

Low Level Radioactive Waste

Frequently asked questions

April 2011

Information about how we regulate the disposal of low-level radioactive waste (LLW) and very low-level radioactive waste (VLLW).

What is your guidance note ‘disposing of radioactive waste to landfill’ about?

In 2007 new Government policy on the management of low-level radioactive waste (LLW) introduced a more flexible framework for the disposal of certain categories of LLW to existing landfill. This guidance explains the options available, and how we will regulate them.

The Government policy has led to a number of applications to dispose of LLW to landfill, particularly for wastes from nuclear sites being decommissioned.

We received three applications from landfill operators during 2009.

Why did Government policy change?

Currently almost all LLW is disposed of at the LLW repository (LLWR) near Drigg in Cumbria. LLWR is an engineered facility, which provides greater containment than traditional landfills. However, LLWR does not have the capacity to meet future national LLW needs. The useful lifetime of LLWR could be extended by using other disposal routes for waste at the lower end of the LLW activity range.

Government policy also stresses the need to reduce, reuse and recycle waste wherever possible to reduce the amount of LLW which has to be disposed of.

The decommissioning and clean-up of nuclear sites will create large amounts of lightly contaminated soil and building rubble. Much of this has relatively small amounts of radioactivity, and does not need the level of disposal engineering provided by LLWR. The policy has introduced a new category of waste: ‘high volume very low-level waste’ (VLLW). This is a subset of LLW, with very low activity levels. The policy states that it can be disposed of to landfill, providing it is controlled in ways that we specify.

The policy has not changed the definition of LLW, nor the dose and risk standards which apply to its disposal. It will allow greater flexibility in the management of LLW, particularly for high volume VLLW.

What does the Nuclear Decommissioning Authority’s (NDA) strategy for the management of LLW say?

NDA published their strategy for the management of LLW from the nuclear industry in August 2009. This reflects and implements Government policy for LLW management. The strategy has three strategic themes:

- implementation of the ‘waste hierarchy’ to minimise the quantities of waste produced, and those requiring disposal;
- making the best use of existing LLW management assets; and
- providing new ‘fit-for-purpose’ waste management routes, including landfill disposal for LLW that does not need the degree of containment provided by the Low Level Waste Repository (LLWR) in Cumbria.

The overall intent of the strategy is to make the best use of the LLWR to help ensure the UK’s capacity for the management of LLW.

What is the Environment Agency’s role in the disposal of low-level radioactive waste? How will you regulate and monitor landfill sites?

We regulate the disposal of all radioactive waste, including LLW, under the Environmental Permitting Regulations 2010 (EPR10). We do this within the scope of Government policy, judging any application for permit for disposal on technical criteria.

We will consider any application by landfill operators requesting a permit to take radioactive waste. Each landfill operator we permit will need to dispose of waste according to the conditions of the permit. This will detail what records are required. We will audit the site to ensure that the operator complies with the requirements of the permit, including record-keeping.

When we permit a site we will decide whether monitoring for radioactivity is necessary and what form it will take. If it is necessary we will require the landfill operator to monitor it, and we may undertake our own independent monitoring.

Any waste producer wishing to consign LLW to a landfill site will need to have a permit before transferring it.

How will this work? Who will apply to whom for permits?

The landfill operator will apply to us for a permit, under EPR10, to dispose of LLW.

In addition to regulating the landfill site, we will require that any waste producer wishing to consign LLW to a landfill site holds a permit under EPR10 prior to its transfer. We will consider separately each application for transfer.

Where will the waste go? Which landfill sites?

Landfill operators will decide whether or not to apply to us for the disposal of LLW to existing landfills. Also, developers may apply to dispose of waste at new landfill facilities.

Why don’t you put it all into a deep hole in the ground?

The disposal of radioactive waste is based on risk. This means that controls take account of any hazard presented by the waste. Most LLW can be safely disposed of in near-surface facilities.

Government policy is for a geological disposal facility to be developed to dispose of waste with higher levels of radioactivity – that is, waste with higher risk. This disposal site will not be ready for many years.

