Magnox Limited – Integrated Decommissioning and Waste Management Strategy

May 2016
Executive Summary

Under contract with the NDA, Magnox is responsible for delivering the clean-up and restoration of the 12 Magnox sites in line with the NDA mission.

Site decommissioning and remediation is the primary focus of the company aiming to achieve the site end state to “make the site suitable for the next planned use”. The waste management strategy supports / enables its delivery.

The decommissioning strategy involves systematic and progressive hazard reduction and takes advantage where possible of the process of natural radioactive decay to reduce levels of radioactivity and hence risk to people and the environment.

The decommissioning strategy for each site includes one or more periods when the plant/facility is purposely kept in a state of “care and maintenance” or “quiescence” as part of the programme for achieving the site end state. Therefore, the sites will work towards interim states in the near-term. Hazards will be removed to ensure risks remain tolerable and As Low As Reasonably Practicable (ALARP) at all times, including during any period of quiescence.

The near-term company objective is to deliver the Magnox sites into a safe and secure interim state. This will involve reducing hazards on site by:

- Transfer of all spent fuel to off-site facilities for treatment and storage;
- Transfer of nuclear materials to off-site facilities for management;
- Dismantling reactors or preparing reactor buildings for safe storage;
- Decommissioning redundant facilities;
- Retrieving, treating, packaging and disposal/storage of waste; and.
- Managing contaminated land.

The Magnox integrated decommissioning and waste management strategy has been developed to ensure that activities are carried out in a way that protects people, plant and the environment; complies with Government policies; and provides value for money.

This document is submitted by Magnox Limited to the NDA as a statement of company strategy. Implementation of the company strategy on a site is subject to regulatory permissioning; it is dependent on completion of all necessary underpinning and the granting of appropriate authorisations, licenses, permits or approvals.
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1 Introduction

1.1 Background

The Nuclear Decommissioning Authority (NDA) is a strategic authority established in 2005 under the Energy Act 2004. It is responsible for decommissioning and clean-up of civil nuclear facilities and delivers its strategy through licensed operators known as site licence companies.

Magnox Ltd1, owned by Cavendish Fluor Partnership, is the management and operations contractor responsible for 12 nuclear sites (see Figure 1) and one hydroelectric plant in the UK working for the sites' owner, the NDA.

Following the change in Parent Body Organisation (PBO) in September 2014, Magnox has reviewed the decommissioning and waste management strategy. The revised strategy is presented here.

1.2 Purpose

The purpose of this document is to define the company decommissioning and waste management strategy for the 12 Magnox nuclear licensed sites.

The company integrated decommissioning and waste management strategy is developed in accordance with the requirements of current legislation, government policies, regulatory requirements, the NDA strategy and company environment, health & safety policy.

1.3 Scope

The strategies contained within this document apply to all the company’s nuclear licensed sites (and associated land-holdings), and all their wastes, ie radioactive and non-radioactive, solid, aqueous and gaseous wastes. The strategy covers the site lifecycle, focusing on the post-defuelling phases.

This document describes the company decommissioning and waste management strategy only. It does not provide tactical detail on the methods that will be deployed to deliver the strategies at the sites; these are generally determined via a programme approach to deliver common solutions across the company.

Site specific decommissioning and radioactive waste management strategy is described in the site appendices. Implementation of the company strategy on a site is subject to regulatory permissioning; it is dependent on completion of all necessary underpinning and the granting of appropriate authorisations, licenses, permits or approvals.

Figure 1: Magnox sites.

1 Formerly two separate site licence companies: Magnox Ltd and Research Sites Restoration Ltd.


Dragon reactor at Winfrith
2 Objectives and Aims

2.1 Overarching Objectives

Magnox is responsible for delivering the clean-up and restoration of the 12 Magnox sites in line with the NDA mission.

Site decommissioning and remediation is the primary focus of the company. The waste management strategy supports / enables its delivery.

The Magnox strategy is driven by the NDA’s objectives, which are set out in the NDA Strategy to support their mission. The relevant NDA objectives are identified throughout this document.

On behalf of the NDA, Magnox manage the sites through their lifecycles, overseeing all aspects decommissioning.

The Magnox integrated decommissioning and waste management strategy has been developed to ensure that activities are carried out in a way that protects people, plant and the environment; complies with Government policies; and provides value for money.

2.2 Near-term Objectives

The near-term company objective is to deliver the Magnox sites into a safe and secure state. This will involve reducing hazards on site by:

- Transfer of all spent fuel to off-site facilities for treatment and storage;
- Transfer of other nuclear materials to off-site facilities for management;
- Dismantling reactors or preparing reactor buildings for safe storage;
- Decommissioning redundant facilities;
- Retrieving, treating, packaging and disposal/storage of waste; and
- Managing contaminated land.

Following the change in PBO and merger of site licence companies, a key short-term objective is to establish a single integrated strategy for the 12 Magnox sites. This will be achieved through adopting a programme approach.

![Figure 2: Waste Hierarchy](image-url)

- Avoid excavation of material which might become waste by in-situ management
- Segregation of waste at workplace by: waste category, physical, chemical and radiological properties to reduce the volumes of higher activity waste
- Consolidated stores reducing build and maintenance resources
- Decontamination to enable reuse/recycling or management as a lower category of waste
- Re-use out-of-scope building rubble and soil from decommissioning to backfill voids
- Re-profile land with material from adjacent areas
- Reuse of decommissioning tools and equipment within and between sites
- Use of local recycling facilities for out-of-scope wastes
- Use of LLWR framework and metal recycling route
- Use of commercial “waste-to-energy” combined heat and power generation as disposal route for out-of-scope combustible waste
- Use of the LLWR framework incineration and VLLW route
- Maximising packaging efficiency by appropriate waste package selection
- Treatment to reduce waste disposal volumes, such as compaction, size reduction or dissolution
2.3 Waste Hierarchy

The waste hierarchy (see Figure 2) provides a key input to decisions regarding the management of waste. Prevention and minimisation of waste generated is preferable in the first instant. Where wastes are generated, reuse and recycling are preferred to disposal.

The application of the waste hierarchy requires a balance of priorities including protection of health, safety, security and the environment, value for money, affordability and technical maturity. Magnox applies the waste hierarchy to the management of all waste.

2.4 Interactions with Other Policies, Strategies and Plans

The Magnox integrated decommissioning and waste management strategy has been developed to be compliant with UK legislation; be consistent with government policy, NDA strategy and company policy; to take due account of regulatory and stakeholder views; and to take due account of regulatory and industry guidance.

Figure 3 illustrates the integration of the strategy within this document with government policy; NDA strategy; site underpinning and justification; and the reporting of progress on delivery.

Implementation of strategies at sites is controlled via company management arrangements. Site specific documents will detail and justify the implementation of the strategy at each site.

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**Figure 3: interactions with other strategies and plans.**

<table>
<thead>
<tr>
<th>EU Directives</th>
<th>International standards and guidance (e.g. IAEA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UK and devolved Government Policy</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Rad Waste Policy</td>
<td>UK Policy for Management of Solid LLW</td>
</tr>
<tr>
<td>Command 2919</td>
<td>Managing Radioactive Waste Safely</td>
</tr>
<tr>
<td>Scottish HAW Policy</td>
<td>Welsh HAW Policy</td>
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</tbody>
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<table>
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<tr>
<th><strong>National Strategy</strong></th>
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<tr>
<td>Non-Rad Waste Strategies</td>
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<tr>
<td>UK Nuclear Industry LLW Strategy</td>
</tr>
<tr>
<td>UK Strategy for Radioactive Discharges</td>
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<tr>
<td>Scottish HAW Implementation Strategy</td>
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<tr>
<td>NDA Strategy</td>
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<tr>
<td>Others</td>
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<th><strong>Company Strategy (WS)</strong></th>
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<tr>
<td>Decommissioning Strategy</td>
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<tr>
<td>Integration &amp; decision making processes</td>
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<tr>
<td>Waste Management Strategy</td>
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<td>Rad waste strategy</td>
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<tr>
<td>Non-rad waste strategy</td>
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<td>Discharges strategy</td>
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<th><strong>Implementation</strong></th>
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<tbody>
<tr>
<td>Implementation plans &amp; underpinning</td>
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<td>Company reporting</td>
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<tr>
<td>R&amp;D</td>
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<tr>
<td>LTP</td>
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<tr>
<td>LC35 Decom. Programme</td>
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<tr>
<td>Land Quality Strategy</td>
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<td>RWMC</td>
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<tr>
<td>UK RWI</td>
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<tr>
<td>IWS Action Plan</td>
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<tr>
<td>TBuRD</td>
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3 Decommissioning Strategy

**NDA Objective:**
- To decommission and remediate our designated sites, and release them for other uses.
- To deliver Site End States as soon as reasonably practicable with a progressive reduction of risk and hazard.
- To ensure that land quality is managed to protect people and the environment.
- To define credible objectives for the restoration of each site (or part of a site).
- To optimise the re-use of NDA sites.

