Nuclear
Decommissioning
Authority

The Importance of Interim Storage in the Management of Higher Activity Radioactive Waste

February 2017

Contents

The Importance of Interim Storage
in the Management of HAW

1. Purpose of the document

This document gives an overview of the significant role that interim storage plays within the lifecycle of Higher Activity Waste[1] (HAW) management and ultimately disposal. The document describes the links between the devolved government policies, strategy set by the Nuclear Decommissioning Authority (NDA), and implementation undertaken by Site Licence Companies (SLCs). The roles and responsibilities of relevant organisations are summarised and the regulatory framework for HAW management is described.

2. The lifecycle of HAW

HAW currently exists in different states at different stages in the waste management lifecycle from generation through to interim storage. The generic steps in the lifecycle are retrievals, treatment and conditioning, packaging, storage and disposal. To ensure overall safety and efficiency, and to minimise the risk of rework, a good understanding of the lifecycle requirements should be gained at an early stage.

The NDA promotes early planning and preparation, timely characterisation and sorting and segregation in the development of waste management. Throughout the lifecycle it is important to consider the application of the waste hierarchy: pursuing opportunities for waste minimisation, reuse and recycling, before undertaking an appropriate waste treatment to enable packaging for the subsequent storage, transport and final disposal in accordance with government policy. For geological disposal, waste package specifications have been published [1], so that conditioning, packaging and storage can be planned to align with safe future disposal.

3. Storage of HAW – implementing Government policies

Implementing the devolved government policies for management of HAW depends on safe and secure interim storage for a substantial period that may well span several decades. Any strategy regarding interim storage is therefore vital to the overall lifecycle management of HAW. Key to this is not placing any unnecessary burden on future generations, hence interim storage needs to be well planned, managed and monitored, with fully developed asset management plans so that future requirements and costs are fully understood and can be accommodated.

The UK Government and Northern Ireland policy for HAW is set out in the 2014 White Paper *Implementing Geological Disposal* [2]. This policy commits to the packaging of radioactive waste followed by safe and secure interim storage until such time as a geological disposal facility becomes available.

The Welsh Government has also confirmed a policy for the geological disposal of HAW [3] as part of a joint programme with England and Northern Ireland. The Welsh Government

[1] Higher Activity Waste (HAW) includes High Level Waste, Intermediate Level Waste and a relatively small volume of Low Level Waste that is unsuitable for disposal at existing facilities.

supports the packaging of radioactive waste followed by safe and secure interim storage until such time as a geological disposal facility becomes available.

The Scottish Government policy [4] states that long term management of HAW should be in near surface facilities, which should be located as near to the site where the waste is produced as possible. This policy also relies on the safe and secure storage of HAW after it is packaged.

4. Storage of HAW – Implementing HAW Strategy

The NDA is a non-departmental public body that was established by the Energy Act 2004. It is responsible for decommissioning and cleaning up existing, publicly owned civil nuclear sites across the whole of the UK. It is responsible for implementing Government policy on the long-term management of radioactive waste.

The 2016 NDA Strategy statement [5] on radioactive waste management includes the following intent: "*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*."

This NDA position is based on the UK Government's response to the recommendations delivered by the Committee on Radioactive Waste Management (CoRWM) in 2006 [6] when they considered a broad range of options for the long-term management of HAW. It was agreed, that geological disposal, supported by safe and secure storage arrangements, was the best available approach. The committee also recommended that a review into issues regarding storage should be conducted.

The NDA conducted a review on the storage of HAW [7] that detailed findings in the areas of waste packaging, interim storage, security, storage optimisation and transport. It recognised the importance of an integrated and standardised approach to HAW storage.

Independently of the NDA review, CoRWM conducted their own review of interim storage of HAW [8]. Recommendation 1 from this report, published in 2009, stated that there should be "*greater UK-wide strategic coordination of the conditioning, packaging and storage of HAW…*" This recommendation was accepted by Government. NDA are the strategic authority and set the strategy. Radioactive Waste Management Ltd (RWM) is the body set up by NDA for implementation of the national programme for higher activity waste.