What are the differences between very low level, low level and other levels of radioactive waste?

Levels are defined by the amount of radioactivity per unit mass or volume.

Low Level Radioactive Waste (LLW) is defined as 'radioactive waste having a radioactive content not exceeding four GBq/te of alpha or 12 GBq/te of beta/gamma activity'.

Very Low Level Radioactive Waste (VLLW) is a sub-category of LLW. This is broken down into 'low volume' and 'high volume' VLLW, each of which has its own definition:

Low volume VLLW meets the following three criteria:

- Each 0.1m³ of waste contains less than 400 kBq ⁽¹⁾ of total activity or single items contain less than 40 kBq of total activity.

For wastes which contain carbon-14 or hydrogen-3 (tritium):

*in each 0.1m³, the activity limit is 4,000 kBq for carbon-14 and tritium taken together; and

*for any single item, the activity limit is 400 kBq for carbon-14 and tritium taken together.

- The waste originates from non-nuclear premises.
- No more than 50m³ per year of waste is disposed of, unless the waste is incinerator residues, in which case no upper volume limit applies.

High volume VLLW meets the following two criteria:

- The maximum activity is 4 MBq per tonne of total activity. For waste containing tritium, the concentration limit for tritium is 40MBq per tonne.
- The waste originates from nuclear premises, or (for wastes other than incinerator residues) it is from non-nuclear premises in quantities of more than 50m³ per year.

How do waste producers categorise waste? Will they ever get it wrong? What would happen if some dangerous waste got mixed in with the waste going to landfill?

The different rules applying to disposal of different waste types oblige operators to segregate wastes into discrete waste streams. This applies just as much to radioactive waste as to wastes deemed as "hazardous" under different legislation. Producers must have management and control arrangements in place to ensure that they meet their permit requirements. We will check, however – which may include 'seizing' wastes consigned for disposal, to confirm their composition.

What is in the waste? What is it made up of?

Waste can contain a wide range of items and substances. We expect the majority of LLW, including high volume VLLW, going to landfill to consist of rubble and soil from decommissioning activities.

How will the radioactive content of incoming waste be checked?

Any permits for disposal that we issue will require the landfill operator to check that the wastes they receive are as described. These are likely to involve checks on the records and external radiation levels. In addition nuclear consigning sites will be responsible for ensuring that the radioactive content of the waste conforms with the appropriate limits (it is the consignors who will have the responsibility, and techniques for measuring, segregating and sentencing their wastes).

As a further check we have the power to periodically seize waste packages for detailed monitoring in an independent laboratory. These will be reported publicly.

Won't some waste that really should be disposed of to the Low Level Waste repository (LLWR) near Drigg go instead to landfills because that will be a cheaper option?

Our main regulatory control will be on the total amount of activity going into the landfill. This means that landfill sites might have capacities to accept large tonnages of wastes - if the wastes are high volume VLLW or close to that. If the waste activities are higher the volumes that can be disposed of to landfill would be much lower and so the LLWR near Drigg would be a preferred destination for those wastes.

Will this waste damage the environment?

No. This type of waste contains only small amounts of radioactivity. Also, we will limit the quantities we permit for disposal. We will also apply controls to the wider (non-radioactive) properties of the waste.

Our principal responsibility is always to protect the environment. We will ensure that waste disposal is safe for people and not harmful to the environment.

Will there be enough covering over and around waste?

Yes. Some high volume VLLW contains such little radioactivity that, even uncovered, it would present hardly any radiological hazard. But, we will require landfill operators not to leave radioactive waste uncovered, and the amount of coverage will depend upon the quantity and type of radioactivity in the waste. The environmental safety assessments that will support any application for disposal will address proposals for cover. We will only agree to any proposals if we are sure the proposals provide adequate protection.

Will landfills be built to same standards as other facilities that take LLW such as the Low Level Waste Repository (LLWR) in Cumbria, or the LLW facilities at Dounreay, in Scotland or L'Aube in France?

All of these sites have basically the same standards of radiation protection that they are required to meet.

