate financial protection for the NDA estate on competitive terms.

Radioactive Waste Management Limited

NDA established Radioactive Waste Management Ltd (RWM) as a wholly-owned subsidiary on 1 April 2014 with the responsibility for planning and ultimately implementing geological disposal of higher activity wastes in accordance with UK government policy. This includes providing advice to waste producers so that such wastes generated throughout the UK are conditioned and packaged in a manner suitable for eventual disposal.

RWM vision is a safer future by managing radioactive waste effectively, to protect people and the environment.

Strategy

RWM strategy is to

- work with the NDA to deliver an optimised programme for the management of higher activity radioactive waste by sharing knowledge and promoting good practice and innovation in retrieving, treating and storing wastes prior to disposal
- engage proactively at an early stage with waste producers to develop and deliver prioritised programmes of disposability assessments by reflecting NDA priorities in the development of the disposability assessments
- deliver a programme for implementation of geological disposal in the UK in line with the 2014 White Paper and UK government policy by establishing and delivering a comprehensive programme for all stages of GDF implementation
- continue to engage with the regulators to ensure the availability of necessary capability, organisation, resources and arrangements to apply for and hold environmental permits and a site licence, ahead of the time they are needed
- have arrangements in place for regulatory scrutiny which enables the regulators to provide advice on organisational development, as well as current activities such as the provision of advice on the disposability of proposed waste packages
- develop and maintain RWM as a capable and competent organisation with the skills and expertise to deliver their programme. The nature of the programme of work is such that the specific resources are required at different stages of the programme. To accommodate these changes RWM will make extensive use of the supply chain, while maintaining core knowledge within the organisation covering the nature and quantity of the waste, design concepts, safety and environmental assessments and underpinning research
- engage with appropriate stakeholders to help create the conditions which could lead to identification of a community, or communities, willing to participate in the process for siting a GDF set out in the 2014 White Paper. RWM will develop and implement a comprehensive engagement programme to raise awareness and provide information nationally about geological disposal. Building on that, we will engage in more detail at the local level with stakeholders and communities potentially interested in hosting a geological disposal facility
- develop and maintain the geological disposal concepts which underpin waste packaging advice and provide a basis for the siting and development of a GDF. RWM will undertake scientific and engineering work to support development of geological disposal concepts while reflecting the changes to the radioactive waste inventory and the understanding gained through their research programme
- benefit from the exchange of knowledge and expertise through co-operation with overseas waste management agencies by establishing long-term relationships with overseas waste management agencies through both formal and informal mechanisms. RWM will aim to transfer technology and knowledge from more advanced programmes to help reduce project risk and avoid unnecessary costs.

Glossary

As Low As Reasonably Practicable (ALARP)

To satisfy this principle, measures necessary to reduce risk must be taken until the cost of these measures whether in money, time or trouble, is disproportionate to the reduction of risk. (Cm 2919) (Edwards v.National Coal Board [1949]).

Best Available Technique

BAT is defined as the most effective and advanced stage in the development of activities and their methods of operation, which indicates the practical suitability of particular techniques for providing, in principle, the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and impact on the environment as a whole.

Best Practicable Means

BPM is a term used by the Environment Agency (EA) and Scottish Environment Protection Agency (SEPA) in authorisations issued under the Radioactive Substances Act. Essentially, it requires operators to take all reasonable practicable measures in the design and operational management of their facilities to minimise discharges and disposals of radioactive waste, so as to achieve a high standard of protection for the public and the environment. BPM is applied to such aspects as minimising waste creation, abating discharges, and monitoring plant, discharges and the environment. It takes account of such factors as the availability and cost of relevant measures, operator safety and the benefits of reduced discharges and disposals. If the operator is using BPM, radiation risks to the public and the environment will be ALARA.

Broadly Acceptable

Risks falling into this region are generally regarded as insignificant and adequately controlled. The level of risk below which, so long as precautions are maintained, it would not be reasonable to consider further improvements to standards if these involved a cost.

Business Case

Provides evidence and rationale to support decision-making, and gives assurance to stakeholders that the NDA has acted responsibly. The business case process involves close scrutiny of all relevant financial and non-financial aspects of a proposed project, ensuring an optimal solution is selected for a given set of circumstances and that the identified benefits can be realised.

Care and Maintenance

When a plant/facility/installation is kept in a state of Care and Maintenance, it is made safe for a planned period of quiescence, after which decommissioning activities will recommence. At Magnox sites, Care and Maintenance begins when the only significant buildings on a site are the reactor buildings and an ILW store, which will be removed at the dismantling stage.