The NDA commissioned an 'Integrated Project Team' to address key issues associated with interim storage in 2009. Research was conducted to develop understanding into areas such as waste package performance, store longevity, monitoring and inspection regimes, store maintenance and refurbishment needs. As well as bringing the NDA, Site Licence Companies, other waste owners and regulators together, the project team produced a draft guidance document for the interim storage of HAW. This was published in 2011 for 'road testing', with the finalised document being published in November 2012 [9].

The position in Scotland is different from the rest of the UK. Current Scottish Government policy is that long-term storage is the primary management option. The Higher Activity Waste Implementation strategy [10] states that the overarching principles, including the Waste Hierarchy and the Proximity Principle, mean that the waste be stored as close as possible to the producing site. This means that long-term radioactive waste management facilities should

be as near to those sites as practicable so that the need to transport the waste over long distances is minimised. The policy outlines a strategy for 300 year storage with renewal of storage facilities on a planned basis, which is reflected in the baseline plans for management of the Scottish sites.

Scottish policy also requires that disposal facilities are monitored and that there is a capability to retrieve waste packages and waste if necessary. The presumption in the Policy is that a disposal facility will be as near to the surface as practicable taking account of all the necessary factors.

5. Interim storage

It is UK Government Policy [2] to progress the recovery and packaging of waste to render it into a passively safe form. The Joint Regulatory Guidance [11] states that "*Wastes should be conditioned to yield products that are passively safe, transportable and ultimately disposable".* In addition, the regulatory guidance states that:

Waste conditioning should yield waste packages that are:

- *Passively safe and suitably robust physically, so as to ensure containment and safe handling during any future periods of storage. The aim should be to minimise the need for active safety systems, monitoring or human intervention whilst the waste remains under institutional control;*
- *Suitable for safe transport through publicly accessible transport routes in compliance with the relevant waste transport regulations. In this regard the waste packages may themselves be approved transport containers or may be of a design which facilitates transport in approved, preferably reusable, transport containers/ flasks;*

and

- *Disposable, such that the nature and properties of the conditioned waste product are compatible with the anticipated standards for eventual disposal e.g. Waste Acceptance Criteria (WAC) of an appropriate disposal facility.*

Existing higher activity radioactive waste must be stored in advance of disposal. Early conditioning of this waste into an appropriate form for storage is a significant part of its management. This is designed to enable hazard reduction on sites and to make wastes passively safe as soon as practicable, such that they are physically and chemically stable and stored in a manner which minimises the need for active control and safety systems and is therefore consistent with the guidance above. Radioactive Waste Management Limited (RWM), has a key role in providing advice to waste producers on the compatibility of their waste conditioning proposals with future geological disposal, with the objective of avoiding the need for repackaging and the 'double handling' of wastes. This is undertaken using the established Disposability Assessment process, which is subject to scrutiny by the Office for Nuclear Regulation and the relevant national environmental regulators.

There is currently no disposal facility for HAW in the UK. For planning purposes only, it is assumed that a geological disposal facility will begin to accept wastes from 2040 and operate until the late 2100's. Therefore, interim storage will be required for some/several decades in support of NDA decommissioning and wider UK programmes.

Similarly, there are currently no agreed plans for the construction of a near surface storage facility for HAW in Scotland, or elsewhere in the UK. However, NDA is now committed to exploring the case for alternative disposal options for some of the HAW inventory (see NDA

Strategy [5]). RWM is supporting NDA by initiating a cross industry 'Integrated Project Team' to develop the strategy for near surface disposal in the UK.

Interim waste storage is therefore an essential component of the HAW management lifecycle and provides a safe, secure environment for waste packages awaiting final disposal.