### 3.1 Site End States

A site end state describes the condition to which a site needs to be restored. The physical end state of the Magnox sites will be to:

“make the site suitable for the next planned use”

Current working assumptions to achieve the site end states are:

- All buildings will be removed from the site.
- Some subsurface structures will remain on the site (ie brownfield site).
- Nuclear site licences and EPR10 permits / RSA93 authorisations surrendered.

It is the preference of the NDA to retain flexible site end state definitions until planning commences for the final stages of restoration. The definitions will be reviewed, in consultation with stakeholders, as decommissioning progresses.

Harwell and Winfrith sites will achieve their site end state on shorter timescales compared to the other sites. Therefore, their site end states are more defined. The assumed next uses are: a science and technology park for Harwell; and natural heathland for Winfrith.

The Magnox sites will work towards achieving their site end states over their lifecycle. The work will be carried out over a series of strategy phases, as described in the Section 3.2.

### 3.2 Decommissioning Strategy Phases

The decommissioning strategy involves systematic and progressive hazard reduction and takes advantage where possible of the process of natural radioactive decay to reduce levels of radioactivity and hence risk to people and the environment.

Harwell and Winfrith are adopting an early reactor dismantling strategy whereas for the remaining Magnox Sites, a deferred reactor dismantling strategy is being adopted. Deferring reactor dismantling on these sites allows benefits to be gained from radioactive decay and manages existing constraints on the availability of waste routes.

In both cases a staged approach to the decommissioning and restoration of the site is being undertaken.

The decommissioning strategy for each site includes one or more periods when the plant/facility is purposely kept in a state of “care and maintenance (C&M)” or “quiescence” as part of the programme for achieving the site end state (see Figure 4).

The sites will work towards interim states in the near-term which are further defined within this document. Hazards will be removed to ensure risks remain tolerable and As Low As Reasonably Practicable (ALARP) at all times, including during any period of quiescence.
## Decommissioning Strategy Phases

### Harwell
- **Site Interim State**
  - Reactor dismantling
  - Waste processing & dispatch
  - ILW packaging
  - ILW Store construction
  - Redundant facility demolition, land remediation & delicensing (outside B462)
  - Prepare B462 for C&M
- **Site End State**
  - Care & Maintenance
  - Final Site Clearance
  - Dispatch of ILW packages
  - Demolition of ILW Stores
  - Land remediation
  - Surrender nuclear site licence & EPR10 permit

### Winfrith
- **Site Interim State**
  - Reactor dismantling
  - Redundant facility demolition & land remediation
  - Waste processing & dispatch
  - ILW packaging
- **Site End State**
  - Quiescence
  - Radioactive decay
  - Land monitoring
  - Surrender nuclear site licence & EPR10 permit

### Berkeley, Bradwell, Dungeness A, Hinkley Point A, Oldbury, Sizewell A, Trawsfynydd, Wylfa
- **Site Interim State**
  - Reactor safestore preparations
  - Waste processing & dispatch
  - ILW packaging
  - ILW Store construction (as required)
  - Redundant facility demolition / make safe
  - Land management
- **Site End State**
  - Care & Maintenance
  - Final Site Clearance
  - Reactor dismantling
  - Demolition of all other facilities
  - Waste processing & dispatch
  - Land remediation
  - Surrender nuclear site licence & EPR10 permit

### Chapelcross, Hunterston A
- **Site Interim State**
  - Reactor safestore preparations
  - Waste processing & dispatch
  - ILW packaging
  - ILW Store construction
  - Redundant facility demolition / make safe
  - Land management
- **Site End State**
  - Care & Maintenance
  - Care & Maintenance
  - Reactor Dismantling & Site Restoration
  - Long-Term Storage of ILW
  - Final Site Clearance
  - ILW package monitoring & inspection
  - Replacement ILW Store construction
  - Dispatch of ILW packages
  - Demolition of ILW Stores
  - Surrender nuclear site licence & RSA93 authorisation
3.3 Decommissioning Strategy

Site decommissioning and remediation is the primary focus of the company. The waste management strategy supports/enables its delivery.

The near-term decommissioning strategy involves preparing the Magnox sites for their interim state / interim end state.

3.3.1 Strategy

The Magnox decommissioning strategy is to dismantle the reactors at Harwell and Winfrith and prepare the other sites reactors for safe storage (where dismantling will take place 85 years after shut-down). Over the lifecycle strategy phases, wastes will be retrieved and managed; facilities decommissioned; and the land restored to enable next planned use.

Key aspects to the Magnox decommissioning strategy include:

- The removal, as far as practicable, of all higher hazards prior to entry of interim states. This will include the removal of accessible asbestos.
- Demolition of redundant (mainly non-radioactive) plant and buildings prior to interim state entry.
- Early dismantling of reactors at Harwell and Winfrith using available technologies.
- For Magnox reactor sites, optimising reactor safestore preparations: boilers left in-situ; adopting risk-based deplanting; and maximising the life of the safestore cladding.
- Optimising the timing of decontamination and demolition of redundant contaminated facilities (i.e. fuel ponds and waste vaults), taking advantage of radioactive decay to minimise lifecycle safety, environmental and cost impacts.
- Avoiding importing clean materials for land restoration by reusing inert wastes from decommissioning for backfilling voidage and managing any remaining voids during quiescence.
- Avoid / reduce importing clean materials for land restoration by reusing inert wastes from decommissioning for backfilling voidage and managing any remaining voids during quiescence.
- Adopting simpler decommissioning techniques: performing pond furniture removal and waste size reduction under water (using divers) and use of high pressure water decontamination methods.
- Managing/monitoring contaminated land in-situ in a manner that avoids the need for intervention during quiescence.
- For Magnox reactor sites, optimising reactor safestore preparations: boilers left in-situ; adopting risk-based deplanting; and maximising the life of the safestore cladding.
- Optimising the timing of decontamination and demolition of redundant contaminated facilities (i.e. fuel ponds and waste vaults), taking advantage of radioactive decay to minimise lifecycle safety, environmental and cost impacts.
- Managing/monitoring contaminated land in-situ in a manner that avoids the need for intervention during quiescence.
- Avoid / reduce importing clean materials for land restoration by reusing inert wastes from decommissioning for backfilling voidage and managing any remaining voids during quiescence.

Magnox are working with the regulators and NDA to establish optimised site end states which may include in-situ disposal of redundant contaminated structures.

Magnox are also working with NDA to explore the opportunity to optimise the timing of reactor dismantling.

The sites will adopt this generic decommissioning strategy as appropriate (see Appendices).

3.3.2 Challenges

Key challenges associated with the strategy going forward include:

- Demonstrating optimised interim entry states.
- Developing arrangements for asset management during quiescence.
- Developing processes and systems that safeguard the necessary knowledge about the site and facilities during the quiescent period.
4 Summary of Waste Inventory

Definitions of the different waste types can be found in section 9. For the purpose of this document they are broadly categorised as:

- **Radioactive Waste** – any material that is either radioactive itself or is contaminated by radioactivity, for which no further use is envisaged. This includes a wide variety of material, ranging from wastes that can be decontaminated and recycled to items that need remote handling and heavy shielding to be managed safely. The radioactive wastes considered within this document are under the categories: nuclear materials; Intermediate Level Waste (ILW); Low Level Waste (LLW); and Very Low Level Waste (VLLW).

- **Non-Radioactive Waste** – the non-radioactive wastes considered within this document are under the categories: hazardous (referenced to as special waste in Scotland); and non-hazardous (which includes inert, eg concrete and rubble).

- **Discharges** – aqueous and gaseous discharges are regulated under EPR10/RSA93. The principal isotopes of interest are dominated by caesium-137 and tritium for aqueous discharges, and tritium and carbon-14 for gaseous discharges. Non-radioactive discharges are also controlled by limits where applicable under the relevant regulation.

Characterisation of waste to determine its volume, physical, chemical and radiological properties is required to produce a reliable waste inventory and is an integral part of developing a waste strategy. The company has developed a waste characterisation process to ensure a consistent approach is adopted to waste characterisation.

Figure 5 shows the volume of waste to be managed across the 12 sites. The total amount of waste to be managed across the sites over all phases is ~2.5 million m³. More detail about site waste arisings is provided in the UK radioactive waste inventory.
5 Waste Management Strategy

5.1 Radioactive Waste

NDA Objective:

- To ensure safe, secure and cost-effective lifecycle management of our nuclear materials.
- 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 following types of radioactive waste require management across Magnox:

- **Prior to the interim state** – reactor dismantling waste (Harwell and Winfrith only) and other decommissioning waste will be generated. Nuclear materials and other legacy waste will be retrieved from existing storage facilities for management.
- **During C&M / quiescence** – small volumes of C&M LLW will be generated from routine monitoring and inspection activities.
- **During reactor dismantling and FSC** – large volumes of reactor dismantling waste will be generated at the Magnox reactor sites. Waste from the demolition of remaining redundant facilities and contaminated land remediation will also require management across the 12 sites.

