National Waste Programme

On-site Decay Storage Principles

NWP-REP-164 – Issue 1 – November 2017

Principle 1
Decay storage is compatible with site interim and/or final end states and endpoints

Principle 2
Decay storage is demonstrably BAT/BPM and ALARP for relevant waste streams and meets regulatory requirements

Principle 3
Decay storage is a planned waste management approach with a full lifecycle justification

Principle 4
Decay storage implementation, whilst planned and optimised, is responsive to change
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<td>Head of Strategy, LLW Repository Ltd.</td>
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Document history

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- Nuclear Decommissioning Authority
- NuGeneration Ltd
- Office for Nuclear Regulation
- Radioactive Waste Management Ltd
- Scottish Environment Protection Agency
- Sellafield Ltd
# Glossary

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<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>ABWR</td>
<td>Advanced Boiling Water Reactor</td>
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<tr>
<td>AGR</td>
<td>Advanced Gas-cooled Reactor</td>
</tr>
<tr>
<td>ALARP</td>
<td>As Low As Reasonably Practicable</td>
</tr>
<tr>
<td>BAT</td>
<td>Best Available Technique</td>
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<tr>
<td>BPEO</td>
<td>Best Practicable Environmental Option</td>
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<td>BPM</td>
<td>Best Practicable Means</td>
</tr>
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<td>C&amp;M Preps</td>
<td>Care and Maintenance Preparations</td>
</tr>
<tr>
<td>Capex</td>
<td>Capital expenditure</td>
</tr>
<tr>
<td>EA</td>
<td>Environment Agency</td>
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<tr>
<td>GDF</td>
<td>Geological Disposal Facility</td>
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<td>HAW</td>
<td>Higher Activity Waste</td>
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<td>HHISO</td>
<td>Half Height ISO</td>
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<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
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<td>ILW</td>
<td>Intermediate Level Waste</td>
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<td>LLW</td>
<td>Low Level Waste</td>
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<tr>
<td>LLWR</td>
<td>Low Level Waste Repository Ltd</td>
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<td>LoC</td>
<td>Letter of Compliance</td>
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<td>NDA</td>
<td>Nuclear Decommissioning Authority</td>
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<td>NRW</td>
<td>Natural Resources Wales</td>
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<td>ONR</td>
<td>Office for Nuclear Regulation</td>
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<td>PFR</td>
<td>Prototype Fast Reactor</td>
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<td>RWM</td>
<td>Radioactive Waste Management Ltd</td>
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<td>RWMC</td>
<td>Radioactive Waste Management Case</td>
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<td>SAP</td>
<td>Safety Assessment Principles</td>
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<td>SEPA</td>
<td>Scottish Environment Protection Agency</td>
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<td>SL</td>
<td>Sellafield Ltd</td>
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<tr>
<td>SQEP</td>
<td>Suitably Qualified and Experienced Person</td>
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<tr>
<td>WAC</td>
<td>Waste Acceptance Criteria</td>
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<td>WAV</td>
<td>Waste Acceptance Criteria</td>
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<tr>
<td>WAGS</td>
<td>Windscale Advanced Gas-cooled Reactor</td>
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<td>WENRA</td>
<td>Western European Nuclear Regulators Association</td>
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<tr>
<td>WMP</td>
<td>Waste Management Plan</td>
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<tr>
<td>WPEP</td>
<td>Waste Packaging Encapsulation Plant</td>
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1. Introduction

Decay storage is the process of using time as a treatment to allow radioactive decay to reduce specific activity levels of waste, stored either in-situ or containerised, to facilitate its onward management (adapted from reference [1]).

Allowing radioactivity to decay can provide significant benefits to waste producers, workers, host communities, the environment and the public purse.

This document identifies four high-level principles to guide waste producers in their decision making regarding on-site decay storage. The underpinning considerations that enable waste producers to apply the principles in practice to suitable waste streams are described in detail later in the document.

A range of case studies have been included in Section 5 to illustrate where and how decay storage is being adopted by waste producers within the UK, and how the principles and key considerations described within this document are reflected in their approaches.

1.1. The policy and regulatory environment supporting decay storage

Decay storage is an accepted waste management approach for Intermediate Level Waste (ILW) and other radioactive waste, and is acknowledged by the regulators (Office for Nuclear Regulation (ONR) and the environment agencies) as being a credible approach within waste management. It is expected that (where relevant) it would form part of the site or organisation waste management strategy.

The Nuclear Decommissioning Authority (NDA) strategy [2] is committed to consider decay storage of ILW and it is recognised as a significant area of work within the NDA Higher Activity Waste (HAW) Treatment Framework. As a result the updated 2017 Industry Guidance for the interim storage of HAW packages [3] recognises the use of decay storage, and includes a decay storage management approach. Radioactive Waste Management Limited (RWM) also recognises decay storage as a credible approach for the management of ILW [4].

The ONR and environment agencies (Environment Agency (EA), Scottish Environment Protection Agency (SEPA) and Natural Resources Wales (NRW)) have published joint regulatory guidance for the management of HAW on nuclear licenced sites [5]. This includes decay storage as a potential strategy for HAW management, subject to demonstration of Best Available Technique (BAT) and As Low As Reasonably Practicable (ALARP), and substantiation in a Radioactive Waste Management Case (RWMC).
This supportive policy and regulatory environment, and the interest of site operators and regulators in a risk-based approach to waste management makes on-site decay storage a useful approach for appropriate waste streams.

Section 6 of this document identifies the references cited in this report. Additional useful sources of information, which underpin the UK policy and regulatory framework surrounding radioactive waste storage, are also provided. These sources of information further support the on-site decay storage principles.

1.2. Principles and considerations for on-site decay storage

Four high-level principles have been developed to assist waste producers in determining the suitability of their waste for on-site decay storage. The principles (Figure 1) have been developed with stakeholder input [7] and consideration of the NDA waste management principles in the NDA strategy [2].

![Figure 1: On-site decay storage principles](image)

The above principles encompass a range of ‘considerations’ that waste producers must address. These considerations clarify what the principles mean in practice by mapping out what a waste producer needs to consider before, during and after the decay storage period (Section 3.1).