The Disposability Assessment process, operated by RWM, considers the performance and safety of waste packages during their transport to a GDF, handling and emplacement at that facility, and in the longer-term post-closure period. The assessment process also considers interim storage of waste packages prior to transport to a GDF, as far as this may influence their subsequent performance and safety.

As stated in RWM's *Disposability Assessment Aim and Principles* (DAAPs) [12]:

> *The principal aim of the Disposability Assessment Process is to minimise the risk that the conditioning and packaging of radioactive wastes results in packages incompatible with geological disposal, as far as this is possible in advance of the availability of Waste Acceptance Criteria for a geological disposal facility. As such, it is an enabler for early hazard reduction on UK nuclear sites.*

A 'disposable' waste package is one that has been shown to be compliant with the relevant packaging specification and the underlying needs for interim storage, safe transport to and emplacement in a GDF.

As the UK's nuclear clean-up mission progresses, more HAW will be held within interim storage facilities. This means that packaged HAW is of high value in terms of environmental, safety and security benefit, as well as cost and programme investment. Therefore, it is appropriate that the nuclear industry takes the right precautions in managing interim storage and ensuring waste packages remain disposable.

A system of robust storage arrangements, together with disposability advice, provides confidence that packages will be disposable at the end of the storage period. Progress with packaging of higher activity radioactive waste is reported annually by the Environment Agency [13].

6. Industry guidance on interim storage

The cross-industry 'Integrated Project Team', assembled by the NDA, coordinated the development of a UK-wide strategic approach to interim storage of HAW. The team then went on to develop the Industry Guidance on the interim storage of packaged HAW [9]. The project team engaged with store operators and regulators during the development of the guidance. The Guidance seeks to cover all significant technical issues arising from the interim storage of HAW, to be practical to implement and to be relevant to all UK storage system designs. It aims to be relevant to the design and planning of new stores and to the operation and maintenance of existing stores. It also collects good practices based on feedback from regulators, operational stores, and research and development studies.

To maintain a passively safe wasteform[2], the waste container must remain in good condition during interim storage. In turn, this means that the store conditions must be suitable to minimise degradation of the waste package[3].

The Guidance is intended to be applied equally to all stores containing packaged HAW in the UK. Consistent application of the Guidance will help to ensure that packages of HAW can be stored safely for at least 100 years, and will remain suitable for safe disposal without the need for rework.

The Guidance was reviewed by the IAEA in 2012. The IAEA recognised the benefits of the Guidance and made a series of suggestions to enhance it. A number of these have been incorporated into the 2016 update [14].

The responsibility for maintaining the Guidance and ensuring its relevance to the current and planned stores passed from NDA to the Store Operations Forum in October 2013. The Store Operators Forum is led by RWM. NDA remains the sponsor through its strategy group.

The Guidance is a 'live' document and it has been updated in 2016 [14]. It consists of the published Guidance document available on the NDA website plus an electronic version of the document and bibliography of supporting material available to store operators.

7. Organisational responsibilities

The NDA is responsible for decommissioning and cleaning up existing, publicly owned civil nuclear sites across the whole of the UK. The NDA acts as a strategic authority for decommissioning and ensures that its Site Licence Companies (SLCs) act in accordance with its integrated waste management strategy [5].

The NDA mission is delivered through SLCs, which are licensed to operate the NDA sites. The decision was made in 2015 that, because of the unique challenges posed and the remaining uncertainties in its decommissioning plans, the Sellafield site should become a wholly owned subsidiary of NDA. This change was implemented from April 2016.

To support NDA with its responsibilities, RWM was established as a wholly owned subsidiary of the NDA to implement Government policy on the long-term management of radioactive waste, including delivery of geological disposal. To do this RWM develops concept designs, associated safety cases and plans for a geological disposal facility. RWM runs the UK's Higher Activity Waste programme in support of NDA's strategy working with the industry to develop waste management solutions and to deliver geological disposal for HAW [15]. RWM operates the Disposability Assessment process [16], previously referred to in Section 5, which is designed to ensure that disposal issues are visible and appropriately addressed at the time of developing a strategy for the retrieval and packaging of HAW. The assessment provides opportunity to scrutinise plans for interim storage.

