

Disposing of radioactive waste to landfill

Contents

- Introduction
- Radioactive waste – our position
- What is low-level radioactive waste?
- Radioactive waste and controlled waste
- How we regulate disposal of low level waste
 - Low volume very low-level waste
 - High volume very low-level waste
 - Low-level waste to landfill – ‘controlled burial’
 - LLW to dedicated disposal facilities
- LLW disposals – what we want to see
- Summary table of requirements
- References
- Glossary

Introduction

This document sets out our position, as the principal environmental regulator in England and Wales, on the disposal of low-level radioactive waste (LLW) and very low-level radioactive waste (VLLW).

We have produced this to respond to the changes introduced by Government policy on LLW, published in 2007 [1]. The supplementary notes to this policy set out the options that may be considered for LLW. These include disposal to landfill and other similar facilities. The following categories are envisaged:

- Continued practice of disposal to specific areas of, or adjacent to, nuclear licensed sites or, in future, disposal in facilities that might, be constructed at, or adjacent to, nuclear sites;
- disposal of LLW and high volume VLLW at specified landfill sites, including “controlled burial”, providing that this meets specified regulatory requirements;
- disposal of low volume VLLW to landfill together with municipal, commercial or industrial wastes.

Government policy sets out other options¹ for disposal not involving landfill. These are not addressed in this document.

Disposal should be the option of last resort for LLW. Government policy on LLW stresses the importance of applying the waste hierarchy to LLW management plans. We expect waste producers to apply the waste management hierarchy to minimise the volumes of radioactive

¹ The other options for LLW disposal set out in Government policy are:

- disposal to facilities that have yet to be constructed to take LLW (where this is deemed to be necessary);
- disposal to near-surface facilities like those used at the Low Level Waste Repository (LLWR) near Drigg, where disposal is by way of compaction, grouting and placement in a concrete vault;
- in-situ disposal; that is, burial at the point of arising;
- incineration.

waste that need disposing of. Nuclear sites operators should consider this as part of their integrated waste strategies.

Radioactive waste – our position

Around 30 nuclear industry sites in England and Wales (nuclear power stations, Sellafield etc.), and several hundred users of radioactivity (hospitals, universities etc.) produce radioactive waste.

We regulate the disposal of radioactive waste under the Radioactive Substances Act 1993 (RSA93).

What is low-level radioactive waste?

There are a number of different types of low-level radioactive waste. These are defined below.

Low level waste

Government policy on LLW defines LLW as:

“radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity.”

Very low level waste

The policy also defines very low level radioactive waste (VLLW), as either:

in the case of low volumes ('dustbin loads') – low volume VLLW (LV-VLLW):

*“radioactive waste which can be safely disposed of to an **unspecified** destination with municipal, commercial or industrial waste (“dustbin” disposal), each 0.1m³ of waste containing less than 400 kilobecquerels (kBq) of total activity or single items containing less than 40 kBq of total activity.”*

for waste containing carbon-14 or hydrogen-3 (tritium):

- in each 0.1m³, the activity limit is 4,000 kBq for carbon-14 and hydrogen-3 (tritium) taken together;
- for any single item, the activity limit is 400 kBq for carbon-14 and hydrogen-3 (tritium) taken together.

Controls for disposing of this material after it has been removed from the premises where it was produced are not necessary.