These principles address the full waste management lifecycle (see Figure 2) and apply to both the ‘strategy and planning’ and ‘implementation’ phases.
Figure 2: An indicative decay storage waste management lifecycle

Decay storage should be implemented with a pre-determined treatment and/or disposal route identified; the route could include technological solutions close to technology readiness, where demonstrably BAT and optimised.

The principles apply to:

- Decay storage of ILW (and other radioactive waste) for disposal or treatment as LLW.
- On-site decay storage at waste producer sites, where the waste is either:
  - stored in-situ and retrieved at a later date
  - retrieved and containerised (but not necessarily conditioned) prior to storage.
- Decay storage where waste producers with multiple sites choose to centralise or regionalise decay storage facilities.
- Decay storage where it enables access to a predetermined waste route.

The principles consider decay storage at the site of origin and have not been tested with stakeholders for decay storage at other locations as described below, where a range of other factors and constraints may apply. Therefore, the principles do not consider decay storage:

- at a future national centralised or regionalised storage site(s)
- at the Low Level Waste Repository Ltd (LLWR) site
- at a supply chain site
2. Benefits and Disbenefits of On-site Decay Storage

On-site decay storage is considered to be a potentially useful waste management option for ILW where dominated by short-lived radionuclides\(^2\).

Decay storage of ILW with suitable radiological, chemical and physical properties, could enable the waste to meet the necessary WAC for appropriate treatment or disposal routes. This could include both existing routes or technological solutions close to technology readiness, where demonstrably BAT and optimised.

The principles and considerations may also prove useful when using decay storage as a management option for other radioactive wastes to facilitate application of the Waste Hierarchy across the radiological spectrum.

Potential benefits and drivers for decay storage may include:

1. **Reduction in hazard and environmental risk prior to intervention.**

2. **Using an optimised waste management approach** (i.e. Best Available Technique (BAT)/ Best Practicable Means (BPM) and minimising risks to As Low As Reasonably Practicable (ALARP)) that may enable:
   - Optimal application of the Waste Hierarchy and management of waste at the lowest possible category, diverting ILW away from the GDF and potentially facilitating sorting and segregation, treatment, exemption, re-use or recycling.

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\(^1\) For the remainder of the document, where comments relating to GDF disposal are relevant to Scotland, this should be taken as applying to a near-site near-surface disposal facility in Scotland.

\(^2\) Short-lived radionuclides could be considered as those typically with half-lives of less than 30 years, which include Cs-137 (30 year half-life), Sr-90 (29.1 year half-life), H-3 (12.3 year half-life), Co-60 (5.3 year half-life) and Fe-55 (2.7 year half-life).
A broader range of treatment and disposal routes to be considered following decay storage.

A reduction in operator exposure to the radiological (and for some wastes the non-radiological) hazards associated with processing ILW for interim storage pending GDF disposal, particularly for wastes requiring little or no pre-treatment before being decay stored.

The activity associated with any secondary waste arisings from treatment to be minimised until the waste has decayed to LLW. Secondary arisings could include processing equipment required to size reduce, package or condition ILW waste.

Quantities of radioactive waste requiring disposal to be minimised.

3. **Avoiding foreclosing management options close to technology readiness**, where their use is demonstrably BAT and optimised. Storing waste in a packaged and conditioned form for disposal to the GDF may foreclose other disposal and treatment options that are close to technology readiness. Decay storing known volumes of waste could also incentivise the maturing of technologies to a deployable state.

4. **Reducing costs** where short-lived ILW can be reclassified in a relatively short timeframe. The cost of decay storage may be lower than the costs associated with interim storage of ILW that is waiting for a GDF to become available (e.g. through use of different, less expensive packaging).

5. **Earlier completion of the final waste management solution** where waste that would otherwise be destined for the GDF, achieves final treatment or disposal earlier than it could be consigned to the GDF. This could deliver the additional benefit of freeing up valuable interim ILW storage space.

In most circumstances, a storage period of 100 years is the likely upper bound for on-site decay storage. This is based on the probable availability of the GDF (predicted to be operational from 2040 and taking around 100 years to consign all stored waste requiring GDF disposal) and the life expectancy of an interim store expected to be 100 years or less.

The above potential benefits and drivers could be used by waste producers to underpin the case for adopting a decay storage strategy for relevant waste streams.

The potential disbenefits, risks, and uncertainties of decay storage must also be considered, these are shown overleaf.
Potential disbenefits, risks, and uncertainties of decay storage may include:

1. Completing the final waste management solution later than necessary. Holding on to waste for up to 100 years (after the planned GDF is available), may not be the preferred solution if it can be packaged for disposal to GDF now or managed by another route.

2. Unnecessary accumulation of waste on a site.

3. Currently available routes for the waste no longer being available at the end of the decay storage period.

4. Changes to WAC of management facilities foreclosing the intended management option.

5. The need to repackage waste at the end of the decay storage period, particularly if the infrastructure for packaging as ILW is currently available.

6. More extensive segregation and characterisation being required compared to that necessary if packaged for ILW disposal. This may need to happen before decay storage to gain the necessary certainty that waste will meet WAC for the management route after the decay period.

7. Double handling of waste.

8. The requirement to package waste in more robust packages than the norm for LLW disposal, e.g. use of stainless steel drums to ensure the package will last for the duration of the decay period. This may result in packages not compliant with WAC for the intended management option.

9. Increased lifecycle costs relating to storage and repackaging as well as higher disposal costs where cost norms for higher activity LLW exceed ILW disposal cost norms.
3. On-site Decay Storage Principles & Underpinning Considerations

The on-site decay storage principles are defined as follows:

P1 **Principle 1: Decay storage is compatible with site interim and/or final end states and endpoints.**

The decay storage strategy needs to be compatible with the existing end state strategies and endpoints for the site. If end state assumptions change and the decay storage period extends beyond the site interim/final end state, then provisions for managing the waste would need to be developed. Subject to prior authorisation/approval, this may include transferring the waste to another site or its ownership to another entity, so that decay storage can continue.

P2 **Principle 2: Decay storage is demonstrably BAT/BPM and ALARP for relevant waste streams and meets regulatory requirements.**

The benefits of decay storage should be shown to outweigh any risks and uncertainties associated with implementation. Hence, decay storage needs to be demonstrated as meeting regulatory requirements, being BAT/BPM and ALARP, and delivered in a passively safe manner.

