

RADIOACTIVE WASTE MANAGEMENT: A BRIEFING FOR ELECTED MEMBERS



Briefing Paper 18

November 2016

1. Introduction

This Briefing Paper provides a high-level overview of radioactive waste management and the role of the Nuclear Legacy Advisory Forum (NuLeAF).

It covers:

Section 2 Categories of radioactive wastes and materials

Section 3 Main steps in the management of radioactive wastes

Section 4 National roles and responsibilities

Section 5 Government policies for radioactive waste management

Section 6 Strategies for implementing policy

Section 7 The role of NuLeAF

The Paper does not set out NuLeAF's view on the key issues that arise in developing or implementing strategies for managing radioactive wastes. For this, the reader is referred to further documentation on the NuLeAF website (www.nuleaf.org.uk).

2. Categories of Radioactive Wastes and Materials

Radioactive waste is any material that is either radioactive itself, or is contaminated by radioactivity, for which no further use is envisaged. Most radioactive waste is produced by nuclear power station operators and associated fuel-cycle facilities. A substantial amount arises from nuclear research and development sites. Some also arises from Ministry of Defence sites, and relatively small amounts are produced by medical, industrial and educational establishments. In the UK, radioactive waste is classified under the following broad categories:

Higher Activity Waste (HAW)

HAW encompasses Higher Level Waste, Intermediate Level Waste, and a portion of Low Level Waste that cannot be disposed of in the Low Level Waste Repository. It is intended that HAW from England and Wales is disposed of in a Geological Disposal Facility (GDF). The Scottish Government

has a different policy on HAW, that of disposal near to the surface and near to site. However some Scottish HAW is unsuitable for such disposal and it is unclear whether this waste will be sent to a GDF.

Higher Level Waste (HLW)

This is highly radioactive and generates substantial amounts of heat. It is produced as a by-product of reprocessing spent fuel at Sellafield in Cumbria.

Intermediate Level Waste (ILW)

The radioactivity level is higher than that of Low Level Waste, but it doesn't generate heat to the same degree as HLW. ILW is sufficiently radioactive to require shielding and containment. It arises mainly from reprocessing of spent fuel, and from operations and decommissioning at nuclear sites. ILW includes, for example, nuclear fuel cladding and nuclear reactor components, graphite from reactor cores and sludges from the treatment of radioactive liquid.

Low Level Waste (LLW)

Unlike HLW and ILW, LLW does not normally require shielding during handling or transport. It tends to consist largely of paper, plastics and scrap metal items which have been used in hospitals, research establishments and the nuclear industry. As the decommissioning of nuclear power stations progresses, it will also include increasing amount of soil, concrete and steel.

Very Low Level Waste (VLLW)

This is a sub-category of LLW, consisting of the same sorts of materials, but is the least radioactive and does not require specially designed containment. It is divided into Low Volume ('dustbin loads') coming mainly from hospitals and universities, and High Volume ('bulk disposal') from nuclear sites.

Low Activity Low Level Waste (LALLW)

A sub-set of LLW which is below a certain threshold of radioactivity.

Out of scope wastes

Material that is so low in radioactivity that the risks to humans and the environment can be classed as negligible.

Non-nuclear LLW

A range of processes and industries outside the nuclear industry produce LLW. These include hospitals, research facilities, military uses and certain industries. There is a separate Government strategy to manage non-nuclear LLW.

Naturally Occurring Radioactive Material (NORM)

NORM consists of materials, usually industrial wastes or by-products, which contain naturally occurring radioactive materials which have been concentrated by the nature of certain processes. Within the UK a range of industries, including oil and gas, produce such NORM wastes. There is a separate Government strategy for the management of NORM (see section 6).

3. Main Steps in the Management of Radioactive Wastes

Radioactive waste will undergo some or all of the following steps depending on the type of waste and strategy for its management:

- **Pre-treatment** – the aim is to segregate waste into streams that will be managed in similar ways.
- **Treatment** – involves changing the characteristics of the waste by volume reduction, radionuclide removal or change of composition.
- **Conditioning** – involves transforming wastes into a form suitable for handling, transport, storage and disposal, usually by immobilisation and packaging.
- **Storage** – involves emplacement of waste in a facility with an intention to retrieve for another step in the management process.
- **Retrieval** – involves removing wastes from storage for inspection, further storage or disposal.
- **Disposal** – occurs when packages of radioactive waste are emplaced in a facility with no intention of retrieval. Disposal can also include discharging liquid and gaseous effluent into the environment.