5.1.1 Strategy

The Magnox radioactive waste strategy is to retrieve and manage waste, making use of appropriate routes (see Table 1). In general, LLW will be sent off-site and ILW will be packaged for ILW disposal, interim stored and then sent to a disposal facility when it becomes available. Consolidation of ILW packages for interim storage will be utilised to make efficient use of existing assets.

Key aspects to the Magnox radioactive waste strategy include:

- Appropriate consideration of the waste hierarchy and use of available routes to divert waste from disposal (by burial) as far as reasonably practicable.
- Treatment (ie dissolution, compaction or decontamination) to reduce volumes for disposal as radioactive waste.
- Effective use of the Low Level Waste Repository Ltd (LLWR) framework contract and implementation of the LLW joint waste management plan (JWMP).
- Simplifying the management of LLW Fuel Element Debris (FED) by establishing a disposal route to LLWR.
- Use of cost-effective and fit-for-purpose containers for packaging ILW (see Figure 7), LLW and VLLW.
- Adopt staged packaging of highly tritiated waste (Chapelcross only) to improve confidence in disposability.
- Transfer of nuclear materials off-site for management (see Figure 6).
- Inter-site transfer of waste for management (ie pond skips and IONSIVs) to reduce the number of retrieval/processing plant required (see Figure 6).
- Maximising the use of existing assets by consolidating ILW packages requiring storage (see Figure 6).
- Reduce volumes of LLW/VLLW generated from contaminated land by management in-situ where practicable until FSC.

The sites will adopt this generic decommissioning strategy as appropriate (see Appendices).
5.1.2 Routes

The implementation of the Magnox strategy for the management of radioactive waste is through the routes shown in Table 1. All routes are currently available except facilities for ILW disposal.

For English and Welsh sites it is assumed that ILW packages will be sent to the geological disposal facility (GDF) for disposal. This is assumed to become available from 2040. Waste will be sent to GDF in accordance with the GDF Emplacement Schedule.

For Scottish sites ILW packages will be stored on-site and above ground for a period of up to 300 years followed by management/disposal.
5.1.3 **Challenges**

Key challenges associated with the strategy going forward include:

- Changing ILW waste packaging to the use of new containers at some sites.
- Demonstration of disposability of ILW packages through the Radioactive Waste Management Limited (RWM) letter of compliance (LoC) process.
- Gaining permissions for consolidated ILW package storage.
- Gaining transport approvals for ILW packages.
- Optimisation of management routes for problematic wastes.
- Supply chain availability for routes diverting waste away from disposal.
- Availability of routes for radioactive asbestos.

### Table 1: Radioactive wastes – planned management routes.

<table>
<thead>
<tr>
<th></th>
<th>Treatment to enable alternative management routes</th>
<th>Reuse / Recycle</th>
<th>VLLW &amp; LA LLW disposal (^2)</th>
<th>Disposal to LLWR</th>
<th>Interim storage &amp; disposal as ILW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals (including pond skips and MCI)</td>
<td>Decontamination</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Oils, solvents &amp; solid combustibles</td>
<td>Incineration</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Nuclear materials and sources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Sand and gravel</td>
<td>Decontamination</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Desiccant</td>
<td></td>
<td>Decay storage Wash and incinerate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Concrete, building structures, asbestos &amp; soils</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Liquors, sludges &amp; resins</td>
<td>Incineration Encapsulation</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SCRU filters</td>
<td>Decontamination</td>
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<td>✓</td>
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<tr>
<td>FED</td>
<td>Segregation Compaction Dissolution</td>
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<tr>
<td>MAC</td>
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<td>IONSIV cartridges</td>
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<td>✓</td>
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\(^2\) Including disposal of VLLW to specified landfill sites or controlled burial of low activity (LA) LLW to permitted landfill facilities.
5.2 Non-Radioactive Waste

**NDA Objective:**

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

Non-radioactive waste accounts for the largest volume of waste arising on each of the Magnox sites. Examples of this waste include:

- **Prior to the interim state** – large volumes of waste will be generated from the demolition of site buildings and facilities.
- **During C&M / quiescence** – small volumes of waste will be generated from the demolition of ILW stores and maintenance of any facilities remaining.
- **During reactor dismantling and FSC** – large volumes of reactor dismantling waste will be generated. Waste from the demolition of remaining redundant facilities and contaminated land remediation will also require management.

5.2.1 **Strategy**

The Magnox non-radioactive waste strategy is to retrieve and manage waste, making use appropriate routes (see Table 2).

Key aspects to the Magnox non-radioactive waste strategy includes:

- Continuing to reduce the amount of non-radioactive waste produced using current good practices.
- Pre-treatment involving waste segregation as far as reasonably practicable to enable appropriate management.
- Applying the waste hierarchy (ie to reuse and recycle in preference to energy recovery and disposal).
- Applying the proximity principle, ie managing waste as close to the site of production as practicable.
- Reducing new build requirements by consolidating ILW treatment and storage between sites.
- Reusing inert wastes from decommissioning for backfilling voidage and by re-profiling land to avoid or reduce importing materials on-site for restoration.

In addition, wherever possible, removal of asbestos will be scheduled to coincide with the decommissioning of associated plant items. If, however this is not possible, then management of asbestos will be prioritised.
5.2.2 Routes
The implementation of the Magnox strategy for the management of non-radioactive waste is through the routes shown in Table 2.

All routes are currently available and will be required throughout the whole lifecycle of the site.

Magnox currently diverts a large amount of waste from landfill disposal by applying the waste hierarchy.

5.2.3 Challenges
Key challenges associated with the strategy going forward include:

- Availability of asbestos management routes during reactor dismantling for the Magnox reactor sites.

<table>
<thead>
<tr>
<th>Table 2: Non-radioactive wastes – planned management routes.</th>
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<tbody>
<tr>
<td>Redundant plant &amp; equipment</td>
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<td>-----------------------------</td>
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<tr>
<td>Mercury</td>
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<tr>
<td>Concrete, rubble and soil</td>
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<tr>
<td>Metals</td>
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<tr>
<td>Sewage</td>
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<tr>
<td>Waste oil and solvents</td>
</tr>
<tr>
<td>Hazardous contaminated soil &amp; concrete</td>
</tr>
<tr>
<td>Asbestos &amp; fibre insulation</td>
</tr>
<tr>
<td>Other hazardous waste</td>
</tr>
<tr>
<td>Other inert waste</td>
</tr>
<tr>
<td>Other non-hazardous waste</td>
</tr>
</tbody>
</table>
5.3 Aqueous and Gaseous Discharges

**NDA Objective:**

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

Aqueous and gaseous discharges are generated at sites during operations and decommissioning. Examples of discharges generated across the lifecycle include:

- **Prior to the interim state** – liquid and gaseous discharges will require management as ponds are drained, reactors / facilities dismantled and waste is processed.

- **During C&M / quiescence** – there will be minimal liquid effluent discharges during this period. Gaseous discharges from reactor safestore, ILW store or other facilities remaining on the site will continue at very low levels.

- **During reactor dismantling and FSC** – liquid and gaseous discharges will require management as remaining reactors and facilities are dismantled and waste is processed.

5.3.1 Strategy

The Magnox strategy for the management of radioactive aqueous and gaseous discharges is aligned to the requirements of the site permit/authorisation to apply Best Available Techniques (BAT) in England and Wales / Best Practicable Means (BPM) in Scotland to optimise radioactive discharges.

Key aspects to the Magnox discharge strategy include:

- Reducing discharges in line with OSPAR and the UK Strategy for Radioactive Discharges.

- Applying appropriate techniques to reduce the impact of the discharges on the environment (see Table 3).

For Magnox, regulatory limits and conditions are imposed on the quantity and quality of discharges. Prior to the implementation of a project, consideration is given to the impact it will have on existing discharges.

Aqueous and gaseous radioactive discharges from the Magnox sites are all compliant with and generally well below the limits set in the EPR10 permits / RSA93 authorisations for the sites.

Non-radioactive discharges are also controlled by limits where applicable under the relevant regulation (eg EPR10, Water Environment (Controlled Activities) (Scotland) Regulations 2011 or Pollution Prevention and Control (Scotland) Regulations 2000).

In general, the volumes of all types of discharges have decreased significantly as the sites have transitioned from operational to decommissioning activities. Discharges should remain low during decommissioning; however, at times it may be appropriate for discharges to increase for specific campaigns. Discharges will cease once decommissioning is complete and the site end state has been achieved.
5.3.2 Routes
The implementation of the Magnox strategy for the management of liquid and gaseous discharges is through the mechanisms shown in Table 3.

In general, these management routes exist, however sites may need to replace or modify existing systems prior to the interim state to manage the volumes of effluent generated.