P3 **Principle 3: Decay storage is a planned waste management approach with a full lifecycle justification.**

Decay storage is a conscious decision to use time to gain the benefit of radioactive decay and enable access to an intended treatment and/or disposal routes. Hence, the approach needs to be planned across the entire waste management lifecycle, including the on-site activities (i.e. storage arrangements, inspection and maintenance, processing and retrieval) and off-site activities (i.e. transport and consignment) required to access the intended final treatment/disposal route.

P4 **Principle 4: Decay storage implementation, whilst planned and optimised, is responsive to change.**

Decay storage should be implemented in an optimised and planned manner, which does not foreclose options. The strategy and implementation arrangements for decay storage should be periodically reviewed to ensure that potential changes in regulations, transport, and management routes are responded to.
3.1. Underpinning considerations

To enable waste producers to successfully apply the principles, a number of cross-cutting considerations have been identified. These considerations are mapped to the principles they underpin below. Detailed descriptions of the considerations are provided in Section 4.

Most of the considerations are relevant to more than one principle and cover various aspects of the waste management lifecycle. For example, the first consideration relates to the characterisation of waste to underpin the management route. This consideration is critical to the fulfilment of all four principles and must be addressed during the strategy and planning, and the implementation phases of the waste management lifecycle.

<table>
<thead>
<tr>
<th>Principles:</th>
<th>Consideration underpinning successful application of the principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 P2 P3 P4</td>
<td>➢ Characterise the waste to inform the future management route.</td>
</tr>
<tr>
<td>P1 P3 P4</td>
<td>➢ Define and assess the suitability of the decay storage time period.</td>
</tr>
<tr>
<td>P1 P4</td>
<td>➢ Consider alignment with the strategic objectives for the site.</td>
</tr>
<tr>
<td>P2 P3 P4</td>
<td>➢ Engage with key stakeholders.</td>
</tr>
<tr>
<td>P1 P2</td>
<td>➢ Evaluate the benefits, disbenefits, and risks of decay storage across the waste management lifecycle.</td>
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</table>
## LLW Repository Ltd

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<table>
<thead>
<tr>
<th>Principles:</th>
<th>Consideration underpinning successful application of the principle</th>
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<tbody>
<tr>
<td>P2 P3</td>
<td>- Demonstrate that the decay storage of waste is BAT/BPM and ALARP and meets regulatory requirements.</td>
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<tr>
<td>P1 P2 P3</td>
<td>- Document the approach in the Radioactive Waste Management Case (RWMC), Waste Management Plan (WMP) and business case (as appropriate).</td>
</tr>
<tr>
<td>P1 P2 P3 P4</td>
<td>- Confirm that the requirements for waste storage can be maintained.</td>
</tr>
<tr>
<td>P2 P3 P4</td>
<td>- Determine and implement the optimal processing requirements.</td>
</tr>
<tr>
<td>P2 P3 P4</td>
<td>- Confirm and maintain the documentation required to support onward waste management.</td>
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<tr>
<td>P2 P3 P4</td>
<td>- Monitor the evolution of the transport and treatment/disposal requirements.</td>
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<tr>
<td>P2 P3 P4</td>
<td>- Operate and maintain the decay storage system addressing concerns for passive safety.</td>
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<tr>
<td>P1 P2 P3 P4</td>
<td>- Maintain as necessary a Suitably Qualified and Experienced work force.</td>
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<td>P1 P2 P3 P4</td>
<td>- Maintain or ensure provision of any relevant infrastructure that is required post decay storage.</td>
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<td>P3 P4</td>
<td>- Ensure that the provisions for off-site transport will be available.</td>
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</table>
4. **Description of the Underpinning Considerations**

Table 1 lists each of the considerations that underpin the four principles, and describes their context and purpose when deciding whether on-site decay storage is an appropriate approach. It also indicates the waste management lifecycle phase that each of the considerations applies to i.e. whether a consideration should be addressed at the strategy and planning and/or the implementation phase.

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<thead>
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<th>Principles:</th>
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<tr>
<td>P4</td>
<td>During implementation, schedule the consignment of the waste to the final treatment/disposal facility.</td>
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</table>
Table 1: Description of the Underpinning Considerations

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Description</th>
<th>Strategy &amp; Planning</th>
<th>Implementation</th>
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</table>
| **Characterise the waste to inform the future management route** | • Characterise (or improve the characterisation of) the waste to determine the physical, chemical, biological and radiological properties (considering heterogeneity and average activity).  
  • Confirm suitability of the waste for decay storage and for the intended onward management route.  
  • Periodically re-characterise the waste to confirm suitability of the intended endpoint.  
  • Confirm the suitability of waste for transportation. | ✓                  | ✓              |
| **Define and assess the suitability of the decay storage time period** | • Duration should be dictated by the dominant radionuclides present, their half-lives, the activity levels of the waste as generated and reduction in activity required to access the disposal/treatment route.  
  • The decay storage time period should be considered in relation to the strategic objectives of the site (and should be informed by the interim and end state dates) and the availability of the intended treatment and/or disposal routes after the storage period.  
  • In most circumstances, a storage period of 100 years is the likely upper bound for on-site decay storage timescales given the probable availability of the GDF for England and Wales (though predicted to be operational from 2040, it will take around 100 years to consign all stored waste requiring GDF disposal). Beyond 100 years\(^3\), the waste may become an inappropriate burden for future generations and it is highly likely that the availability/capacity of the national infrastructure for handling and managing the waste would be significantly different. LLWR, for example, is forecast to remain operational until 2130.  
  • Consider longevity of proposed stores and consider whether stores or other infrastructure would |                   | ✓              |

\(^3\) In accordance with Scottish Policy and under the Scottish regulatory regime, expectation on an acceptable timeframe for decay storage is likely to be different to England and Wales, hence the inclusion of the Magnox tritiated rotary pump oil case study (in Section 5) where the decay period is circa 150 years.
### Consideration