Strategies and plans for managing radioactive wastes need to address all the steps that are relevant to a particular waste.

4. Roles and Responsibilities

National responsibilities are allocated in the following way:

- Government maintains and develops policy and the regulatory framework;
- Regulators have the duty to ensure that the policy and regulatory framework is properly implemented; and
- The owners and producers of radioactive waste are responsible for developing their own waste management strategies to implement policy and regulatory requirements.

Within Government, the **Department for Business, Energy and Industrial Strategy (BEIS)** and the Devolved Administrations have overall responsibility for policy and legislation.

The primary regulators are:

Office for Nuclear Regulation (ONR) – ONR independently regulates nuclear safety and security at 37 nuclear licensed sites in the UK. They also regulate transport and the safeguarding of nuclear and radioactive materials. Their duty is to ensure that the nuclear industry controls its hazards effectively, has a culture of continuous improvement and maintains high standards.

The Environment Agency – regulates any disposal, discharge or off-site transfer of radioactive waste through authorisations issued under the Radioactive Substances Act 1993 (RSA93). It advises ONR on the long-term disposability of conditioned waste and scrutinises plans for disposal.

Natural Resource Wales - is responsible for regulating the nuclear industry in Wales on disposals and discharges of radioactive waste, discharges of cooling water and operation of standby generators.

Scottish Environmental Protection Agency (SEPA) – is responsible for regulation and environmental monitoring in Scotland. It regulates radioactive activities and monitors the environment according to the Radioactive Substances Act 1993.

Other regulators include: the Office for Civil Nuclear Security (OCNS) – responsible for regulating security arrangements; and the Radioactive Materials Transport Division (RMTD) of the Department of Transport – responsible for regulating the transport of radioactive materials.

The **owners and producers** of radioactive waste are:

- Civil public sector nuclear sites are owned by the **Nuclear Decommissioning Authority (NDA)**, a non-departmental public body established under the Energy Act 2004;
- These sites are operated by Site Licensee Companies (SLCs), the bodies which are licensed by ONR to operate a nuclear site. Current SLCs are **Magnox** and **Dounreay Site Restoration Limited (DSRL)**;
- The UK's largest nuclear site, **Sellafield**, is managed by Sellafield Limited, a subsidiary of the NDA;
- Private sector nuclear sites are owned and operated by **EDF Energy**;
- Defence-related sites are usually owned by the **Ministry of Defence**, and operated by private sector companies;
- **URENCO UK** (from production of enriched uranium for nuclear fuel); and
- **GE Healthcare** and other non-nuclear users of radioactive material (i.e. universities and hospitals).

5. Government Policies for Radioactive Waste Management

These can be summarised as follows:

Higher Activity Wastes (mainly High Level Waste and Intermediate Level Waste)

In October 2006, the UK Government announced that it accepted the primary recommendations of the independent Committee on Radioactive Waste Management (CoRWM) for geological disposal, preceded by safe and secure interim storage. In June 2008, it published a White Paper setting out its implementation framework (Managing Radioactive Waste Safely), based on the concepts of voluntarism and partnership. Following the unsuccessful West Cumbria 'Expression of Interest', Government published a revised White Paper¹ in July 2014 setting out its new approach. This approach is still based on the principle that a host community for a Geological Disposal Facility (GDF) has to give its consent before any facility can be built.

Since 2014 the Government has been involved in developing the framework for a new GDF siting process, engaging with stakeholders to consider how communities can participate in the siting process and to advise on the geological and land use planning aspects of the process. It is expected that a new siting process will be launched during 2017.

Radioactive waste management is a devolved policy issue. Therefore, the Welsh Government, Northern Ireland Executive and Scottish Government each have responsibility for this issue in respect of their areas.