In addition, it is recognised that appropriate changes to the treatment processes and discharge routes will need to be made during the sites lifecycle to reflect the changing needs.

5.3.3 Challenges
Key challenges associated with the strategy going forward include:

- Establishing arrangements for managing discharges during periods of quiescence.

Table 3: Aqueous and gaseous discharges – planned management routes.

<table>
<thead>
<tr>
<th></th>
<th>Active Effluent Treatment Plant</th>
<th>Pond Water Treatment Plant</th>
<th>Abatement (eg filtration)</th>
<th>Oil separator</th>
<th>Sediment traps/settling tanks</th>
<th>Sewage treatment plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radioactive aqueous effluent (pond water, active drains)</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-radioactive aqueous effluent (sewage, surface water drains)</td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radioactive gaseous discharges (reactor buildings, ILW store, waste processing)</td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-radioactive gaseous discharges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6 Strategy Implementation

The strategy will be implemented through the programmes described below.

6.1 Implementation during Defuelling

The defuelling programme is being coordinated through the Magnox Operating Plan (MOP).

The MOP is an integrated programme covering all NDA business areas associated with the management of spent Magnox fuel. The MOP helps to ensure the safe and cost effective delivery of the NDA strategy to reprocess all Magnox spent fuel by 2020.

6.2 Implementation prior to the Interim State

6.2.1 Decommissioning

Decommissioning consists of four sub-programmes:

- **Ponds** – responsible for the removal of waste and redundant furniture from fuel storage ponds, draining pond water and stabilising pond surfaces, decommissioning existing effluent treatment plants and delivery of new, fit-for-purpose effluent treatment plants.

- **Plant and Structures** – responsible for asbestos removal, deplanting, demolition and preparation of the safestores for C&M. Implementation will be through the use of conventional waste removal and demolition techniques.

- **Site Restoration** – responsible for land quality, remediation and groundwater monitoring.

- **Reactors** – responsible for the dismantling of Winfrith SGHWR and Dragon reactors; and Harwell BEPO, DIDO and PLUTO reactors.

6.2.2 Waste Management

Waste Management consists of three sub-programmes:

- **Waste Strategy and Permissioning** – responsible for the development and integration of the decommissioning and waste management strategy; preparation of ILW and LLW disposability cases; and assurance.

- **Waste Projects** – responsible for the design, procurement, installation and commissioning of plant, equipment and systems required to deliver the waste management strategy.

- **Waste Operations** – responsible for the implementation of the waste management strategy; operation of waste plants, including ILW stores; disposition of all LLW, hazardous and conventional waste off the site.

6.2.3 Asset Management

Asset Management consists of two sub-programmes:

- **Asset Management** – responsible for managing the physical assets across the 12 sites.

- **Care and Maintenance** – responsible for establishing the arrangements to accept and manage sites as each achieves its defined interim state entry configuration.

6.3 Implementation during the Interim State

In general, when a site enters the interim state, the responsibility for the management of that site will be transferred to the Care and Maintenance Programme. Management of a site during the interim state will include ensuring the site meets the requirements of the nuclear site license and permit/authorisation and management of any facilities and waste on-site.
7 Assumptions and Risks

7.1 Assumptions

The development of the strategies described in this document is based on the following assumptions:

- Government policy, standards, legislative and regulatory environment remain unchanged, or changes pending have no significant impact.
- Regulators adopt a consistent and proportionate approach.
- External licensed conventional, hazardous material and special waste disposal facilities will be available to receive all non-radioactive material requiring removal from the site.
- The LLWR waste acceptance criteria (WAC) will not change significantly to the extent that baseline plans are not achievable.
- There will be sufficient capacity available through the supply chain to provide alternatives to LLWR disposal such as treatment of metallic and combustible LLW, and VLLW and controlled burial of LLW (subject to meeting relevant WAC).
- ILW packages in their passively safe condition will be acceptable for disposal in the GDF.
- For planning purposes, the GDF for ILW will be operational from 2040 for packaged wastes in England and Wales, with a national prioritised programme for waste emplacement. Access to the GDF will remain available for use during FSC.
- Near site near surface disposal facilities for packaged wastes in Scotland will be available within 300 years.
- Waste consolidation strategies will receive necessary permissions (including planning permission).
- There will be a reasonably practicable interpretation of the ‘no danger’ clause in the Nuclear Installations Act 1965 (as amended) so as to facilitate delicensing.
- Site funding plans will allow the delivery of the lifecycle strategy to the Lifetime Plan schedule.

The validity and implications of these assumptions are kept under review.

7.2 Risks

The strategies in this document have been determined following extensive research, design and development programmes carried out over many years. However, it is recognised that not all of the technologies required to support the existing strategies are fully developed for site implementation.

The Magnox technical baseline underpinning research and development (TBuRD) document identifies the technology readiness level (TRL) of the baseline technologies and the associated underpinning research and development work required to improve the TRL for implementation.

Table 4 shows the key generic threats to the implementation of the strategies set out in this document. Key opportunities currently being investigated are shown in Table 5.

The gaps, threats and opportunities relating to decommissioning and waste management which have been identified throughout this document have been reviewed and an action plan developed.
### Table 4: Key Threats.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Threat</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interim state entry</strong></td>
<td>There is a threat that unidentified emergent scope is required for sites to enter the interim state.</td>
<td>Frequent engagement with regulators to reach agreement on interim entry states for redundant contaminated structures, safestores and land.</td>
</tr>
<tr>
<td></td>
<td>There is a threat that knowledge will be lost during the interim state which will impact on FSC.</td>
<td>Use of appropriate mechanisms to record information about all plant/facilities to remain during the interim state.</td>
</tr>
<tr>
<td><strong>Waste consolidation</strong></td>
<td>There is a threat that inter-site transfers for waste storage consolidation is not approved.</td>
<td>Continuing engagement with stakeholders (SSGs, Local Authorities, Regulators etc).</td>
</tr>
<tr>
<td></td>
<td>Waste storage consolidation strategy cannot be implemented due to additional waste packages being produced, beyond the estimated base numbers that results in the store capacities at Berkeley, Bradwell and Harwell being exceeded.</td>
<td>Optimise usage of waste container capacity e.g. through segregation, compaction, filling and co-packaging of wastes as appropriate. Monitor container forecast on a regular basis so that appropriate action can be taken in the event that additional waste containers and/or a new store(s) are required.</td>
</tr>
<tr>
<td><strong>Waste packaging</strong></td>
<td>There is a threat that disposability cases cannot be made for some waste requiring packaging for ILW disposal.</td>
<td>Dialogue continues with RWM and additional focus on potential problematic wastes/packaging.</td>
</tr>
<tr>
<td><strong>Plant Operations</strong></td>
<td>There is a threat that plants do not achieve their design throughput specification which results in extended operations.</td>
<td>Provide a focussed approach to continual improvements.</td>
</tr>
<tr>
<td><strong>Waste disposal</strong></td>
<td>There is a threat that LLWR will no longer be able to accept certain LLW eg asbestos.</td>
<td>Support LLWR who are investigating the scale of the problem and the potential opportunities.</td>
</tr>
</tbody>
</table>

### Table 5: Key Opportunities.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Opportunity</th>
<th>Potential Benefit</th>
<th>Enabling Plans</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site restoration</strong></td>
<td>There is an opportunity to optimise end states through considering in-situ disposal of sub-surface contaminated concrete structures (ie ponds, vaults).</td>
<td>Significantly reduce the amount of waste generated and requiring management.</td>
<td>Strategic options assessment and business case to be developed for pilot sites (Winfrith and Trawsfynydd).</td>
</tr>
<tr>
<td><strong>Reactor dismantling</strong></td>
<td>There is an opportunity to review the optimised timing for carrying out reactor dismantling.</td>
<td>Avoid nugatory work (eg safestore preparation), avoid loss of workforce/knowledge and enable potential early release of land.</td>
<td>Strategic options assessment and business case to be developed.</td>
</tr>
<tr>
<td><strong>Non-standard wastes</strong></td>
<td>There is an opportunity to review the strategy for non-standard wastes.</td>
<td>Optimisation of waste management routes, lifecycle cost savings.</td>
<td>Early characterisation of wastes and review strategies for all non-standard wastes.</td>
</tr>
<tr>
<td>Topic</td>
<td>Opportunity</td>
<td>Potential Benefit</td>
<td>Enabling Plans</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Waste packaging and interim storage</td>
<td>There is an opportunity to review and optimise the Wylfa ILW packaging and interim storage strategy.</td>
<td>Avoid storage of ILW packages at Wylfa site.</td>
<td>Strategic options assessment and business case to be developed.</td>
</tr>
<tr>
<td></td>
<td>There is an opportunity to review the current strategy for Bradwell FED disposition.</td>
<td>Use of alternative waste management routes which may reduce environmental impacts and reduce timescales and costs.</td>
<td>Review of characterisation information and strategic options assessment.</td>
</tr>
<tr>
<td>Long-term storage</td>
<td>There is an opportunity to optimise Scottish sites long-term (up to 300 years) storage strategy.</td>
<td>Reduce period of long-term storage and reduce cost.</td>
<td>Support Scottish Government and NDA in development of strategy and plans as required.</td>
</tr>
</tbody>
</table>

### 8 Monitoring and Evaluation

Review of this document will be undertaken on a cycle of no more than three years, action plans will be reviewed annually (see Figure 8).