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<thead>
<tr>
<th>Consideration</th>
<th>Description</th>
<th>Strategy &amp; Planning</th>
<th>Implementation</th>
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</table>
| **Consider alignment with the strategic objectives for the site**           | • Consider impact of decay storage on achieving site strategic objectives.  
• Identify whether the storage period extends beyond the site end point, and the associated implications of that.  
• Consider whether there are opportunities for consolidation of decay storage capability with another site.  
• The waste owner should take account of the level of confidence in the planned interim/final end states and the timing of them. If end state assumptions change and the decay storage period extends beyond the site interim/final end state, then provisions for managing the waste would need to be developed.  
• Consider whether decay storage would have implications on other decommissioning programmes. | ✓                   | ✓                                        |
| **Engage with key stakeholders**                                             | • The NDA and Parent Body Organisations or shareholders for corporate support.  
• Regulators e.g. environment agencies and ONR for regulatory acceptance.  
• The treatment and disposal supply chain to assess the suitability of the waste for the intended management route. Further engagement with the supply chain would be necessary at subsequent stages of the waste management lifecycle to minimise any risk associated with future waste routing e.g. assess the implications of changes to the Waste Acceptance Criteria (WAC).  
• Others e.g. RWM, local planning authorities and local communities (where relevant) to gain wider acceptance of the approach. | ✓                   | ✓                                        |
| **Document the decay storage approach in the RWMC, WMP and business case**    | • The RWMC should state the intended management approach and the final treatment/disposal route following a suitable period of decay storage. It should also be described in the WMP (which can refer to the RWMC).  
• Develop a business case to document the benefits, disbenefits, risks and cost estimates, and any R&D that may be required. This would require site owner endorsement, and possible escalation to the relevant Senior Strategy Committee.  
• Identify key risks and outline how these will be managed. | ✓                   |                                           |
## Consideration

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<tr>
<th>Description</th>
<th>Strategy &amp; Planning</th>
<th>Implementation</th>
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<tbody>
<tr>
<td><strong>Evaluate the benefits, disbenefits, and risks of decay storage across the waste management lifecycle</strong></td>
<td>✓</td>
<td>✓</td>
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</tbody>
</table>
| • The feasibility of this management approach would need to be underpinned, or justified by demonstrating that the benefits outweigh the risks and disbenefits across the waste management lifecycle.  
• Obtain 'approval in principle' for future treatment/disposal following the decay period and develop a fall-back strategy for if the risks associated with the strategy are not fully understood, or become unacceptable in the future.  
• Demonstrate that the benefits outweigh the risks and disbenefits and continue to do so e.g. periodic review of the business case and the RWMC.  
• For ILW that is being decay stored, it is essential that the waste producer and RWM have ongoing interaction throughout the lifecycle of the waste. This should be documented in the RWMC (and WMP) and may be via the Letter of Compliance (LoC) process. Develop a fall-back strategy, e.g. LoC submission, if the risks associated with the strategy are not fully understood or become unacceptable. New technologies may arise that are better | |
| **Demonstrate that the decay storage of waste is BAT/BPM and meets regulatory requirements** | ✓ | |
| • The decision to implement decay storage should be reflected in the appropriate safety cases and be underpinned by BAT/BPM assessments.  
• The BAT/BPM assessments may consider the strategic benefits (e.g. diversion of waste from the GDF and optimisation of the Waste Hierarchy; see Section 2).  
• Determine and justify how decay storage would be implemented e.g. stored ex-situ (containerised) or in-situ (stored at source). Consider the potential for waste form and facility degradation.  
• The approach should be demonstrated as being ALARP across the lifecycle. For example, ALARP arguments may be appropriate to support in-situ storage (delayed retrieval/packaging) owing to a reduction in operator exposure. | |
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#### Confirm that the requirements for waste storage can be maintained

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<th>Consideration</th>
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<th>Strategy &amp; Planning</th>
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<tr>
<td></td>
<td>• The nature of the storage system should be commensurate with the hazard posed by the waste and appropriate regulatory requirements.</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td></td>
<td>• Where appropriate ensure alignment with guidance on the storage of HAW and guidance on waste package records/documentation. Need to demonstrate waste will meet the WAC of the receiving treatment or disposal facility.</td>
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<td>• A number of documents have been published to provide guidance and are listed in Section 6.</td>
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<tr>
<td></td>
<td>• The requirements for the storage of HAW packages largely focus on passive safety, which encompasses the entire storage system, namely, the waste form, waste package, storage facility and management arrangements.</td>
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<td>• Ensure that the storage system addresses concerns for passive safety without unnecessarily foreclosing alternative treatment and disposal options.</td>
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<td></td>
<td>• For waste being decay stored (for future ex-situ management) without first being retrieved, the store would be the originating facility. In this scenario, it would be necessary to demonstrate that the facility in which the waste is to be decay stored addresses concerns for the requirements of passive safety, with maintenance and structural integrity having been considered.</td>
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Consideration | Description | Strategy & Planning | Implementation
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**Determine and implement the optimal processing requirements**  
- The processing approach will depend on the nature of the waste and the intended onward management route, but may include sorting and segregating, dewatering, decontamination and size reduction.  
- Consider the need for and relative merits of undertaking pre-treatment activities before the decay storage period formally commences, or after decay storage once the waste has decayed to a lower waste category. For example, processing and packaging the waste before the decay storage period may support the journey to passive safety; however, processing ILW prior to decay storage may not be ALARP.  
- The generation and management of secondary waste needs to be considered when optimising the processing requirements.  
- These aspects could be addressed in the RWMC. | ✓ | ✓

**Confirm and maintain the documentation required to support onward waste management**  
- Early development of a record-management strategy.  
- Provide evidence that the waste meets the requirements for transport and treatment/disposal.  
- Identify data requirements to ensure correct information is being recorded. These may vary depending on the nature of the waste, mode of transport and treatment/disposal site.  
- Data must be retrievable for later use. | ✓ | ✓

**Monitor the evolution of the transport and treatment/disposal requirements**  
- Engagement with the supply chain needs to be maintained to understand changes to the treatment/disposal WAC or transport requirements.  
- On-going waste assessment would be required throughout the implementation phase to underpin the strategy.  
- Where changes to the transport regulations and/or treatment/disposal WAC occur, confirmation would be required to confirm that the waste continues to meet the criteria.  
- Developing a fall-back option if the risks associated with the original decay storage strategy become unacceptable e.g. a LoC submission for the waste stream could be developed, which would then subject the waste stream to RWM’s disposability assessment process.  
- Consider any new treatment and transport solutions developed during the decay storage time | ✓ |
## Consideration