Welsh Government

Following the publication of the Managing Radioactive Waste Safely White Paper in 2008, the Welsh Government reserved its position on geological disposal in Wales. After a further Call for Evidence and a consultation, in 2015 the Welsh Government adopted a policy of supporting geological storage for the long-term management of Higher Activity Wastes (HAW). This brought Wales in line with England, although Welsh policy will continue to reflect the different legislative and cultural context there.

Scottish Government

Scottish Government policy² is that long term management of Higher Activity Waste should be in near-surface facilities located as near to the site waste originates as possible. It does not sponsor the programme for implementing geological disposal.

¹ <https://www.gov.uk/government/publications/implementing-geological-disposal>

² [Scotland's Higher Activity Radioactive Waste Policy 2011](#)

Northern Ireland

The Northern Ireland Executive supports the implementation of geological disposal.

Low Level Wastes

The UK Government published a policy statement³ on Low Level Waste management in March 2007. The most recent strategy for the management of solid Low Level Waste (LLW) from the nuclear industry was published in February 2016⁴. At its heart are commitments to:

- Apply the waste hierarchy and move away from the past focus on disposal;
- Make best use of existing LLW management assets, particularly the LLW Repository (LLWR) in Cumbria; and
- Identify new fit-for-purpose management routes.

NuLeAF's **Briefing Paper 19** provides more detail on LLW policy. Strategies for the management of NORM (Naturally Occurring Radioactive Material) and for non-nuclear industry radioactive waste have also been published (see Section 6).

Spent Fuel (SF)

Government policy is that the question of whether to reprocess spent fuel (a chemical process for separating uranium and plutonium), or hold it in storage, is a matter for the commercial judgement of the owner of the spent fuel, subject to meeting the necessary regulatory requirements.

Government has confirmed its view that in the absence of any proposals from industry, new nuclear power stations built in the UK should proceed on the basis that spent fuel will not be reprocessed.

Plutonium

UK Government's preferred policy for the long-term management of plutonium is that it should be reused in the form of mixed oxide fuel (MOX). UK Government has also stated that it would be open to consider alternative options if they offered better value to the UK taxpayer. It should be noted that at present, there are no plans to build a facility to produce MOX, nor, at present, are any of the new build reactor designs capable of burning it.

Liquid and Gaseous Waste Discharges

Under the terms of the Radioactive Substances Act 1993 (RSA 93), disposal includes the discharge of liquid and gaseous wastes to the environment. Such disposals are made as part of normal operations from hospitals, research establishments and the

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254393/Low_level_waste_policy.pdf

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/497114/NI_LLW_Strategy_Final.pdf

nuclear industry, and are controlled by means of authorisations issued under RSA 93. The Government is committed to progressive and substantial reductions in radioactive discharges.

Decommissioning

This is the process whereby a nuclear facility is taken permanently out of service, dismantled and its site made available for other purposes. Government policy on decommissioning was updated in 2004. This states that decommissioning should be carried out as soon as reasonably practicable, taking all relevant factors into account, including the availability of waste disposal routes. Government states that the relevant factors, and their respective importance, can only be determined on a case-by-case approach.

Import and Export

Government policy is that radioactive waste should not be imported or exported from the UK, except for the recovery of reusable materials and, in specific cases, for treatment that will make its subsequent storage and disposal more manageable.

6. Strategies for Implementing Policy

NDA Strategy

The NDA is responsible for producing a strategy for managing civil public sector nuclear liabilities which must be updated every 5 years. The latest Strategy was published in April 2016⁵. The Strategy is broken down into a series of themes: site decommissioning and remediation, spent fuels, nuclear materials, integrated waste management and critical enablers.

Site Decommissioning and Remediation – NDA’s objective is to release designated sites for other uses, these being determined through engagement with local authorities and communities. The aim is to complete this as soon as reasonably practical and to progressively reduce risk and hazard. Each site will be treated individually and the benefits and detriments of clean up, in terms of safety, desired next use, environmental impact and cost, will be assessed.

Spent Fuel – NDA’s strategy is to “secure and subsequently implement the most appropriate management approach for spent Magnox and oxide fuels and, where possible, take advantage of these approaches to manage exotic fuels.⁶” There is a commitment to engage with government, regulators and stakeholders in reaching strategic decisions.