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However, the degree of engineering of the waste packaging or disposal facility will vary; greater integrity will generally be required if the quantity of radioactivity in the waste is higher. This is the case at LLWR in Cumbria or French facility at Centre de l'Aube.

As it's cheaper to dispose of waste to landfill than to recycle it, won't the motivation be money rather than reducing the impact on the environment?

Clearly, money will be a motivator, but not the only thing to be considered. Through our regulation of sites that may wish to consign LLW to landfill, we will insist that they have considered what the 'best practicable environmental option' is for waste management. Operators will need to have addressed a number of factors before arriving at decisions. These include costs, proximity to disposal site, radiation doses to workers and impact on the environment.

Will this waste affect the health of people living near the sites?

No. We will not permit a site for disposal of LLW unless we are satisfied that the wastes proposed for disposal are safe. That means that any application for disposal must be accompanied by a radiological impact assessment that considers radiation risks to the most exposed members of the public.

What will be the expected radiation doses resulting from disposal?

The radiological impact assessment that an applicant for disposal permit provides to us will specify the types and quantities of waste, the controls on disposal, and an estimate of the resultant doses. There are several upper dose values that we apply:

- In most cases we would expect doses to be no greater than 0.02 mSv ⁽²⁾ per year.
- In some cases however, an applicant may choose to make an application for disposal that involves higher doses; up to a 'dose constraint' of 0.3mSv per year. In such cases we would require more detailed information from the applicant to show, for example that the design and operation of the landfill will minimise the impacts of disposal.
- We apply a different, higher dose limit in cases where, due to human intrusion of the landfill, exposures might occur. Here we specify a dose limit of either 1 mSv/year (for a simple cases) or 3 mSv/y for more complex cases.

These stated doses would be in addition to natural background. For comparison average UK doses from all sources, including natural background and medical exposures are about 2.7 mSv per year.

Could disposals contaminate the food chain?

Each applicant will provide us with a radiological impact assessment detailing the risks of radiation exposure, including those through food pathways. We would only permit disposals if we were satisfied that any such exposures were within acceptable limits.

Is this just the start of another LLWR? Will it lead to the landfilling of wastes with increasingly higher levels of radioactivity?

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No. In permitting LLW disposal at any landfill we will not only set the level of radioactivity of the waste, we will also set a lifetime radiological limit for wastes disposed of to the site. We anticipate that capacities for landfills will be much lower than that for the LLWR near Drigg, which is a specialist facility for LLW disposals.

Will there be more fumes and smells from the landfill due to the increase in amounts of waste?

We do not believe odour will be a problem. However, we will regulate odour in exactly the same way as we do for landfill disposal of conventional wastes.

Will it be separate from other waste on landfill sites? Will it be in packages? Will it be identifiable as radioactive waste?

The LLW does not need to be separated from other wastes. We will not specify packaging requirements. Each landfill operator will set out their proposed disposal arrangements in their application to us. These arrangements must meet the required levels of protection.

LLW packaging must, by law, identify that the contents are radioactive. Most LLW is transported in freight containers.

Will terrorists be able to use any of this waste material?

No. The specific activity of these wastes (the quantity of radioactive material in any given volume) of these wastes is so low that it would be of no use to terrorists.

How many landfill sites will you issue permits for? How much radioactive waste will go into landfill each year?

We do not know how many landfill operators will seek to accept these wastes for disposal, nor how much waste they will seek a permit to dispose of. It is up to landfill operators to initiate applications. We will control the amount disposed of by specifying in advance the radiological capacity for each landfill.

Does it make sense to partially decontaminate, a 'dirty' site, by moving contaminated material to a 'clean' one?

Waste disposal makes sense when it brings overall benefits that outweigh the costs.

Nuclear site owners may need to demolish redundant, possibly unsafe, older buildings and dispose of the waste. In doing so they may want to make land available for redevelopment in preference to acquiring new land and expanding their sites outwards. We require and encourage operators to minimise the volumes of any solid radioactive waste streams they will have to dispose of, and maximise the quantity re-used. As a result of this waste streams containing substantial radioactivity are normally small in volume. The larger volume wastes tend to contain very little radioactivity – often, the levels will be quite hard to detect by monitoring, but the waste has to be assumed to be radioactive because of the difficulty in proving that it is not. This is often inert waste such as demolition rubble – it presents little hazard, but is still waste it needs to be disposed of.