<table>
<thead>
<tr>
<th>Description</th>
<th>Strategy &amp; Planning</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operate and maintain the decay storage system to address concerns for passive safety</strong></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>- The storage system comprises the facility used to store waste and the waste package where applicable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The requirements of buildings and containers used to store radioactive materials are outlined in the joint regulatory guidance [5], which are consistent with the recommendations outlined in the International Atomic Energy Agency (IAEA) safety standard (see Section 6); Western European Nuclear Regulators Association (WENRA) Guidance may also be of assistance).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The joint regulatory guidance discusses the storage of radioactive waste in detail and outlines a number of fundamental principles that should be adhered to.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Any potential degradation processes that could take place during decay storage period should be identified and quantified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maintain, as necessary, a Suitably Qualified and Experienced workforce and maintain knowledge</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>A workforce will be required to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Operate and maintain the storage system, inspect waste packages, generate and manage information and knowledge about the waste throughout the decay storage period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Carry out periodic reviews of the strategy.</td>
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<td></td>
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<tr>
<td>- Undertake a number of post-decay activities associated with waste retrieval, processing and conditioning, off-site transport and consignment.</td>
<td></td>
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</tr>
<tr>
<td>- A SQEP workforce is required throughout the entire lifecycle to implement the approach.</td>
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<tr>
<td>- Appropriately manage the handshake/interface points across the entire lifecycle.</td>
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</tbody>
</table>
## National Waste Programme

### Consideration

<table>
<thead>
<tr>
<th>Description</th>
<th>Strategy &amp; Planning</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maintain or ensure provision of any relevant infrastructure that is required post decay storage</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
| - Infrastructure will be required to support a number of activities after the decay storage period, which may include:  
  o retrieval and handling of packages  
  o waste conditioning or processing.  
- Failure to maintain infrastructure or ensure provision of any relevant infrastructure would mean that waste cannot be transported off-site and consigned to the intended treatment/disposal site. This would result in the burden remaining on the waste producing site. | ✓                   | ✓              |
| **Ensure that the provisions for off-site transport will be available**     | ✓                   | ✓              |
| - Transport provisions may include:                                         | ✓                   | ✓              |
  - Infrastructure for handling and transferring packages to the transport vehicle.  
  - Vehicles for transporting the waste packages off-site, and off-site logistic arrangements.  
  - Appropriate transport packaging e.g. overpacks approved for transport.  
  - Documentation and authorisations necessary for off-site transport need to be considered in a timely manner. This may include consignment paperwork, waste descriptions and waste information of sufficient detail to meet the treatment/disposal requirements.  
  - Maintenance and licensing of physical assets. | ✓                   | ✓              |
| **During implementation, schedule the consignment of the waste to the final treatment/disposal facility** | ✓                   | ✓              |
| - During implementation, at a high level, plan the pace and sequencing of the waste consignments to the treatment/disposal facility.  
- Plan and organise the handshakes between operators, teams and organisations as necessary.  
- This should be periodically reviewed and adjusted over the implementation period.  
- Liaise with the supply chain to identify any constraints for treatment or disposal. The treatment/disposal facility may have particular constraints such as limited volume capacity or limited capacity for specific radionuclides. For example, a waste stream may meet the WAC for a pre-determined route. However, the waste may contain high-levels of a particular radionuclide that would cause the treatment/disposal facility to exceed its capacity for that radionuclide.  
- Develop mitigation strategies where appropriate. | ✓                   | ✓              |
5. Case Studies

A number of case studies are presented in this section. They are designed to illustrate where decay storage is currently being implemented by waste producers within the UK, and how the principles and key considerations are reflected in their approaches.

The case studies also summarise the benefits and drivers supporting the decision to implement decay storage, along with the key risks and challenges.

Relatively few examples of waste being decayed stored from ILW to LLW were available. One case study, from Horizon Nuclear Power, has therefore been included where GDF disposal remains the intended route. In spite of this, the case study provides some useful insights, and highlights the relevance of the principles and considerations. It also highlights the opportunity to not unnecessarily foreclose future alternative management options, where it is not required to do so.
### Tritiated Reactor Steel from Prototype Fast Reactor at Dounreay

#### 1. Context and Nature of the Waste

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dounreay Site Restoration Ltd has identified approximately 1000 te of reactor vessel stainless steel from the Prototype Fast Reactor (PFR) as being tritiated to ILW levels. Tritium is the primary radionuclide, although other activation products include Co-60, Ni-63 and Cs-137. Alkaline metal from the liquid sodium coolant will be removed from the steel during processing.</td>
<td>The tritiated reactor stainless steel is located in the PFR vessel and retrieval operations are expected to commence in 2021. It is estimated that the activated stainless steel reactor vessel will decay to LLW by 2046, hence there is a strategic opportunity to decay store the waste to reduce the volume of ILW being managed. However, the current site interim endpoint is 2029, 17 years before the storage period is forecast to end.</td>
</tr>
</tbody>
</table>

#### 2. Benefits and Drivers

- Application of the Waste Hierarchy reduces ILW management burden.
- No additional conditioning required, relatively quick and easy to load the steel straight into a HHISO as it is retrieved, which is also ALARP.
- No additional shielding is required in the ILW store during the decay storage period.
- Reduced disposal costs associated with non-ILW disposal (i.e. reduced container and transport costs).

#### 3. Application of On-Site Decay Storage Principles and Relevant Considerations

**Principle 1: Decay storage is compatible with site interim and/or final end states and endpoints:**
- Initial characterisation has been undertaken to confirm the suitability of the approach.
- The decay storage timescale has been defined through sampling campaigns.
- The decision to decay store is documented in the RWMC for PFR Decommissioning ILW and 2016 HAW strategy.
- The NDA are supportive of the strategy.
- The waste management arrangements beyond 2029 will require consideration and definition by the NDA.

**Principle 2: Decay storage is demonstrably BAT/BPM and ALARP for relevant waste streams and meets regulatory requirements:**
- Decay storage accepted as the preferred management approach, an options paper has been submitted to the NDA Senior Strategy Committee.
- The existing storage facilities and container are adequate for the entire storage duration.

**Principle 3: Decay storage is a planned waste management approach with a full lifecycle justification:**
- Requirements for storage of HAW can be maintained. The containerised waste would be stored within an existing ILW store on the Dounreay site.
- No changes to the intended ILW storage environment are required.
- Sampling of reactor components will continue to improve understanding of the tritium content.