It is foreseeable that significant events occur within the three year review cycle that requires the strategy to be updated early. These events (triggers) may include, but not limited to:

- Changes in policy, legislation, regulation and/or NDA strategy.
- Long term plans for national repositories may change and affect the assumptions in the strategy.
- Changes to a site Licence Condition 35 decommissioning programme.
- Lessons learned from site implementation.
- New scientific or technical research or other advances.
- Non-availability of a waste management route or change in WAC.
9 Communication and Consultation

9.1 Regulatory and Stakeholder Input and Consultation

The development of the strategies contained within this document has been undertaken in consultation and with input from the NDA, regulators and other stakeholders. Other key stakeholders include Government, Local Planning Authorities, Site Stakeholder Groups (SSGs), Nuclear Legacy Advisory Forum (NuLeAF) and local interest groups.

A proportionate approach to the involvement of and engagement with external stakeholders is used in strategic options assessment.

Significant changes to this strategy are taken to the NDA Senior Strategy Committee (SSC) for endorsement.

Regulators are informed of strategic options studies being undertaken. In some cases it is appropriate that regulators are invited to participate in the process, although to maintain their independence they may choose to do so as observers.

Changes to individual sites decommissioning and radioactive waste management strategy is regulated through Licence Condition 35.

9.2 Communication

Progress against delivery of the decommissioning and waste management strategies are communicated to regulators and other stakeholders on a regular basis as are any potential changes to the strategies and implementation plans.

Recent engagements include:

- Transfer of nuclear materials from Harwell and Winfrith to other NDA sites.
- Inter-site transfer of ILW for management.
- Revisions to ILW packaging strategy.
- Optimisation of the number and location of ILW storage facilities.
- Proposals for a new Harwell ILW Store.
- Decommissioning of the Harwell Liquid Effluent Treatment Plant (LETP).
- Winfrith site end state optimisation.
- Decommissioning strategy and interim states.

9.3 Accessibility

This document is unrestricted and publicly accessible via the Magnox website (www.magnoxsites.com).

Other company documents are available upon application via the Magnox communications department.

Artists impression of the new Harwell ILW Store

Whessoe Tanks at the LETP at Harwell
## 10 Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>As low as reasonably achievable (ALARA)</strong></td>
<td>Radiological doses or risks from a source of exposure are as low as reasonably achievable when they are consistent with the relevant dose or target standard and have been reduced to a level that represents a balance between radiological and other factors. The level of protection may then be said to be optimised.</td>
</tr>
<tr>
<td><strong>As low as reasonably practicable (ALARP)</strong></td>
<td>To satisfy the ALARP principle, measures necessary to reduce risk may be taken until or unless the cost of those measures, whether in money, time or trouble, is disproportionate to the reduction in risk.</td>
</tr>
<tr>
<td><strong>Care and maintenance (C&amp;M) entry state</strong></td>
<td>The physical, chemical and radiological conditions at commencement of C&amp;M. This includes any passive or active control measures intended to last into and throughout C&amp;M.</td>
</tr>
<tr>
<td><strong>Care and maintenance preparations (C&amp;MP)</strong></td>
<td>The programme of decommissioning and waste management activities necessary to enable the site to enter C&amp;M. A site enters C&amp;M preparations when they carry out activities to permanently disable the reactors.</td>
</tr>
<tr>
<td><strong>Final site clearance</strong></td>
<td>The programme of decommissioning and waste management activities necessary to achieve the site end state.</td>
</tr>
<tr>
<td><strong>Hazardous waste</strong></td>
<td>Controlled waste that contains any substance specified in The Hazardous Waste (England and Wales) Regulations 2005 and the Special Waste (Scotland) Regulations 2004. These include oils, acids and materials such as asbestos.</td>
</tr>
<tr>
<td><strong>Higher activity waste (HAW)</strong></td>
<td>HAW includes high level waste, intermediate level waste, and some low level waste unsuitable for prompt disposal at the LLW Repository.</td>
</tr>
<tr>
<td><strong>Interim state</strong></td>
<td>A natural milestone or decision point in the site restoration programme that typically represents a significant reduction in risk and hazard and a change in how the Site is managed.</td>
</tr>
<tr>
<td><strong>Interim end state</strong></td>
<td>A state where no further physical decommissioning and restoration works are carried out and the site end state is reached passively mainly as a consequence of radioactive decay during the period of quiescence.</td>
</tr>
<tr>
<td><strong>Intermediate level waste (ILW)</strong></td>
<td>Wastes exceeding the upper boundaries for LLW, but which do not require heating to be taken into account in the design of storage or disposal facilities.</td>
</tr>
<tr>
<td><strong>Inert waste</strong></td>
<td>Waste subject to the Landfill Directive which does not undergo any significant physical, chemical or biological transformations. The total leachability and pollutant content of the waste and the ecotoxicity of the leachate must be insignificant and pose no danger to surface or groundwater quality. These primarily consist of building rubble and glass.</td>
</tr>
<tr>
<td><strong>Low level waste (LLW)</strong></td>
<td>Wastes having a radioactive content not exceeding 4 GBq (gigabecquerels) per tonne of alpha, or 12 GBq per tonne of beta/gamma activity.</td>
</tr>
<tr>
<td><strong>Nuclear Materials</strong></td>
<td>Materials containing uranium or plutonium which have been produced from fuel cycle operations such as enrichment, fuel fabrication and reprocessing. Where these materials have no future value they may need to be managed as waste.</td>
</tr>
<tr>
<td><strong>Non-hazardous waste</strong></td>
<td>Controlled waste which is not covered by the definition of hazardous waste, but which remains biologically, chemically, or physically active if disposed of to landfill. These include metal, timber and other organic wastes. Non-hazardous wastes result both from site occupation, eg office, kitchen, canteen and garden waste and through decommissioning activities, eg metals and treated wood.</td>
</tr>
<tr>
<td><strong>Site end state</strong></td>
<td>The condition to which designated land and its associated structures and infrastructure need to be restored such that it can be released for its next use.</td>
</tr>
<tr>
<td><strong>Very low level waste (VLLW)</strong></td>
<td>Wastes with maximum concentrations of 4 MBq (megabecquerels) per tonnes of total activity that can be disposed to specified landfill sites. There is an additional limit for tritium in wastes containing this radionuclide.</td>
</tr>
<tr>
<td><strong>Waste</strong></td>
<td>Any substance or object the holder discards, intends to discard or is required to discard.</td>
</tr>
</tbody>
</table>
Site Specific Appendices

The following appendices contain site specific information about the implementation of the integrated decommissioning and waste management strategy:

- Appendix A: Berkeley Site                        Pages 26 - 27
- Appendix B: Bradwell Site Strategy               Pages 28 - 29
- Appendix C: Chapelcross Site Strategy            Pages 30 - 31
- Appendix D: Dungeness A Site Strategy             Pages 32 - 33
- Appendix E: Harwell Site Strategy                Pages 34 - 35
- Appendix F: Hinkley Point A Site Strategy        Pages 36 - 37
- Appendix G: Hunterston A Site Strategy            Pages 38 - 39
- Appendix H: Oldbury Site Strategy                Pages 40 - 41
- Appendix I: Sizewell A Site Strategy              Pages 42 - 43
- Appendix J: Trawsfynydd Site Strategy             Pages 44 - 45
- Appendix K: Winfrith Site Strategy                Pages 46 - 47
- Appendix L: Wylfa Site Strategy                  Pages 48 - 49

The following key is used for the decommissioning strategy tables:

- GL – ground level

The following key is used for the radioactive waste strategy wiring diagrams:

- Grey boxes – work completed
- Black text – waste currently in stock and how it is currently managed
- Blue text – waste that is yet to arise
- Red text – work to be undertaken prior to entering the interim state
- Green text – work to be undertaken after entering the interim state
# Appendix A: Berkeley Site

## Table 6: Berkeley Decommissioning Strategy Overview.

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy phases</td>
<td>C&amp;MP</td>
</tr>
<tr>
<td>Interim state (C&amp;M)</td>
<td>Reactor safestore preparations</td>
</tr>
<tr>
<td></td>
<td>Redundant contaminated structures</td>
</tr>
<tr>
<td></td>
<td>Other redundant structures</td>
</tr>
<tr>
<td></td>
<td>Drains, tunnels &amp; pipelines</td>
</tr>
<tr>
<td></td>
<td>Land quality</td>
</tr>
<tr>
<td></td>
<td>ILW storage</td>
</tr>
<tr>
<td>Site end state</td>
<td>Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.</td>
</tr>
</tbody>
</table>
Figure 9: Berkeley Radioactive Waste Strategy Overview.