Client Specification

The Client Specifications define the required scope of work within the contracts issued to our SLCs. Typically the Client Specifications describe a set of outcomes rather than detailed deliverables and they are based on NDA Strategy so that there is a clear link between NDA Strategy and what is delivered by the SLCs.

Cogent

This is the Sector Skills Council for the nuclear industry - www.cogent-ssc.com

Decommissioning

Taking a facility permanently out of service once operations have finally ceased, including decontamination and full or partial dismantling of buildings and their contents.

De-designation

This is a shortened expression which means a Revocation or Modification of a Designating Direction. Designations are made by the Secretary of State and for sites in Scotland by the Secretary of State in conjunction with the Scottish Ministers and laid before the UK Parliament and as appropriate in the Scottish Parliament.

Decay storage

Storing radioactive materials to allow radioactive decay. After decay storage materials will be less radioactive and will fall into a lower activity classification (for example ILW will become LLW). Decay storage is only suitable for materials with short half lives.

Designation/designated

All nuclear installations on land owned by the NDA are designated as such under the Energy Act 2004. A designation is a specific description which controls use as a nuclear asset. Designations are made by the Secretary of State and for sites in Scotland by the Secretary of State in conjunction with the Scottish Ministers and laid before the UK Parliament and as appropriate in the Scottish Parliament.

Directive Waste

The phrase Directive Waste refers to European legislation called the Waste Framework Directive. This identifies the environmental protection principles behind waste regulation. It also identifies which wastes are covered by these principles and those which are not. It does not include radioactive waste, but does include the majority of non-radioactive wastes generated at NDA sites.

Disposition

Consignment of, or arrangements for the consignment of, material to some specified (interim or final) route or form.

Environmental Safety Case

A set of substantiated claims concerning the environmental safety of disposals of solid radioactive waste. It will be provided by the developer or operator of a disposal facility and should demonstrate that the health of members of the public and the integrity of the environment are adequately protected.

Geological disposal

A long-term management option involving the emplacement of radioactive waste in an engineered underground geological disposal facility or repository, where the geology (rock structure) provides a barrier against the escape of radioactivity and there is no intention to retrieve the waste once the facility is closed.

Glossary contd

Hazard

Hazard is the potential for harm arising from an intrinsic property or ability of something to cause detriment.

Hazardous Waste

Hazardous waste is essentially waste that contains hazardous properties that may render it harmful to human health or the environment. The European Commission has issued a Directive on the controlled management of such waste (91/689/EEC) and hazardous waste is defined on the basis of a list drawn up under that Directive. Examples include asbestos, lead-acid batteries, oils and solvents.

Health Impact Assessment

Assesses the potential effects of NDA Strategy upon public health. Health Impact Assessment is undertaken as part of the Integrated Impact Assessment to understand the potential risks for health effects associated with implementation of NDA Strategy.

High Level Waste

High Level Waste is heat generating waste that has accumulated since the early 1950s at Sellafield and Dounreay, primarily from the reprocessing of spent nuclear fuel. The temperature in HLW may rise significantly, this factor has to be taken into account when designing storage or disposal facilities.

Integrated Impact Assessment

The Integrated Impact Assessment of NDA Strategy comprises the combined assessment results of a strategic environmental assessment (SEA), health impact assessment (HIA) and socio-economic impact assessment (SeA).

Institutional Control

Institutional Control is a legal or administrative tool or action taken to reduce the potential for exposure to hazardous substances. Institutional controls may include, but are not limited to, land use restrictions, environmental monitoring requirements, and site access and security measures.

Intermediate Level Waste

Waste with radioactivity levels exceeding the upper boundaries for Low Level Waste (LLW), but which does not need heating to be taken into account in the design of storage or disposal facilities. ILW arises mainly from the reprocessing of spent fuel, and from general operations and maintenance of radioactive plant. The major components of ILW are metals and organic materials, with smaller quantities of cement, graphite, glass and ceramics.

Intolerable Risk

Above a certain level, a risk is regarded as intolerable and cannot be justified in any ordinary circumstance.

Irradiated fuel

Fuel assemblies taken out of a nuclear reactor after a period of energy production.

Land use Planning Regime

The responsibility for land use planning rests primarily with local planning authorities. The remedial measures required to allow site redevelopment and ensure a site is 'suitable for use' are agreed through the planning regime. The majority or remedial action undertaken on brownfield sites in the UK is through the planning regime. This approach is encouraged through the governments National Planning Policy Framework.