Landfill sites are engineered and lined, and are intended to substantially contain the wastes and allow radioactive decay. If the disposal site can satisfy us that the high standards of environmental protection we insist on will be met, it can make very good sense to move such LLW or high volume VLLW to a landfill site for disposal.

Wouldn't it be better for all nuclear sites to have their own disposal facilities?

The 2007 government policy statement recognised the option to dispose of LLW on or adjacent to nuclear sites, but it did not mandate this. We would assess any case for this type of disposal on its merits, as we do for disposal to existing landfills.

What is happening in Scotland?

Government policy on LLW management also applies in Scotland. The Scottish Environment Protection Agency (SEPA) is taking a similar approach to us in implementing the policy.

What is happening in Wales?

Government policy on LLW also applies in Wales. We regulate in both England and Wales. We plan to take the same approach to regulation in Wales as in England (subject to any changes that the Welsh Assembly Government may wish to introduce).

Has the volume of waste gone up?

The volumes of LLW, including high volume VLLW, have not recently increased. However, future decommissioning and site clean-up of nuclear installations is expected to create more waste, particularly high volume VLLW.

How many nuclear power stations are being decommissioned?

Seven power stations have ceased operation and are being decommissioned. These are Berkeley; Trawsfynydd; Calder Hall; Sizewell A; Dungeness A; Hinkley Point A; and Bradwell.

Which power stations are building a new facility for disposal of LLW on their site?

We understand the nuclear industry is considering this as an option, but we have not yet received an application for disposal to such a facility.

What about radioactive waste from radio-chemical producers, nuclear weapon manufacturers, reprocessing facilities and the MOD?

The new policy, and the way that we regulate it, will also apply to these types of nuclear site.

Will we see an increase in the number of lorries or will it be transported by rail?

The total quantities of LLW and high volume VLLW that might be disposed of to landfill are very small compared with the quantities of conventional (non-radioactive) waste. We do not expect to see a

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noticeable increase in traffic to any landfill. It will be for the consignor and landfill operator to agree the most appropriate mode of transport.

Is the “proximity principle” being followed by accepting waste from existing nuclear plants?

The 2007 Government policy on LLW management is explicit in stating that the proximity principle needs to be taken into account when consigning sites take waste management decisions. The policy also states that the proximity principle needs to be weighed against other factors when considering options. This will inevitably mean that sometimes the preferred option may not be the nearest to the site of origin of the waste.

Currently most LLW is disposed of to the LLWR in Cumbria. This is a long distance from some nuclear sites. If a number of landfill sites are ultimately permitted for the disposal of lower activity LLW and high volume VLLW this will help, in part, address the proximity principle.

Will you consider the risk of flooding (coastal and inland) when you are deciding whether or not to issue a permit?

Yes, we will consider flooding when looking at any application.

Where can I find out information about what goes to my local landfill site?

‘What’s in your backyard’: <http://www.environment-agency.gov.uk/homeandleisure/37793.aspx>

What are the arrangements for consulting on applications for disposal to landfill?

We will consult local authorities and the Office for Nuclear Regulation on any applications received for disposal to landfill. In addition we are requiring applicants to undertake and lead on dialogue with the potential host community, other interested parties and the general public. We will provide support in setting out our regulatory role, and the standards we will regulate to within the scope of Government policy.

How will radiation from a landfill being used to dispose of radioactive waste be monitored? Does the radiological impact assessment in the application make this clear?

Only low or very low level radioactive waste will be permitted for disposal in landfills, subject to a sound radiological impact assessment. Monitoring of radiation levels around the landfill will not be a major feature of the impact assessment as for this type of waste we would not expect the safety of disposal to be dependent on monitoring of the local environment. However we do expect to require operators to carry out regular radiation monitoring, for example of landfill leachate, in any permits we grant. This will be primarily for purposes of wider reassurance. We will also require waste being disposed of to be monitored by the nuclear site before it is disposed of and from time to time we may make independent checks on and monitor the wastes.