⁵ <https://www.gov.uk/government/consultations/nuclear-decommissioning-authority-draft-strategy>

⁶ NDA Strategy p19

Nuclear Materials – Strategy is to safely and securely store nuclear materials while cost-effective lifetime solutions for their management are developed. Nuclear materials are being consolidated at sites which are considered to be best suited to their safe long term management.

Integrated Waste Management – Strategic decisions about waste management are informed by the following principles:

1. Supporting risk and hazard reduction by enabling and delivering a flexible approach to long term waste management.
2. Application of the waste hierarchy.
3. Promoting timely characterisation and segregation of waste.
4. Where appropriate, providing leadership aimed at integrating waste management delivery across the estate and supply chain.
5. Supporting and promote the use of robust decision making processes.
6. Enabling the availability of sustainable, robust infrastructure for continued operations, hazard reduction and decommissioning.

Through the development of a single **Radioactive Waste Strategy** covering all classifications of waste, the NDA is considering the opportunities for a more flexible approach to the management of radioactive wastes.

Critical Enablers – NDA has identified a range of critical enablers which it must address in order to deliver its strategy effectively. They are:

1. Health, safety, security, safeguards, environment and quality (HSSSEQ);
2. Research and development;
3. People;
4. Asset management;
5. Contracting;
6. Supply Chain Development;
7. Information Governance;
8. Socio-economics;
9. Public and stakeholder engagement;
10. Transport and logistics;
11. Revenue optimisation;
12. International relations; and
13. Land and property management.

The Strategy notes that NDA is currently considering how best to engage in future with national and local stakeholders, and consultation on this will take place in 2017.

The overarching strategy is supported by the **NDA Business Plan**⁷, the **UK Strategy for the management of solid Low Level Radioactive Waste from the nuclear industry**⁸ and a **Higher Activity Wastes Strategy**⁹. An integrated Radioactive Waste Strategy, covering all NDA wastes, is due to be published in 2017.

EDF Energy Strategy

EDF Energy is the operator of the current fleet of energy generating nuclear power stations in the UK. It is responsible for discharging all aspects of decommissioning and radioactive waste management associated with its sites.

Low Level Waste produced in operating the power stations is sent for treatment and/or disposal. Intermediate Level Waste is stored on site in tanks or vaults pending disposal to the Geological Disposal Facility when it becomes available, or in Scotland stored long term in near surface facilities. Spent fuel from the Advance Gas Cooled Reactors (AGR) is sent to Sellafield for storage or reprocessing, whilst spent fuel from Sizewell B, which is a Pressurised Water Reactor (PWR), is stored on site until a final decision is made on how it will be disposed of.

EDF Energy is constructing a new nuclear power station at Hinkley Point in Somerset, with a further planned for Sizewell in Suffolk. Decommissioning is a factor included in the design of the new reactors, the intention being to minimise the amount of radioactive waste produced. Current plans are that spent fuel from new nuclear power stations will be sent directly to the Geological Disposal Facility for disposal and will not be reprocessed.

Ministry of Defence Strategy

The MoD is committed to complying with legislation and 'so far as is reasonably practicable' with national policy relating to the management of radioactive wastes and decommissioning. MoD's approach includes sending Low Level Waste to the Low Level Waste Repository near Drigg, and interim storage of Intermediate Level Waste at the sites where it arises. The intention is that ILW will be disposed of in the Geological Disposal Facility.

The MoD's Submarine Dismantling Project (formerly known as ISOLUS) concluded in 2016. This identified Capenhurst in Cheshire as the site for the storage of ILW from decommissioned submarines, currently located at Rosyth and Devonport (Plymouth) dockyards. Following storage, these wastes will be sent to the Geological Disposal Facility when it is operational.