#### 4. Challenges & Risks

- Uncertainty regarding how the disposal and treatment of the waste will need to be managed beyond 2029, and whether repackaging might be required.
- Disposal route is assumed to be off-site LLW disposal but no handshake is in place.
- A fall-back option of packaging and grouting of these wastes was included in an interim LoC submission for PFR Decommissioning ILW.
- The Dounreay site may not have the infrastructure or facilities available to support the retrieval and consignment of packages after decay storage.
### Magnox Chapelcross Tritiated Rotary Pump Oil

#### 1. Context and Nature of the Waste

| Vacuum pumps were used within the Chapelcross processing plant process line to achieve high vacuum integrity operating conditions. This oil became contaminated with tritium. The tritium is present at ILW levels. The oil does not present any complicating non-radiological (i.e. chemical) hazards. The volume of oil is small, circa 200 litres. | The majority of the oil has been absorbed on absorbent media within the bottles, however some remains as free liquid. The high tritium inventory, combined with the presence of free liquids, presents challenges in terms of disposal. Decay storage has been identified as the most appropriate approach for managing the tritiated oil. |

#### 2. Benefits and Drivers

- The rotary pump oil represents a challenge for disposal.
- Decay storage is ALARP and avoids conditioning ILW. Tritium presents unique challenges with regards to conditioning, particularly management of off-gassing during processing.
- The current tritium levels challenge the permitted capacities of the incinerators used to treat radiologically contaminated oils.
- Significant cost savings could be realised by decay storage followed by incineration of LLW oil, compared to incinerating small volumes of ILW oil.
- Decay storing the oil may make alternative treatment/disposal routes viable and so avoids foreclosing options.

#### 3. Application of On-Site Decay Storage Principles and Relevant Considerations

**Principle 1: Decay storage is compatible with site interim and/or final end states and endpoints:**

- The approach has been documented in an RWMC.
- Regulator engagement has been undertaken with no fundamental issues identified.
- A storage period of 150 years has been defined, along with consideration of how this aligns with the lifetime of the on-site storage facilities.

**Principle 2: Decay storage is demonstrably BAT/BPM and ALARP for relevant waste streams and meets regulatory requirements:**

- Decay storage is the only credible management option, demonstrated as being BPM.
- Deferring processing and treatment of the ILW oil is ALARP.
- Scottish Policy and the Scottish regulatory regime apply.

**Principle 3: Decay storage is a planned waste management approach with a full lifecycle justification:**

- The final treatment route has been identified as incineration as LLW.
- Facilities meeting the requirements for HAW storage will be available throughout the decay storage period.
- Passive safety will be maintained through high integrity containment (no evidence of corrosion or damage), which is vented to prevent pressurisation. The majority of the oil has been absorbed on absorbent media.

**Principle 4: Decay storage implementation, whilst planned and optimised, is responsive to change:**

- Documentation required for onward management has already been considered.
- Treatment/disposal routes other than incineration will be considered at the end of the storage period.
- Periodic review of the proposed route to ensure that it remains BAT.

#### 4. Challenges & Risks

- Decay storage does not necessarily reduce the on-site hazard as the tritiated oil remains on-site for an extended period of time.
- The decay storage period is relatively long (~150 years) so the availability of treatment routes, or changes in the WAC during this period cannot be predicted. This risk could be mitigated through a process of periodic review.
Sellafied Windscale Advanced Gas-cooled Reactor (WAGR) Boxes

1. Context and Nature of the Waste

| The core of WAGR was dismantled in a series of campaigns, with discrete reactor components being packaged/conditioned within WAGR reinforced concrete boxes, for ongoing storage in the WAGR box store. |
| The waste primarily comprises activated reactor components, with the dominant radionuclides being Co-60, Fe-55 and N-63. |
| The waste stream was packaged as ILW with the intention that it would be disposed of to the GDF. |
| However whilst 112 of these WAGR boxes still contain ILW, 75 are now LLW. Many more of the ILW packages will reach LLW levels within the next 10 years. |
| Despite not being a planned decay storage activity, the case study does highlight the relevance of some of the principles and considerations. |

2. Benefits and Drivers

- A number of the WAGR boxes have already decayed to LLW.
- Direct disposal to LLWR would generate additional storage capacity in the WAGR box store. The facility could be used for other wastes e.g. HLHISOs, representing a cost saving from more efficient storage and waste routing.
- Changes to the LLWR WAC over time may mean that these packages now meet the criteria for specific activity.
- Overall cost savings if the WAGR boxes could be disposed to the LLWR instead of the GDF.

3. Application of On-Site Decay Storage Principles and Relevant Considerations

**Principle 1: Decay storage is compatible with site interim and/or final end states and endpoints**
- Characterisation has shown that some WAGR boxes are already LLW, with others reaching LLW levels within the next 10 years.
- Direct disposal to LLWR following decay storage would benefit site strategy by releasing storage capacity and supporting high hazard reduction operations in the legacy facilities.

**Principle 3: Decay storage is a planned waste management approach with a full lifecycle justification**
- Direct disposal to LLWR is the end point. Characterisation has shown that a number of the WAGR boxes may already be suitable for direct disposal.

**Principle 4: Decay storage implementation, whilst planned and optimised, is responsive to change**
- Initially, decay storage for these wastes was not a conscious strategy. However, the existing interim storage arrangements comply with the requirements of passive safety.
- The infrastructure required to retrieve and transport the packages off-site will be available at the end of the storage period.
- A workforce capable of delivering the post decay storage activities will be available.

4. Challenges & Risks

- WAGR boxes may not meet the Discrete Item Limit or other WAC for vault disposal at the LLWR.
- The WAGR box would need to be re-licenced for off-site transport. A design authority would need to be appointed.
### EDF Energy Hartlepool and Heysham ILW Bypass/ Blowdown Filters

#### 1. Context and Nature of the Waste

| A number of ILW filters arising from EDF Energy’s AGR stations at Heysham 1 and Hartlepool are being decay stored. The filters originate from the gas bypass system when sufficient particulate cannot be removed through back-flushing to restore operational differential pressure levels. | The dominant radionuclide is Co-60, although Fe-55, Mn-54 and Cr-51 are also present. These filters cannot be disposed of directly to the LLWR because they do not meet the WAC; the filters fail to meet the Discrete Item Limit. There is no other disposal route at present, so decay storage is the preferred approach. |

#### 2. Benefits and Drivers

- No other disposal route is currently available. The LLWR WAC makes the filters unsuitable for direct disposal.
- Heysham 1 and Hartlepool are operational sites and have been able to adapt existing facilities to incorporate passively safe storage arrangements for the filters.
- Processing filters after a period of decay reduces operator dose exposure, which is ALARP.
- Reduced volume of ILW being consigned to the GDF.