Are you happy that responsibility for this operation, and for monitoring, lies with the landfill operators?

We will only grant a permit to a landfill operator for the disposal of radioactive waste if we are sure that the operator has provided a sound radiological impact assessment which demonstrates that disposals will be safe. Any permit we grant to an operator will specify the requirements that he must meet, including the operator's management and technical capability, and on monitoring. We would then regulate the site to ensure that an operator is meeting the requirements of the permit. We may also carry out monitoring of the waste and the environment around the site.

Why won't the Health Protection Agency (HPA) monitor the health of local people?

The statutory duty to monitor the health of the local population lies with the local Primary Care Trust, who often do ask the HPA for advice.

It is very difficult to decide whether there are any health risks from complex environmental hazards, such as radioactive waste (LLW and VLLW). Large studies measuring individual or collective exposure with reliable results are needed to ascertain if there is any additional risk. Local studies are very rarely useful in these cases.

From what we know about the storage and disposal of radioactive wastes, radiation doses to the local population would be far too low and too long term to demonstrate a local effect.

Are you confident that someone will monitor the site after closure?

As part of our regulation, we will require landfill operators to monitor sites permitted for the disposal of radioactive waste for a period after the disposals to the site have ended and the site has been capped. This is to ensure that the site is continuing to perform as predicted. Decisions on the length of time that monitoring needs to continue will be based on the content of the radiological impact assessment and on the ongoing monitoring results. This continued monitoring will be a legal requirement; we will only revoke the permit that requires this once we are satisfied that monitoring need not continue.

Does anyone really understand the long-term consequences of radiation and the behaviour of radioactivity in a landfill?

The longer term impacts of radiation exposure are well understood, primarily through large scale studies of groups exposed to radiation such as miners, radiation workers and Japanese atomic bomb survivors. This understanding continues to improve as further work is carried out. Based on this evidence, radiological protection principles and legislation throughout the world - are based on the recommendations of International Commission on Radiological Protection (ICRP). These ICRP recommendations are reviewed by the Health Protection Agency (HPA) as the relevant UK competent national authority. Its advice is taken into account in new or revised legislation, national policy, and Government guidance.

The radiological impact assessment will not attempt to predict how the site might evolve after closure, for example the timing and nature of activities in the long term that might disrupt the site. Instead the impact assessment will need to consider a range of possibilities and, building in conservative assumptions into each, address the potential radiation doses. Through this approach the more

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restrictive scenarios can be identified, and used to derive an upper limit on the quantities of waste that can be disposed of.

Where can I find information about your monitoring programme?

Monitoring for radioactivity is already carried out at some landfill sites and is reported in the 'Radioactivity in Food and the Environment Report'. You can access this at <http://www.environment-agency.gov.uk/homeandleisure/110281.aspx>

What is an Article 37 submission?

Article 37 of the Euratom Treaty requires each European Member State to inform the European Commission about any new plan for the disposal of radioactive waste. DECC has confirmed that this will need to be done before we can issue a permit for the disposal of LLW or VLLW from nuclear sites to landfill. Each submission will need to contain an assessment of the potential impact on other member states of proposed disposals. This means that landfill operators will need to prepare information for submission to the European Commission. The Commission will then take up to six months to give an opinion. We will not issue a permit for the disposals of radioactive waste to landfill until after a favourable opinion has been received from the Commission.

1 The international (SI) unit for the number of nuclear disintegrations occurring per unit time in a quantity of radioactive material. 1 Bq = 1 radioactive disintegration per second. As this is an extremely small unit, levels of activity expressed in Bq are often prefixed such as kBq (kilo becquerels = 1000 becquerels; MBq = megabecquerel = 1,000,000 becquerels)

2 Sievert (Sv) The international unit of effective dose, obtained by weighting the equivalent dose in each tissue in the body and summing over all tissues. Because the sievert is a large unit, effective dose is commonly expressed in millisieverts (mSv) – that is, one thousandth of one sievert