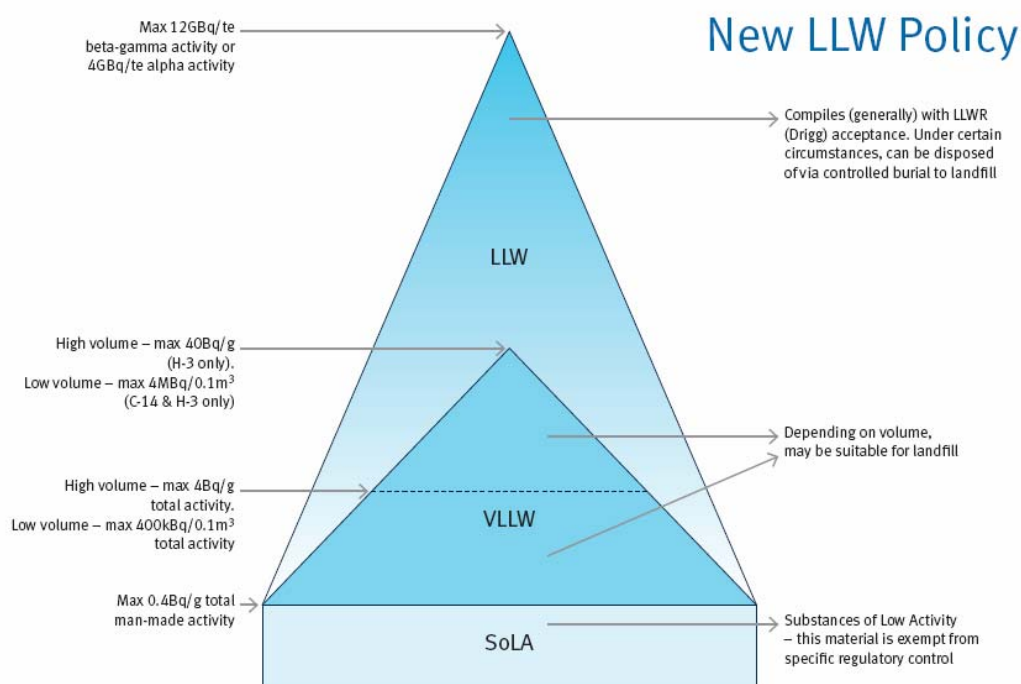
OR

in the case of bulk disposals – **high volume VLLW (HV-VLLW)**:

*“radioactive waste with maximum concentrations of four megabecquerels per tonne (MBq/te) of total activity which can be disposed of to **specified** landfill sites. For waste containing hydrogen-3 (tritium), the concentration limit for tritium is 40MBq/te.*

The main difference between the two definitions of very low level waste is the need to control the total volumes of VLLW in the second (high volume) category being deposited at any one particular landfill site.

The diagram below shows the different categories of low-level waste.



Radioactive waste and controlled waste

Radioactive waste is not 'directive waste' or 'controlled waste' within the terms of the Waste Framework Directive² or UK legislation. However, radioactive waste and controlled waste are often mixed before or when they are disposed of.

Even though radioactive waste is not controlled waste, it must always be disposed of in a way that is appropriate for its non-radioactive properties.

How we regulate disposal of LLW

Low volume very low-level waste (LV VLLW)

We authorise the waste producer to send their waste for disposal with conventional waste to landfill or for incineration; the receiving landfill or incinerator operator does not need an authorisation to dispose of this waste. Research has considered the safety of such disposal and we are satisfied that there is no risk to human health or the environment [2]. For the time being, we are treating the following as low volume VLLW disposals:

- waste from non-nuclear producers (e.g. hospitals, universities), provided LV VLLW activity limits are met and volumes do not exceed 50 m³/y;
- incinerator residues, provided LV VLLW activity limits are met.

² Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste. Note however that where a radioactive waste is exempt from the requirements of sections 13 or 14 of the Radioactive Substances Act 1993 and has one or more of the hazardous properties listed in Appendix A of our guide [HWR01 - What is a Hazardous Waste?](#), then it will be classified as hazardous waste and the provisions of the Hazardous Waste Regulations 2005 will apply.

High volume very low-level waste (HV VLLW)

This is likely to apply to contaminated demolition waste and soil from the nuclear industry, along with other general wastes.

- For a landfill site operator to dispose of HV VLLW they must hold an RSA93 disposal authorisation.
- An application for disposal must be supported by a radiological impact assessment for a specific site. This assessment may refer to published generic research and development [3, 4].
- If we authorise disposal, we set an upper mass / volume limit of waste that can be disposed of. We do not generally include conditions that cover how the waste should be managed at the landfill.
- We treat any applications for VLLW disposals from nuclear sites as HV VLLW.
- Sites that intend to dispose of HV VLLW to landfill sites need an RSA93 transfer authorisation.