#### 3. Application of On-Site Decay Storage Principles and Relevant Considerations

**Principle 1: Decay storage is compatible with site interim and/or final end states and endpoints:**

- The short decay period (typically ~20-50 years) is compatible with site operations (including C&M Preps).
- Some filters may not reach LLW levels at the point that the sites enter care and maintenance in 2037.
- The decay storage strategy is documented in the 2016 RVMC for HAV Strategy.

**Principle 2: Decay storage is demonstrably BAT/BPM and ALARP for relevant waste streams and meets regulatory requirements:**

- A Best Practicable Environmental Option (BPEO) study found decay storage to be the preferred strategy.
- The approach is BAT as there are currently no other management routes.
- Both sites have dedicated storage facilities for passive safety.

**Principle 3: Decay storage is a planned waste management approach with a full lifecycle justification:**

- There are no concerns for off-site transport of the filters as they can be packaged in HHISO containers.
- The planned management approach is to transfer the filters to Tradebe Inutec for further decay storage (if required), treatment and packaging before disposal at LLWR.
- A robust record management system is in operation. Each filter is assigned a Uniquely Tracked Commodity code and all records are maintained on an Asset Management Suite.

**Principle 4: Decay storage implementation, whilst planned and optimised, is responsive to change:**

- A fall-back option of packaging the filters as ILW is available in case the LLWR WAC cannot be met.
- Contact with the supply chain is maintained to establish any developments in treatment and disposal solutions.

#### 4. Challenges & Risks

- The RVMC referred to is strategic in nature and does not provide site-specific management coverage.
- Further off-site decay storage may be required for some of the waste at Tradebe Inutec.
- Waste is at the early phase of the lifecycle, so there is little operational experience associated with the management route.
- Changes to the treatment and disposal WAC.
- Progression of LoC for filters requiring disposal to GDF.
### 1. Context and Nature of the Waste

Sellafield Ltd (SL) has approximately 13,500 drums containing graphite dismantler waste from AGRs. The waste has been containerised within a liner within 500 litre drums, but not conditioned. The graphite originates from the sleeve that supports the AGR fuel pin cluster and fuel assembly. Co-60 is the dominant radionuclide, although the waste also contains high levels of C-14.

The original intention was for the waste to be disposed to the GDF; therefore, the waste was packaged as LLW, in 500 litre stainless steel drums. However, as the majority of the waste stream could potentially achieve LLW levels within the operational lifespan of the Repository, SL is now considering the possibility of decay storing some of the waste to LLW followed by direct disposal to LLWR.

### 2. Benefits and Drivers

- Disposing of some of the drums to the LLWR could provide additional storage capacity in existing stores.
- Opportunity for earlier decommissioning of the AGR Dismantler Store, or reuse of the store for Waste Packaging Encapsulation Plant (WPEP) drums.
- Earlier final waste management solution for some waste; SL is considering disposing approximately 10% of the drum population to LLWR.
- Overall cost savings if the drums are disposed to the LLWR instead of the GDF.

### 3. Application of On-Site Decay Storage Principles and Relevant Considerations

**Principle 1: Decay storage is compatible with site interim and/or final end states and endpoints:**
- Characterisation has shown that LLW levels may be attainable within two Co-60 half-lives for some drums (~11.6 yr).
- Direct disposal to LLWR following decay storage would benefit site strategy by providing additional storage capacity.

**Principle 3: Decay storage is a planned waste management approach with a clearly defined endpoint:**
- Further characterisation campaigns are planned to confirm rate of decay and suitability for direct disposal at LLWR.
- At the outset, decay storage of these wastes was not a conscious strategy; however, the existing interim storage arrangements comply with the requirements of passive safety.

**Principle 4: Decay storage implementation, whilst planned and optimised, is responsive to change:**
- The infrastructure required to retrieve and transport the packages off-site will be available at the end of the storage period.
- A workforce capable of delivering the post-decay storage activities will be available.

### 4. Challenges & Risks

- The C-14 inventory of the full stream could account for ~60% of LLWR’s remaining capacity for this radionuclide; hence SL’s focus on only 10% of the waste stream.
- Stainless steel packages are not LLWR’s preferred container type.
- Possible requirement to package a small number of drums in self-shielded containers to meet the transport requirements.
- In its current form, AGR graphite may not meet the criteria for Discrete Items and voidage and is not yet confirmed as acceptable to LLWR.
Horizon Nuclear Power UK ABWR Filter Demineraliser Resin

1. Context and Nature of the Waste

Decay storage is in Horizon’s waste management strategy for the Wylfa Newydd new build project. Ion exchange resins will be generated in small quantities every 30 days, through clean-up of reactor and spent fuel pool water in the UK ABWR. The waste has not yet been generated; source term indicates it will be ILW with a significant Co60 burden. The waste resin will be discharged to purpose designed storage tanks in the Radioactive Waste Building. The strategy is to accumulate the waste in the tanks over a c.5.5 year cycle then allow it to decay for a further c.4.5 years. Following decay the waste will be processed by cement solidification in 3 m³ drums conforming to RWM waste packaging specification, and placed into an on-site ILW storage facility pending GDF disposal.

Despite GDF disposal being the intended route, the case-study has been included as it serves to usefully highlight a number of the principles and considerations outlined in this document.

2. Benefits and Drivers

- Decay storage will provide the opportunity to fully characterise the waste before finalising process and storage facility design. This will mitigate the risk that wastes are not as predicted from design.
- Decay storage will significantly reduce the risk of C060 dose uptake by operators during processing.
- Decay storage will avoid foreclosure of options and allow Horizon to consider a wider range of processing options, taking account of future technological advances (with 7 years to commencement of operations).
- Decay storage will enable deferral of ILW Storage Facility build, shorten required facility design-life, reduce construction Capex, and align construction phasing with the adjacent Spent Fuel Storage Facility.