---

[2] The wasteform is waste that has been immobilised, encapsulated or otherwise treated so that it is suitable for long term storage and disposal.

[3] The waste package is comprised of the wasteform and the waste container.

8. Regulatory Framework

The independent Office for Nuclear Regulation (ONR) is responsible for the safety and security regulation of the nuclear sector across the UK. ONR also regulates the safety of transport of radioactive materials. ONR works closely with the International Atomic Energy Agency and European Commission to ensure that the UK's safeguarding obligations are met.

A number of environmental regulators are responsible for the nuclear facilities within their respective jurisdictions. The Environment Agency is responsible for the enforcement of environmental protection legislation in England, regulating radioactive and non-radioactive discharges and disposals to air, water (both surface and groundwater) and land. This responsibility sits with Natural Resources Wales in respect of Wales, the Northern Ireland Environment Agency in respect of Northern Ireland and the Scottish Environment Protection Agency in respect of Scotland.

ONR and the environment agencies regulate the operations and discharges from nuclear sites; they also provide scrutiny and oversight of the work of RWM including the provision of disposability assessments and advice on higher activity waste management.

9. In conclusion

A system of robust storage arrangements, set in the framework outlined in previous sections of this report and checked by the relevant UK regulators, provides confidence that packages will be disposable at the end of the storage period and will be unaffected by any variance in the timing and availability of disposal routes. In line with UK (including Scottish) Policies, the NDA has in place a strategy that allows for safe and secure storage of HAW for a period of at least 100 years.

References

1. Radioactive Waste Management packaging specifications https://www.gov.uk/guidance/generic-waste-package-specification (accessed 27 January 2017)
2. Department of Energy and Climate Change, *Implementing Geological Disposal – A Framework for the long-term management of higher activity radioactive waste*, 2014
3. The Welsh Government, *Welsh Government Policy on the Management and disposal of Higher Activity Radioactive Waste*, 2015
4. The Scottish Government, *Scotland's Higher Activity Radioactive Waste Policy*, 2011
5. Nuclear Decommissioning Authority, *Higher Activity Waste Strategy,* May 2016
6. Committee on Radioactive Waste Management, *Managing our Radioactive Waste Safely – CoRWM's recommendation to Government*, 2006
7. Nuclear Decommissioning Authority, *UK Radioactive Higher Activity Waste Storage Review*, 2009
8. Committee on Radioactive Waste Management, *Interim Storage of Higher Activity Wastes and the Management of Spent Fuels, Plutonium and Uranium*, 2009
9. Nuclear Decommissioning Authority, *Industry Guidance – Interim Storage of Higher Activity Waste Packages – Integrated Approach*, Issue 2, 2012
10. Scottish Government, *Higher Activity Waste Implementation strategy*, 15 December 2016.
11. *The management of higher activity radioactive waste on nuclear licensed sites,* Joint guidance from the Office of Nuclear Regulation, Environment Agency, the Scottish Environment Protection Agency and Natural Resources Wales to nuclear licensees, February 2015, Revision 2.
12. NDA, *Disposability Assessment Aim and Principles*, NDA RWM Policy Document RWP60, Revision 2, August 2015.
13. Environment Agency, *Nuclear Sector Plan - 2014 Environmental Performance Report*, 2015
14. Nuclear Decommissioning Authority*, Industry Guidance – Interim Storage of Higher Activity Waste Packages – Integrated Approach*, Issue 3, 2016
15. Radioactive Waste Management, *Corporate Strategy 2015 – 2018*
16. Nuclear Decommissioning Authority, *Geological Disposal – An overview of the RWM Disposability Assessment Process*, WPS/650/03, 2014