Low-level waste (LLW) to landfill – ‘controlled burial’

LLW disposal to landfill sites is known as ‘controlled burial’. This applies to LLW with radioactivity greater than HV-VLLW. The arrangements for this are as stated above for HV VLLW, except that:

- The radiological impact assessment that will be needed to support an application will need to be more detailed. We expect that any application should have been prepared making reference to and proportionate use of our specialist guidance on radioactive waste disposal [5]. Applicants will need to discuss with our regulators how this might apply.
- If we authorise disposal, we may choose to include additional conditions in the authorisation to make sure any radiological impacts are suitably controlled.

LLW (or HV VLLW) to dedicated disposal facilities

These facilities may be developed to dispose of radioactive waste from the nuclear industry. They may be located on or off nuclear sites.

- We authorise the disposal site operator receiving the waste to dispose of it under RSA93.
- Applications for disposal must be supported by a radiological impact assessment for a specific site.
- If we authorise disposal, we include conditions in the authorisation to make sure any radiological impacts are suitably controlled.
- If the disposal facility is not on the nuclear site that is sending the waste to be disposed of, the waste producing site must have an RSA93 transfer authorisation.
- Any site dedicated to the disposal of LLW does not need a permit under Environmental Permitting (EP) or landfill legislation, as it will not be receiving ‘controlled’ or ‘Directive’ waste. As part of an application for LLW disposal we will ask for information equivalent to an EP application to demonstrate that the non-radiological impacts would be no worse than would be acceptable under EP legislation. We may choose to include controls in the disposal authorisation that deal with the non-radiological impacts.

LLW disposals – what we want to see

- Operators must discuss proposals for disposal with their local site regulator.
- For more significant disposals, particularly those from nuclear sites, we want to see an integrated waste strategy that has considered other waste management options (such as recycling and reuse), the proximity principle and climate change issues.

- Waste disposals must meet the conditions for acceptance as set by the disposal site operator. Consignors are responsible for making sure that the waste meets the conditions, or that it is treated by a subsequent holder.
- Consignors will need to make sure carriers are contractually obliged to dispose of waste at the specified disposal site(s).

Summary table of requirements

Type of LLW disposal	Destination	Consigning site		Receiving site	
		Type of RSA authorisation	Radiological impact assessment needed to support application?	Need for RSA authorisation?	Type of radiological impact assessment needed
LV – VLLW ³	Landfill or incineration	Standard VLLW conditions	No	No	N/A
HV – VLLW	Specific landfill	Transfer authorisation	No	Yes	Sufficient to demonstrate acceptable impacts – simple approach likely to suffice
Controlled burial	Specific landfill	Transfer authorisation	No	Yes	Sufficient to demonstrate acceptable impacts
Disposal to dedicated disposal site (LLW, including HV-LLW)	Dedicated site, off nuclear site	Transfer authorisation	No	Yes EP-type conditions may be applied through RSA authorisation	Sufficient to demonstrate acceptable impacts
	Dedicated disposal site, on or adjacent to nuclear site: Receiving site is consigning site. Disposal facility will need to hold RSA authorisation. EP-type conditions may be applied through RSA authorisation				

³ Includes incinerator bottom ash, fly ash and waste lime or other reagents from the abatement plant

References

1. Policy for the long-term management of solid low-level radioactive waste in the United Kingdom. Defra, DTI and the Devolved Administrations. March 2007
2. Dose implications of very low-level radioactive waste disposal. SNIFFER. UKRSR09. November 2007.
3. Radiological assessment of disposal of large quantities of very low-level waste in landfill sites. QQ Chen, K Rowe, SF Mobbs and KA Jones. HPA-RPD-020. March 2007.
4. Assessing the capability of controlled landfills to accept the disposal of solid low-level radioactive waste. SNIFFER. UKRSR03. 2006.
5. Disposal Facilities on Land For Low and Intermediate Level Radioactive Wastes: Guidance on Requirements for Authorisation. Environment Agency, SEPA, Department of the Environment for Northern Ireland