Lifetime Plans

The Lifetime Plan is produced by the site contractor to meet a contractual requirement of the NDA, and is revised annually. It gives details of the planned activities and costs of the work required to fully decommission the site to an agreed end state. The combination of all Lifetime Plans across the NDA estate yields the total cost of dealing with the NDA's liabilities.

Low Level Waste

Low Level Waste which includes metals, soil, building rubble and organic materials, arising principally as lightly contaminated miscellaneous scrap. Wastes other than those suitable for disposal with ordinary refuse, but not exceeding 4 GBq/te (gigabecquerels) of alpha or 12 GBq/te of beta/gamma activity. Metals are mostly in the form of redundant equipment. Organic materials are mainly in the form of paper towels, clothing and laboratory equipment that have been used in areas where radioactive materials are used – such as hospitals, research establishments and industry. The National Repository for LLW is near Drigg, Cumbria.

Monitored Natural Attenuation

Monitors the effects of naturally occurring physical, chemical, and biological processes or any combination of these processes to reduce the load, concentration, flux or toxicity of polluting substances in ground or groundwater in order to obtain a sustainable remediation objective.

Near site, near surface disposal facilities

Facilities located at the surface of the ground or at depths down to several tens of metres below the surface. Near surface facilities may use the geology (rock structure) to provide an environmental safety function, but some may rely solely on engineered barriers.

Non-Radioactive Waste

We use the term non-radioactive waste to describe those wastes generated at our sites that are not radioactive waste. It includes both hazardous and non-hazardous waste.

Nuclear Site Licence

A formal notification of the authorised body which can operate a nuclear operation under the Nuclear Installations Act 1965.

OSPAR

(Oslo-Paris Convention) Convention which established requirements on the level of nuclear and non-nuclear discharges to the marine environment of the North East Atlantic, the North Sea and the Irish Sea.

Parent Body Organisation

Entities, competitively selected by the NDA, that own the SLCs for the duration of their PBO contract, responsible for bringing improvement in SLC performance.

Post Operational Clean Out

POCO – the fi rst stage in preparing plant for Care and Maintenance after operations have ceased.

Quiescence

A period of reduced activity for sites and facilities with appropriate management arrangements including those required for site security, monitoring, maintenance and records management.

Repatriation

The process of returning material/waste to the place of origin.

Research Board

Focused on Decommissioning and Clean-Up in the UK, set up by NDA to look at strategic coordination of R&D issues. Current members of the Board include Government representatives, Regulators, Engineering and Physical Sciences Research Council (EPSRC) and the NDA.

Risk

Risk is the chance that someone, or something that is valued, will be adversely affected by the hazard.

Safety Case

A safety case is the written documentation demonstrating that risks associated with a site, a plant, part of a plant or a plant modification are As Low As Reasonably Practicable and that the relevant standards have been met. safety cases for licensable activities at nuclear sites are required as licence conditioned under the Nuclear Installations Act.

Site Licence Company

Entities that deliver the NDA's programmes of work on the sites, under contract to the NDA. SLCs are owned by competitively selected Parent Body Organisations. SLCs employ the majority of staff, place contracts with the supply chain, and hold the authorisations for the activities they undertake, particularly the Nuclear Site Licences for the sites for which they are responsible. Some SLCs operate a single site, whereas others operate multiple sites.

Site Strategic Specification

Site Strategic Specifications define the required outcomes based on NDA Strategy so that there is a clear link between NDA Strategy and what is delivered by the SLCs.

Socio-economic Impact Assessment

Assesses the potential socio-economic effects of NDA Strategy. Socio-economic Impact Assessment is undertaken as part of the Integrated Impact Assessment to understand the socio-economic effects associated with implementation of NDA Strategy.

Strategic Environmental Assessment

SEA refers to the type of environmental assessment legally required by the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004/1633) and the Environmental Assessment (Scotland) Act. SEA for NDA Strategy is undertaken as part of the Integrated Impact Assessment to understand the significant environmental effects of implementing NDA Strategy.

Strategy Management System

The SMS is a management tool used to develop, control and communicate our Strategy for decommissioning and cleaning up the UK's civil public sector nuclear sites. It also provides the basis for the periodic review of our Strategy which summarises the current strategy at the time that it is published.

Thermal treatment

Any waste treatment technology that involves high temperatures in processing the feedstock and is normally deployed to enable the volume of radioactive waste for storage or disposal to be reduced. All thermal treatment technologies require an off-gas system to capture any gaseous radioactive waste produced during treatment and give the ability to manage the concentrated radioactive waste product that is produced as a result of the process.