Note: modifications will be required to the existing Berkeley ILW Store to accommodate the storage of 6m³ concrete boxes.
## Appendix B: Bradwell Site Strategy

### Table 7: Bradwell Decommissioning Strategy.

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
<tr>
<td><strong>Interim state</strong></td>
<td><strong>(C&amp;M)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>GL</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Pond</strong></td>
</tr>
<tr>
<td></td>
<td><strong>GL</strong></td>
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<tr>
<td></td>
<td><strong>Foundations / slabs</strong></td>
</tr>
<tr>
<td></td>
<td><strong>GL</strong></td>
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<tr>
<td></td>
<td><strong>Non-active drains &amp; tunnels</strong></td>
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<tr>
<td></td>
<td><strong>GL</strong></td>
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<tr>
<td></td>
<td><strong>Areas of Potential Concern (APCs)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>GL</strong></td>
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<tr>
<td></td>
<td><strong>GL</strong></td>
</tr>
<tr>
<td><strong>Site end state</strong></td>
<td>Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.</td>
</tr>
</tbody>
</table>
Figure 10: Bradwell Radioactive Waste Strategy.

ILW resin and sludge
ILW sand and gravel
ILW MCI
ILW nimonic springs and FED secondary wastes

Receive Dungeness A DCICs
Interim storage in Bradwell ILW Store
Receive Sizewell A DCICs

Package and dry (if required) in DCICs
Transport to GDF

Treatment by dissolution
Package for LLW disposal
Decay storage in ILW Store
Transport to LLWR

ILW MCI

FED magnox
ILW
LLW

ILW desiccant

Package for decay storage

Other LLW

Segregation

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

Encapsualtion in 4M boxes

Note: Bradwell ILW Store will require re-configuration to accommodate the storage of Dungeness A and Sizewell A ILW packages.
### Appendix C: Chapelcross Site Strategy

**Table 8: Chapelcross Decommissioning Strategy.**

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
<tr>
<td><strong>Interim state</strong></td>
<td><strong>Reactors safestore preparations</strong></td>
</tr>
<tr>
<td>(C&amp;M)</td>
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<tr>
<td><strong>Redundant contaminated structures</strong></td>
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<td></td>
<td></td>
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<tr>
<td><strong>Other redundant structures</strong></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drains, tunnels &amp; pipelines</strong></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td><strong>Land quality</strong></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td><strong>ILW storage</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site end state</strong></td>
<td></td>
</tr>
</tbody>
</table>

- **Interim state (C&M):**
  - Reactors safestore preparations
    - Boilers taken down and stored on site
    - Risk based deplanting
    - Cladding maintain & repair
    - Reactor void MAC to remain in-situ

- **Redundant contaminated structures**
  - Ponds to be demolished
    - Chapelcross Processing Plant (CXPP) to remain in-situ

- **Other redundant structures**
  - Demolition to slab level
  - Voids to be infilled as suitable material becomes available
  - Turbine Hall void to be infilled

- **Drains, tunnels & pipelines**
  - Non-active drains and tunnels to remain in-situ
  - Active drains to remain in-situ
  - Remove above ground pipeline structure, below-ground pipeline structure to remain

- **Land quality**
  - Radioactive contaminated land to be contained in-situ
  - Non-radioactive contaminated land to be remediated as required to meet contaminated land & groundwater regulations

- **ILW storage**
  - See Figure 11 for waste management strategy
  - Long-term storage (up to 300 years) of Chapelcross ILW packages (including staged packaging of tritiated waste) in site ILW store

- **Site end state**
  - Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.
Figure 11: Chapelcross Radioactive Waste Strategy.

ILW CXPP stainless steel and reactor defuelling waste

ILW zeolite skips and fuel skips

ILW sludge

ILW pond MAC and cobalt cartridges

ILW ceramic pellet waste

ILW CXPP cave line waste

ILW CXPP process line waste

ILW CXPP dismantling waste

ILW desiccant

ILW mercury and rotary pump oil

LLW

Reactor dismantling waste & Reactor void MAC

Package and grout into 6m$^3$ concrete boxes

Long-term storage in Chapelcross ILW Store

Package and dry (if required) in DCICs

Long-term storage in Chapelcross ILW Store

Overpack in 4M boxes

Package for decay storage

Decay storage in Chapelcross ILW Store

Package for decay storage

Segregation

Encapsulation in 4M boxes

Transport to Sellafield for management

Transport to future ILW disposal facility

Transport to future ILW disposal facility

Overpack in HHISOs

Transport to future LLW disposal facility

Transport to future ILW disposal facility

Transport to future LLW disposal facility

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

Transport to LLWR

Transport to future ILW disposal facility

Transport to future ILW disposal facility
## Appendix D: Dungeness A Site Strategy

### Table 9: Dungeness A Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
<tr>
<td><strong>Interim state</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
<tr>
<td>(C&amp;M)</td>
<td>Reactor safestore preparations</td>
</tr>
<tr>
<td></td>
<td>• Risk based deplanting</td>
</tr>
<tr>
<td></td>
<td>• Reactor void MAC to remain in-situ</td>
</tr>
<tr>
<td></td>
<td><strong>Redundant contaminated structures</strong></td>
</tr>
<tr>
<td></td>
<td>• Ponds to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Vaults to remain in-situ</td>
</tr>
<tr>
<td></td>
<td><strong>Other redundant structures</strong></td>
</tr>
<tr>
<td></td>
<td>• Demolition to slab level</td>
</tr>
<tr>
<td></td>
<td>• Voids to be infilled as suitable material becomes available</td>
</tr>
<tr>
<td></td>
<td>• Turbine Hall void partially infilled, remaining void to be managed</td>
</tr>
<tr>
<td></td>
<td><strong>Drains, tunnels &amp; pipelines</strong></td>
</tr>
<tr>
<td></td>
<td>• Non-active drains and tunnels to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Active drains remove inner, outer to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Remove above ground pipeline structure, below-ground pipeline structure to remain</td>
</tr>
<tr>
<td></td>
<td><strong>Land quality</strong></td>
</tr>
<tr>
<td></td>
<td>• Radioactive contaminated land to be contained in-situ</td>
</tr>
<tr>
<td></td>
<td>• Non-radioactive contaminated land to be remediated as required to meet contaminated land &amp; groundwater regulations</td>
</tr>
<tr>
<td></td>
<td><strong>ILW storage</strong></td>
</tr>
<tr>
<td></td>
<td>~ 200 m$^3$ raw waste (ILW)</td>
</tr>
<tr>
<td></td>
<td>No ILW store</td>
</tr>
<tr>
<td></td>
<td><strong>Site end state</strong></td>
</tr>
<tr>
<td></td>
<td>Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.</td>
</tr>
</tbody>
</table>
Figure 12: Dungeness A Radioactive Strategy

- **FED magnox**: Treatment by dissolution
- **ILW nimonic springs**: Package and dry (if required) in DCICs
  - Transport for interim storage in Bradwell ILW Store
- **ILW MCI**: Package and dry (if required) in DCICs
- **ILW resin and sludge**: Transport to Oldbury for management
- **ILW IONSIV filters**: Transport to Oldbury for management
- **ILW IONSIV cartridges (and high dose rate filters)**
- **ILW desiccant**: Off-site treatment and disposal as VLLW
- **ILW fuel skips**: Transport to Hinkley Point A for management
- **LLW**: Segregation
  - Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)
- **Reactor dismantling waste & Reactor void MAC**: Encapsulation in 4M boxes
  - Transport to GDF
### Appendix E: Harwell Site Strategy

**Table 10: Harwell Decommissioning Strategy**

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Early reactor dismantling and early achievement of site end state for parts of the site.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>RD &amp; PD</strong></td>
</tr>
<tr>
<td>Interim state (C&amp;M)</td>
<td>Reactors</td>
</tr>
<tr>
<td></td>
<td>Reactors deplanted and dismantled</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redundant structures</td>
</tr>
<tr>
<td></td>
<td>Demolition to slab level</td>
</tr>
<tr>
<td></td>
<td>Voids to be filled as suitable material becomes available</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drains, tunnels &amp; pipelines</td>
</tr>
<tr>
<td></td>
<td>Drains and tunnels removed as required for next planned use</td>
</tr>
<tr>
<td></td>
<td>Remove pipeline where practicable</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Land quality</td>
</tr>
<tr>
<td></td>
<td>Remove contaminated land as required for next planned use</td>
</tr>
<tr>
<td></td>
<td>Delicence areas to be released for next planned use</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILW storage</td>
</tr>
<tr>
<td></td>
<td>~ 2,800 m³ raw waste (ILW)</td>
</tr>
<tr>
<td></td>
<td>See Figure 13 for waste management strategy</td>
</tr>
<tr>
<td></td>
<td>Interim storage of Harwell and Winfrith ILW packages in site ILW stores</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site end state</td>
</tr>
<tr>
<td></td>
<td>Reactors dismantled. All facilities removed and below-ground structures made safe.</td>
</tr>
<tr>
<td></td>
<td>Contaminated land remediated as required. All waste removed from site.</td>
</tr>
</tbody>
</table>
Figure 13: Harwell Radioactive Waste Strategy