Glossary of terms

Controlled burial

Also known as “special precautions burial”. A process of disposal for solid LLW that has an activity level above that which would allow it to be disposed of as **VLLW**. Controlled burial takes place at **landfill** sites used for the deposit of substantial quantities of ordinary refuse but which are approved for the disposal of radioactive substances. Controlled burial has various limitations placed on its use in terms of maximum activity per waste container, type of container, surface dose rate of container, and depth of burial beneath earth or ordinary waste.

Integrated Waste Strategies (IWS)

An integrated waste strategy is not a legal requirement but is required of contractors working under the auspices of the **NDA**. It covers waste in all waste categories. For example, during an options’ assessment, one option could be to store ILW until it decays to LLW.

Landfill

The disposal of waste in or on land. Modern landfills are lined to reduce seepage of material from the site into the environment, and once full, are capped to reduce rainfall entering the site. The EU Directive on the landfill of waste (Council Directive 99/31/EC) set targets for the reduction of biodegradable municipal waste sent to Landfill, encourages less reliance on landfill by advocating more reuse and recycling and specifies stringent standards for the construction and operation of landfills.

Low Level Waste (LLW)

Includes metals, soil, building rubble and organic materials, which arise principally as lightly contaminated miscellaneous scrap. Metals are mostly in the form of redundant equipment. Organic materials are mainly in the form of paper towels, clothing and laboratory equipment that have been used in areas where radioactive materials are used – such as hospitals, research establishments and industry. LLW contains radioactive materials other than those acceptable for disposal with municipal and general commercial or industrial waste. It is now defined as “radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma radioactivity”.

Radioactive Substances Act 1993 (RSA 93)

customer service line

08708 506 506

www.environment-agency.gov.uk

incident hotline

0800 80 70 60

floodline

0845 988 1188

UK legislation which provides for regulation of the disposal of radioactive wastes, including liquid and gaseous discharges to the environment. It also provides for regulation of the accumulation of radioactive wastes on non-nuclear sites: this function for licensed nuclear sites being provided by the **NIA65**.

Radioactive waste

Any material contaminated by or incorporating radioactivity above certain thresholds defined in legislation, and for which no further use is envisaged, is known as radioactive waste.

Very low level waste (VLLW)

Covers waste with very low concentrations of radioactivity. It arises from a variety of sources, including hospitals and the wider non-nuclear industry. Because VLLW contains little total radioactivity, it has been safely treated by various means, such as disposal with municipal and general commercial and industrial waste directly at landfill sites or indirectly after incineration. Its formal definition is: (a) **in the case of low volumes ('dustbin loads') of VLLW** "Radioactive waste which can be safely disposed of to an **unspecified** destination with municipal, commercial or industrial waste ("dustbin" disposal), each 0.1m³ of waste containing less than 400 kilobecquerels (kBq) of total activity or single items containing less than 40 kBq of total activity. For wastes containing carbon-14 or hydrogen-3 (tritium):

- in each 0.1m³, the activity limit is 4,000 kBq for carbon-14 and hydrogen-3 (tritium) taken together; and
- for any single item, the activity limit is 400 kBq for carbon-14 and hydrogen-3 (tritium) taken together.

Controls on disposal of this material, after removal from the premises where the wastes arose, are not necessary."

Or (b) in the case of high volumes of VLLW "Radioactive waste with maximum concentrations of four megabecquerels per tonne (MBq/te) of total activity which can be disposed of to **specified** landfill sites. For waste containing hydrogen-3 (tritium), the concentration limit for tritium is 40MBq/te. Controls on disposal of this material, after removal from the premises where the wastes arose, will be necessary in a manner specified by the environmental regulators".