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/512786/Nuclear_Decommissioning_Authority_Business_Plan_financial_year_beginning_April_2016_to_financial_year_ending_2019.pdf

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/497114/NI_LLW_Strategy_Final.pdf

⁹ <https://www.gov.uk/government/publications/nda-higher-activity-waste-strategy>

UK Strategy for Managing Non-Nuclear Industry (NNI) Low Level Waste

UK Government published the first part of its strategy for the management of solid Low Level Waste from the non-nuclear industry in March 2012¹⁰. This deals with radioactive waste which is generated on non-nuclear licensed sites such as hospitals, pharmaceutical industries, and research and educational establishments.

The Strategy lists a number of key points which include:

- Government will work with industry, the environmental regulators and planning authorities to strengthen the robustness of disposal arrangement for Low Level Waste.
- Producers of Low Level Waste should work with planning authorities, to ensure that such wastes are handled effectively through the preparation of local plans and in determining planning applications.
- Low Level Waste can be disposed of safely without harm to human health and the environment, and without compromising the rigorous standards of radiological protection set out in legislation.
- Radiological risks associated with disposal of Low Level Waste are low when disposal is made to an appropriate facility. Provided that the risks have been calculated and shown to be within the relevant limits, then radiological risk does not prevent the use of any disposal facility referred to in this strategy.
- The proximity principle needs to be a consideration, alongside other considerations, in any waste management plan prepared by Low Level Waste producers. The principle is a component of work and decisions by waste producers, the environment agencies, and planning authorities.
- Communities which benefit from the beneficial uses of radioactive materials (including the direct benefit such as the use of radiopharmaceuticals, and indirect benefits such as contributions to a local economy from commercial bodies using radioactive materials) should take a share in the responsibility for managing the radioactive waste which inevitably arise from their use, where possible, while recognising that each and every local authority can not necessarily be self-sufficient in the matter of waste management.
- Waste planning authorities should consider how to manage Low Level Waste and Very Low Level Waste arising in their areas as part of the preparation of their local waste plans. They should seek advice from waste producers and the environment agencies to ensure that the waste is being sent to a suitable waste management facility. If necessary and feasible, they should work with other waste planning authorities to share facilities. The environment agencies will supply information on disposal facility locations, on request, to waste producers and planning authorities to assist their decisions.
- The principles of the waste hierarchy, and the waste reduction step in particular, apply equally to radioactive wastes as they do to Directive wastes. However, the practical application of these principles may be different; the protection of human health over-rides any consideration of the hierarchy.¹¹

¹⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48291/4616-strategy-low-level-radioactive-waste.pdf

¹¹ Chapter 2, pages 8-22

UK Strategy for the management of Naturally Occurring Radioactive Materials (NORM)¹²

The earth's crust contains Naturally Occurring Radioactive Materials (NORM). NORM wastes are generated in industries such as production of titanium oxide and Oil and Gas exploration and production, including the process known as fracking. In the instance of fracking NORM waste is produced when these Naturally Occurring Radioactive Material mixes with the liquid (usually a water mixture) used under high pressure to fracture rock, and the released gas and is brought to the surface. It accumulates in scale, sludge and scrapings and can also form a thin film on the interior surfaces of gas processing equipment and vessels.

7. The Role of NuLeAF

NuLeAF is a Special Interest Group of the Local Government Association. Its remit encompasses all aspects of the management of the UK's nuclear legacy. This includes the implications for legacy management of any developments (including construction of new nuclear power stations) that are likely to impact on that management.

NuLeAF's primary objectives are:

- to provide a mechanism to identify, where possible, a common, local government viewpoint on nuclear legacy management issues;
- to represent that viewpoint, or the range of views of its member authorities, in discussion with national bodies, including Government, the NDA and the regulators;
- to seek to influence policy and strategy for nuclear legacy management in the interests of affected communities; and
- to develop the capacity of its member authorities to engage with nuclear legacy management at a local level.

NuLeAF has over 100 member local authorities and National Park authorities. Its work is overseen by a Steering Group of elected members from member authorities. Councillor Brendan Sweeney from Barrow-in-Furness Borough Council is the Chair of NuLeAF, while Councillor David Monks of Shepway District Council is the Vice-Chair. The Steering Group meets on average four times a year and reports are published on the NuLeAF website.

For further information contact Catherine Draper on 01473 264833 or catherine.draper@nuleaf.org.uk

¹²

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/335821/Final_strategy_NORM.pdf