Tolerable Risk

Tolerability does not mean 'acceptability'. It refers to a willingness to live with a risk so as to secure certain benefits and in the confidence that it is being properly controlled. To tolerate a risk means we do not regard it as negligible or something we might ignore, but rather as something we need to keep under review and reduce still further if and as we can.

Value Framework

A combination of factors which we consider when selecting a preferred strategic option, helping us balance our top priority of risk and hazard reduction alongside socio-political and affordability considerations. The Value Framework incorporates the requirements of the Integrated Impact Assessment.

Waste Hierarchy

A hierarchical approach to minimise the amounts of waste requiring disposal. The hierarchy consists of non-creation where practicable; minimisation of arisings where the creation of waste is unavoidable; recycling and re-use; and, only then, disposal.

** Formerly British Energy*

Abbreviations

AGR	Advanced Gas-Cooled Reactor
ALARP	As Low As Reasonably Practicable
BAT	Best Available Technique
BNFL	British Nuclear Fuels Limited
BPM	Best Practicable Means
CCFE	Culham Centre for Fusion Energy
CDP	Cavendish Dounreay Partnership Limited
CFP	Cavendish Fluor Partnership
CPNI	Centre for Protection of National Infrastructure
CS	Client Specification
DECC	Department of Energy and Climate Change
DFR	Dounreay Fast Reactor
DRS	Direct Rail Services
DSRL	Dounreay Site Restoration Limited
DWMP	Decommissioning and Waste Management Plans
EC	European Commission
EDFE	EDF Energy
EDRAM	Environmentally Safe Disposal of Radioactive Material
FGMSP	First Generation Magnox Storage Pond
GDF	Geological Disposal Facility
HASTs	High Active Storage Tanks
HAW	Higher Activity Waste
HEU	High Enriched Uranium
Hex	Uranium Hexafluoride Tails
HIA	Health Impact Assessment
HLW	High Level Waste
HSSSEQ	Health, Safety, Security, Safeguards, Environment & Quality
IAEA	International Atomic Energy Agency
IIA	Integrated Impact Assessment
ILW	Intermediate Level Waste
INS	International Nuclear Services
LETP	Liquid Effluent Treatment Plant
LLW	Low Level Waste
LLWR	Low Level Waste Repository
LLWR Ltd	Low Level Waste Repository Limited
LP&S	Legacy Ponds and Silos
LTP	Lifetime Plan
MDU	Magnox Depleted Uranium
MoD	Ministry of Defence
MOP	Magnox Operating Programme
MOX	Mixed Oxide Fuel
MPA	Major Projects Authority
MSSS	Magnox Swarf Storage Silo
MTIP	Magnox Throughput Improvement Plan
MTR	Materials Test Reactor
NDA	Nuclear Decommissioning Authority
NDPB	Non-Departmental Public Body
NEA	Nuclear Energy Agency
NIGLQ	Nuclear Industry Group for Land Quality
NIRAB	Nuclear Innovation and Research Advisory Board
NLF	Nuclear Liabilities Fund
NNL	National Nuclear Laboratory
NPL	National Physical Laboratory
NPV	Net Present Value
NSAN	National Skills Academy for Nuclear
NWDRF	Nuclear Waste and Decommissioning Research Forum
OGC	Office of Government Commerce
ONR	Office for Nuclear Regulation
OSPAR	Oslo and Paris Conventions to protect the marine environment of the North-East Atlantic
RSS	Radioactive Substances Strategy
PAS-55	Publically Available Specification - 55
PBO	Parent Body Organisation
PFR	Prototype Fast Reactor
PNTL	Pacific Nuclear Transport Limited
POCO	Post Operational Clean Out
R&D	Research and Development
RWM	Radioactive Waste Management Ltd
SCAN	Supply Chain Apprenticeships for Nuclear
SDR	Site Decommissioning and Remediation
SeA	Socio Economic Impact Assessment
SEA	Strategic Environmental Assessment
SGHWR	Steam Generating Heavy Water Reactor
SLC	Site Licence Company
SME	Small and Medium Enterprises
SMP	Sellafield MOX Plant
SMS	Strategy Management System
SPRS	Sellafi eld Product and Residue Store
SSA	Shared Services Alliance
SSG	Site Stakeholder Group
SSS	Site Strategic Specification
STEM	Science Technology Engineering and Maths
T&LWG	Transport and Logistics Working Group
THORP	Thermal Oxide Reprocessing Plant
TMF	Tails Management Facility
TPU	THORP Product Uranium
TRS	Talent Retention Solution
UKAEA	United Kingdom Atomic Energy Authority
VF	Value Framework
VLLW	Very Low Level Waste