3. Application of On-Site Decay Storage Principles and Relevant Considerations

**Principle 1: Decay storage is compatible with site interim and/or final end states and endpoints:**
- Storage period predicted at ~10 years; planned operation lifetime of 60 years for the UK ABWR.
- Horizon liaising with the regulators to justify this approach. An options assessment has been undertaken.

**Principle 2: Decay storage is demonstrably BAT/BPM and ALARP for relevant waste streams and meets regulatory requirements:**
- Storing waste in raw form for a defined period is ALARP, delayed processing cutting dose to operatives.
- Storing the waste in its raw form means that the waste can be homogenised and periodically characterised, with the nature and quantity fully understood prior to processing.

**Principle 3: Decay storage is a planned waste management approach with a full lifecycle justification:**
- The decay storage approach is consistent with Horizon’s Integrated Waste Strategy.
- RWM have already conducted a disposability assessment as part of the Generic Design Assessment for the UK ABWR. This has not identified any significant risks with the proposed processing of this waste.
- The waste will be disposed of to the GDF after the end of the site decommissioning programme.
- Storage tanks will be designed to provide the capability for homogenisation, sampling and retrieval.
- All waste will be retrieved/processed into a passive, disposable form before the end of the decommissioning phase.

**Principle 4: Decay storage implementation, whilst planned and optimised, is responsive to change.**
- The decay storage approach is intended to avoid foreclosure of options, thereby future proofing the strategy against changes.

4. Challenges & Risks

- Failure to present an adequate justification of the approach to the regulators.
- Risk that later installation of ILW processing capability in the building cannot be achieved.
- Risk that the waste undergoes degradation during storage invalidating the proposed solidification process or reducing the waste loading and thereby increasing package numbers and storage capacity requirements.
### 6. References and Key Reading

#### References

<table>
<thead>
<tr>
<th>Ref no.</th>
<th>Document title</th>
<th>Relevance to decay storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NDA Higher Activity Waste Treatment Framework, Document Ref: 23792960, October 2015</td>
<td>A strategic overview of HAW treatment, which includes decay storage and highlights the areas where NDA believe there is further opportunity. The document also describes how NDA will drive the delivery of these opportunities.</td>
</tr>
<tr>
<td>2</td>
<td>NDA Strategy, April 2016</td>
<td>Document describing the NDA strategy, which includes investigating specific decay storage opportunities, demonstrating the commitment and support for this management approach.</td>
</tr>
<tr>
<td>3</td>
<td>NDA Industry Guidance Interim Storage of Higher Activity Waste Packages – Integrated Approach, Issue 3, January 2017</td>
<td>Guidance on the main significant technical aspects relating to the interim storage of packaged HAW. The guidance is relevant to all UK storage system designs, including wastes which are being decay stored. It provides references to additional guidance and underpinning work including research and development.</td>
</tr>
<tr>
<td>5</td>
<td>The Management of Higher Activity Radioactive Waste on Nuclear Licensed Sites Joint Guidance from the Office of Nuclear Regulation, the Environment Agency, the Scottish Environment Protection Agency and Natural Resources Wales to nuclear licensees, Revision 2, February 2015</td>
<td>Joint regulatory guidance on the management of radioactive materials, including those being decay stored. The guidance covers all aspects of the storage system and outlines a number of fundamental principles that should be adhered to.</td>
</tr>
</tbody>
</table>
### Additional Key Reading

<table>
<thead>
<tr>
<th>Document title</th>
<th>Relevance to decay storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAEA, Predisposal Management of Radioactive Waste, General Safety Requirement Part 5, GSR Part 5, 2009</td>
<td>Presents the requirements that must be satisfied in the pre-disposal management of radioactive waste, which will be relevant to waste being decay stored on waste producing sites. An outline of the responsibilities and steps in the pre-disposal management of waste is presented.</td>
</tr>
<tr>
<td>IAEA Safety Standards, Safety Guide: The Storage of Radioactive Waste, WG-S-6.1, 2006</td>
<td>Provides recommendations to regulatory bodies and operators of nuclear sites for meeting the safety requirements associated with the storage of radioactive material in general (not specifically decay storage, although it is acknowledged within the standard).</td>
</tr>
<tr>
<td>Document title</td>
<td>Relevance to decay storage</td>
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<tr>
<td>Office for Nuclear Regulation, Safety Assessment Principles for Nuclear Facilities, Revision 0, 2014 Edition</td>
<td>Safety Assessment Principles (SAP) used by the ONR when undertaking technical assessments. The SAPs are relevant to aspects of decay storage e.g. radioactive waste management, engineering aspects, safety cases and siting aspects.</td>
</tr>
<tr>
<td>National Waste Programme, Short-lived Intermediate Level Waste Study, NWP-REP-148, Issue 1, March 2017</td>
<td>Overview of short-lived ILW inventory (boundary waste); this type of ILW may be suitable for decay storage. The report assesses the opportunities to apply alternative waste management solutions to the inventory, whilst also understanding how any barriers to alternative management may be overcome.</td>
</tr>
<tr>
<td>Basic Principles of Radioactive Waste Management - An Introduction to the Management of Higher Activity Radioactive Waste on Nuclear Licensed Sites, Revision 2, February 2015</td>
<td>Joint regulatory guidance that provides a basic introduction to the management of radioactive waste. Includes definitions of waste categories, policy and regulatory objectives and responsibilities.</td>
</tr>
<tr>
<td>Regulatory Arrangements for the Management of Higher Activity Radioactive Waste on Nuclear Licensed Sites, Regulatory Position Statement – 2017 Update</td>
<td>Update from regulators (ONR, EA, SEPA, NRW) in relation to their commitment to working together to improve arrangements for the management of HAW on nuclear licences sites. These joint working relationships are relevant to the joint regulatory guidance (see reference [5]) for the storage of HAW.</td>
</tr>
<tr>
<td>Environment Agency, Radioactive Substances Regulation – Environmental Principles – RSR1, April 2010</td>
<td>Environmental Principles (EP) used by the EA when undertaking technical assessments. These principles address storage of waste amongst other aspects of waste management. Principle RSMDP11 discusses passive storage specifically, which is a key aspect of safe decay storage.</td>
</tr>
</tbody>
</table>