- Encapsulated LETP Liquors & Sludges
- HLA ILW heels
- Historic ILW in tube stores
- Stored Nuclear Material (GLEEEP/Zenith)
- Standard RHILW non-gaseous NDS sources
- Active Handling Facility Decommissioning ILW
- Large RHILW non-gaseous NDS sources
  - Radiochemical Facility Decommissioning ILW
  - Reactor Decommissioning ILW
- Low enriched Uranium (LEU)
- Depleted and Natural Uranium
- Drummed Contact Handled ILW (CHILW)
- Concrete Lined Drums
- DRAGON Waste
- LLW
- Segregation
- Polymer encapsulation in 200l drums

- Package in to 500L drums in HEC
- Interim storage in Vault Store
- Overpack ILW packages into SWTCs
- Transport to GDF
- Grout in WEP
- Receive Culham 6m³ concrete boxes
- Receive Winfrith 6m³ concrete boxes
- Interim storage in Harwell ILW Store
- Package and grout into 6m³ concrete boxes

- Package & grout into 3m³ stainless steel containers
- Receive Winfrith Thorium & other ILW for packaging

- Receive Culham 6m³ concrete boxes
- Interim storage in Harwell ILW Store
- Package & grout into 6m³ concrete boxes
- Receive Winfrith 6m³ concrete boxes

- Polymer encapsulation in 200l drums
- Package in to 500L drums in HEC

- Waste not suitable for recycling
- Use of available routes (i.e., metal recycling, incineration, VLLW, LLW disposal)

- Transfer to Capenhurst for management
- Transfer to Springfields for reuse/recycle
- Transport to Sellafield for processing and disposal
## Appendix F: Hinkley Point A Site Strategy

### Table 11: Hinkley Point A Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
</tbody>
</table>
| **Interim state (C&M)** | Reactor safestore preparations | • Boilers to remain in-situ  
| | | • Risk based deplanting  
| | | • Cladding maintain & repair  
| | | • Reactor void MAC to remain in-situ  
| | Redundant contaminated structures | • Ponds to remain in-situ  
| | | • Dry vaults to remain in-situ  
| | | • Wet vaults and other contaminated structures to be demolished  
| | Other redundant structures | • Demolition to slab level  
| | | • Voids to be infilled as suitable material becomes available  
| | | • Turbine Hall void already mostly infilled, opportunity to use material from Hinkley Point C site construction  
| | Drains, tunnels & pipelines | • Non-active drains and tunnels to remain in-situ  
| | | • Active drains remove inner, outer to remain in-situ  
| | | • Remove primary and secondary pipeline structure, tertiary pipeline structure to remain  
| | Land quality | • Radioactive contaminated land to be contained in-situ  
| | | • Non-radioactive contaminated land to be remediated as required to meet contaminated land & groundwater regulations  
| | ILW storage | • See Figure 14 for waste management strategy  
| | | • Interim storage of Hinkley Point A ILW packages (including pond skips from Dungeness A, Oldbury and Sizewell A) in site ILW store  
| **Site end state** | Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site. |
Figure 14: Hinkley Point A Radioactive Waste Strategy

ILW resin and sludge

ILW MCI

ILW sand and gravel

ILW IONSIV cartridges and filters

FED magnox

Segregation

ILW Nimonic springs

ILW desiccant

LLW

Reactor dismantling waste & Reactor void MAC

Segregation

Encapsulation in 4M boxes

Package and dry (if required) in DCICs

Receive Dungeness A, Oldbury and Sizewell A ILW fuel skips

Interim storage in Hinkley Point A ILW Store

Transport to GDF

Package and grout into 6m³ concrete boxes and TRUShields

Off-site treatment and disposal as VLLW

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

Transport to GDF

Segregation

Transport to GDF

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

Segregation

Transport to GDF

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)
## Appendix G: Hunterston A Site Strategy

### Table 12: Hunterston A Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
<tr>
<td><strong>Interim state (C&amp;M)</strong></td>
<td>Reactor safestore preparations</td>
</tr>
<tr>
<td></td>
<td><img src="image1" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>• Boilers to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Risk based deplanting</td>
</tr>
<tr>
<td></td>
<td>• Full recladding</td>
</tr>
<tr>
<td></td>
<td>• Reactor void MAC to remain in-situ</td>
</tr>
<tr>
<td><strong>Redundant contaminated structures</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>• Ponds to remain in-situ (overbuilding replaced at a lower height)</td>
</tr>
<tr>
<td></td>
<td>• Solid Active Waste Building (SAWB) bunkers to remain in-situ</td>
</tr>
<tr>
<td><strong>Other redundant structures</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image5" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>• Demolition to slab level</td>
</tr>
<tr>
<td></td>
<td>• Voids to be infilled as suitable material becomes available</td>
</tr>
<tr>
<td></td>
<td>• Turbine Hall void already infilled</td>
</tr>
<tr>
<td><strong>Drains, tunnels &amp; pipelines</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image7" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>• Non-active drains and tunnels to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Active drains remove inner, outer to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Remove above ground pipeline structure, below-ground pipeline structure to remain</td>
</tr>
<tr>
<td><strong>Land quality</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image10" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>• Radioactive contaminated land to be contained in-situ</td>
</tr>
<tr>
<td></td>
<td>• Non-radioactive contaminated land to be remediated as required to meet contaminated land &amp; groundwater regulations</td>
</tr>
<tr>
<td><strong>ILW storage</strong></td>
<td>~ 2,700 m$^3$ raw waste (ILW)</td>
</tr>
<tr>
<td></td>
<td><img src="image11" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>• See Figure 15 for waste management strategy</td>
</tr>
<tr>
<td></td>
<td>• Long-term storage (up to 300 years) of Hunterston A ILW packages in site ILW store</td>
</tr>
<tr>
<td><strong>Site end state</strong></td>
<td>Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.</td>
</tr>
</tbody>
</table>
Figure 15: Hunterston A Radioactive Waste Strategy
### Appendix H: Oldbury Site Strategy

#### Table 13: Oldbury Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
<tr>
<td><strong>Interim state (C&amp;M)</strong></td>
<td>Reactor safestore preparations</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redundant contaminated structures</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other redundant structures</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drains, tunnels &amp; pipelines</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td></td>
<td>Land quality</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILW storage</td>
</tr>
<tr>
<td></td>
<td>No ILW store</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site end state</strong></td>
<td>Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.</td>
</tr>
</tbody>
</table>
Figure 16: Oldbury Radioactive Waste Strategy

- **ILW IONSIV cartridges & filters**
  - **ILW MCI**
  - **ILW resin and sludge**
  - **ILW gravel**
  - **ILW nmonic springs & FED magnox**
    - Segregation
  - **ILW FED magnox**
    - Package and dry (if required) in DCICs
      - Receive Dungeness A and Sizewell A IONSIVs
      - Transport for interim storage in Berkeley ILW Store
      - Package for LLW disposal
      - Transport to LLWR
  - **ILW Fuel skips**
    - Transport to Hinkley Point A for management
  - **ILW desiccant**
  - **Other LLW**
    - Segregation
      - Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)
      - Off-site treatment and disposal as VLLW
    - Encapsulation in 4M boxes
      - Transport to GDF
  - **Reactor dismantling waste & Reactor void MAC**
    - Transport to Hinkley Point A for management
# Appendix I: Sizewell A Site Strategy

## Table 14: Sizewell A Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
<tr>
<td><strong>Interim state (C&amp;M)</strong></td>
<td></td>
</tr>
<tr>
<td>Reactor safestore preparations</td>
<td></td>
</tr>
<tr>
<td>Redundant contaminated structures</td>
<td></td>
</tr>
<tr>
<td>Other redundant structures</td>
<td></td>
</tr>
<tr>
<td>Drains, tunnels &amp; pipelines</td>
<td></td>
</tr>
<tr>
<td>Land quality</td>
<td></td>
</tr>
<tr>
<td>ILW storage</td>
<td></td>
</tr>
<tr>
<td>Site end state</td>
<td></td>
</tr>
</tbody>
</table>

**Overarching strategy**
- Deferred reactor dismantling (85 years from reactor shutdown).

**Strategy phases**

**Interim state (C&M)**
- Reactor safestore preparations
  - Boilers to remain in-situ
  - Risk based deplanting
  - Cladding maintain & repair
  - Reactor void MAC to remain in-situ
- Redundant contaminated structures
  - Ponds to remain in-situ
  - Vault to remain in-situ
- Other redundant structures
  - Demolition to slab level
  - Voids to be infilled as suitable material becomes available
  - Turbine Hall void to be managed
- Drains, tunnels & pipelines
  - Non-active drains and tunnels to remain in-situ
  - Active drains remove inner, outer to remain in-situ
  - Remove above ground pipeline structure, below-ground pipeline structure to remain
- Land quality
  - Radioactive contaminated land to be contained in-situ
  - Non-radioactive contaminated land to be remediated as required to meet contaminated land & groundwater regulations
- ILW storage
  - No ILW store
  - ~ 100 m³ raw waste (ILW)
  - See Figure 17 for waste management strategy
  - Transport of ILW packages to Bradwell for interim storage
- Site end state
  - Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.
Figure 17: Sizewell A Radioactive Waste Strategy

- ILW IONSIV filters
- ILW MCI
- ILW resin and sludge
- ILW sand and gravel
- ILW nimonic springs
  - Segregation
  - Package and dry (if required) in DCICs
  - Transport for interim storage in Bradwell ILW Store

- FED magnox
  - Package for LLW disposal
  - Transport to LLWR

- ILW fuel skips
  - Transport to Hinkley Point A for management

- ILW IONSIV cartridges (and high dose rate filters)
  - Transport to Oldbury for management

- ILW desiccant
  - Off-site treatment and disposal as VLLW

- Other LLW
  - Segregation
  - Use of available routes (i.e., metal recycling, incineration, VLLW, LLW disposal)

- Reactor dismantling waste & Reactor void MAC
  - Encapsulation in 4M boxes
  - Transport to GDF
## Appendix J: Trawsfynydd Site Strategy

### Table 15: Trawsfynydd Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy phases</strong></td>
<td><strong>C&amp;MP</strong></td>
</tr>
</tbody>
</table>
| **Interim state**     | Reactor safestore preparations | • Reactors height reduced  
                        |                      | • Boilers height reduced  
                        |                      | • Back to bare room deplanting  
|                       |                      | • Full recladding  
                        |                      | • Reactor void MAC to remain in-situ  
|                       | Redundant contaminated structures | • Ponds to remain in-situ  
                        |                      | • Vaults to remain in-situ  
|                       |                      | • Opportunity for in-situ disposal of contaminated structures  
|                       | Other redundant structures | • Demolition to slab level  
                        |                      | • Voids to be infilled as suitable material becomes available  
|                       |                      | • Turbine Hall void already infilled  
|                       | Drains, tunnels & pipelines | • Non-active drains and tunnels to remain in-situ  
                        |                      | • Active drains remove inner, outer to remain in-situ  
|                       |                      | • Remove above ground pipeline structure, below-ground pipeline structure to remain  
|                       | Land quality | • Radioactive contaminated land to be contained in-situ  
|                       |                      | • Non-radioactive contaminated land to be remediated as required to meet contaminated land & groundwater regulations  
|                       | ILW storage | ~ 2,000 m³ raw waste (ILW)  
                        |                      | • See Figure 18 for waste management strategy  
|                       |                      | • Interim storage of Trawsfynydd ILW packages in site ILW store  
| **Site end state**    | Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site. Opportunity for in-situ disposal of active waste vaults below-ground concrete structures. |
Figure 18: Trawsfynydd Radioactive Waste Strategy

ILW FED

ILW MAC

ILW MCI

ILW sand and gravel

ILW sludge and oil

ILW resins

ILW desiccant

ILW sand and gravel

ILW sludge and oil

ILW resins

ILW desiccant

LLW

Segregation

Encapsulation in stainless steel containers

Interim storage in Trawsfynydd ILW Store

Transport to GDF

Off-site treatment and disposal as VLLW

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

Transport to GDF

Repackage prior to disposal

Encapsualtion in 4M boxes

Transport to GDF

Reactor dismantling waste & Reactor void MAC

LLW

Encapsualtion in 4M boxes

Transport to GDF

Repackage prior to disposal

Package in 1803 mild steel drums

Interim storage in Trawsfynydd ILW Store
# Appendix K: Winfrith Site Strategy

## Table 16: Winfrith Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Strategy phases</th>
<th>RD &amp; SR</th>
<th>Quiescence</th>
<th>Site end state</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interim end state</strong> (quiescence)</td>
<td>Reactors</td>
<td></td>
<td>• Reactors deplanted and dismantled</td>
<td>Site released for next planned use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Opportunity for in-situ disposal of below-ground contaminated structures (including SGHWR basement)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redundant structures</td>
<td></td>
<td>• Demolition to below ground level and landscaped</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drains, tunnels &amp; pipelines</td>
<td></td>
<td>• Non-active drains and tunnels to remain in-situ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Active drains remove inner, outer to remain in-situ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Remove above ground pipeline structure, below-ground pipeline structure to remain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Land quality</td>
<td></td>
<td>• Radioactive contaminated land surface contamination to be removed and in-situ contamination with institutional controls for deeper contamination</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Non-radioactive contaminated land to be remediated as required to meet contaminated land &amp; groundwater regulations</td>
<td></td>
</tr>
<tr>
<td>ILW storage</td>
<td>No ILW store</td>
<td></td>
<td>• See Figure 19 for waste management strategy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Transport of ILW packages to Harwell for interim storage</td>
<td></td>
</tr>
</tbody>
</table>

---

GL: GL
SGHWR: SGHWR
Dragon: Dragon
Figure 19: Winfrith Radioactive Waste Strategy

- **Dragon Decommissioning ILW**
- **SGHWR Decommissioning ILW**
- **Miscellaneous ILW stored in SGHWR**
- **ILW Concrete Lined Drums**
- **ILW not suitable for packaging in 6m³ concrete boxes**
  - **Thorium**
  - **Natural and Depleted Uranium**
    - **SGHWR sludge**
      - Package in 500L drums
      - Short-term storage at Winfrith
      - Transport to LLWR for disposal
    - **LLW**
      - Segregation

- **Package & grout into 6m³ concrete boxes**
- **Transport to Harwell for interim storage in Harwell ILW Store**
- **Transfer to Harwell for processing & packaging**
- **Recovery at Springfields for re-use/recycle**
- **Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)**
## Appendix L: Wylfa Site Strategy

### Table 17: Wylfa Decommissioning Strategy

<table>
<thead>
<tr>
<th>Overarching strategy</th>
<th>Deferred reactor dismantling (85 years from reactor shutdown).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy phases</td>
<td>C&amp;MP (&amp; defuelling)</td>
</tr>
<tr>
<td>Interim state (C&amp;M)</td>
<td>Reactor safestore preparations</td>
</tr>
<tr>
<td></td>
<td>• Boilers to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Risk based deplanting</td>
</tr>
<tr>
<td></td>
<td>• Cladding maintain &amp; repair</td>
</tr>
<tr>
<td></td>
<td>• Reactor void MAC to remain in-situ</td>
</tr>
<tr>
<td>Redundant contaminated structures</td>
<td>• Dry store cells (DSC) 1-5 to remain in-situ</td>
</tr>
<tr>
<td>Other redundant structures</td>
<td>• Demolition to slab level</td>
</tr>
<tr>
<td></td>
<td>• Voids to be infilled as suitable material becomes available</td>
</tr>
<tr>
<td></td>
<td>• Turbine Hall void to be managed, opportunity to use material from Wylfa Newydd site construction</td>
</tr>
<tr>
<td>Drains, tunnels &amp; pipelines</td>
<td>• Non-active drains and tunnels to remain in-situ</td>
</tr>
<tr>
<td></td>
<td>• Active drains remove inner, outer to remain in-situ</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>ILW storage</td>
<td>No ILW store</td>
</tr>
<tr>
<td></td>
<td>~ 20 m³ raw waste (ILW)</td>
</tr>
<tr>
<td></td>
<td>• See Figure 20 for waste management strategy</td>
</tr>
<tr>
<td></td>
<td>• Interim storage of Wylfa ILW packages in converted existing facility (such as reactor safestore)</td>
</tr>
<tr>
<td>Site end state</td>
<td>Reactors dismantled. All facilities removed and below-ground structures made safe. Contaminated land remediated as required. All waste removed from site.</td>
</tr>
</tbody>
</table>
Figure 20: Wylfa Radioactive Waste Strategy

ILW MCI

ILW DSC4 corrosion debris

ILW DSC4 skip debris

ILW Desiccant

Package and dry (if required) in DCICs

Interim storage in converted existing facility (reactor safestore)

Transport to GDF

Off-site treatment and disposal as VLLW

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

ILW MCI

ILW DSC4 corrosion debris

ILW DSC4 skip debris

ILW Desiccant

Segregation

Encapsulation in 4M boxes

Transport to GDF

Reactor dismantling waste & Reactor void MAC

LLW Segregation

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

Transport to GDF

Reactor dismantling waste & Reactor void MAC

LLW Segregation

Use of available routes (i.e. metal recycling, incineration, VLLW, LLW disposal)

Transport to GDF