Waste topic paper 6:

Radioactive waste

Somerset County Council

Minerals and Waste Development Framework

WWW.SOMERSET.GOV.UK

This document has been prepared by Somerset County Council.

Cover photographs kindly supplied by the Nuclear Decommissioning Authority. They depict:

- The Intermediate Level Waste (ILW) store at Trawsfynydd, Wales. This is the first of its kind to become operational in the UK (*bottom left*).
- A waste package being transferred to the ILW store at Trawsfynydd (*top left*)
- Low Level Waste (LLW) being placed into one of the vaults at the Low Level Waste Repository (LLWR) near Drigg in Cumbria. LLWR is the UK's only such facility *(main*).

Copies of this document are available from:

Somerset County Council
Environment Directorate, County Hall
Taunton, Somerset, TA1 4DY
Tel: 0845 345 9188
Email: mineralsandwaste@somerset.gov.uk

For further details of the Somerset Minerals and Waste Development Framework, and to view and download this and other documents, please visit our website: www.somerset.gov.uk/mineralsandwaste

Acknowledgements: the waste policy team wish to thank those who reviewed this document and offered valuable feedback, in particular NuLeAF, the nuclear industry and colleagues from other waste planning authorities.

Document control record

Name of document:	Radioactive waste
Author:	Minerals and waste policy team, Somerset County Council
Description of content:	Presents information on radioactive waste, its management and planning implications.
Approved by:	Interim Minerals and Waste Policy Manager
Date of approval:	06 March 2012
Assigned review period:	12 months
Date of next review:	2013

Revision	Date	Comments
1	15 June 2011	Version 1 approved
2	06 March 2012	Version 2 approved

Contents

1. Radioactive waste: fundamentals

1.1. What is radioactive waste?

The Environmental Permitting (England and Wales) Regulations 2010 define radioactive waste as waste which consists wholly or partly of:

(a) a substance or article which, if it were not waste, would be radioactive material, or

(b) a substance or article which has been contaminated in the course of production, keeping or use of radioactive material, or by contact with or proximity to other waste falling within sub-paragraph (a) or this sub paragraph.

From this initial definition, a number of sub categories are used, which are briefly outlined below.[1]

High level (or heat-generating) waste (HLW): high level radioactive waste is a highly radioactive liquid (nitric acid) generated as a by-product from the reprocessing of spent nuclear fuel. Approximately 0.1% of the radioactive waste produced in the UK is HLW and this small percentage contains about 95% of the total radioactivity of all nuclear waste[2]. The temperature of high level waste may increase significantly a result of its radioactivity; a fact that needs to be considered when designing appropriate storage and disposal facilities. If declared a waste, spent fuel would also be categorised as HLW. Historically, spent fuel and other products of its reprocessing (plutonium and uranium) have not been formally defined as "waste".

Intermediate level waste (ILW): intermediate level waste has lower levels of radioactivity than HLW and does not generate sufficient heat for this to be taken into account in the design of storage or disposal facilities. ILW is sufficiently radioactive to require shielding and containment.

ILW arises mainly from the reprocessing of spent fuel and from general operations and maintenance at nuclear power sites. It consists of solid materials such as reactor components or wet wastes such as resins from the treatment of radioactive liquid effluents and sludges from the settlement of materials in tanks and pipe work. Approximately 10% of the radioactive waste produced in the UK is ILW.

[1] Information taken from NuLeAF website
http://www.nuleaf.org.uk/nuleaf/documents/20080306_BP13_Briefing_for_Local_Authority_Planners.pdf

[2] Radioactivity measure information taken from:
http://mrws.decc.gov.uk/en/mrws/cms/Home/What_is_radiow/What_is_radiow.aspx

Low level waste: low level waste is generally made up of everyday materials such as plastics, glass, metals and paper which have come into contact with radioactive liquids or powders. This waste stream accounts for about 90% of solid radioactive waste in the UK (by volume); it contains less than 0.1% of the total radioactivity.[3]

A sub-section of Low level Waste (LLW) is termed **Very Low Level Waste** (VLLW). As its name suggests, this type of waste contains very low levels of radioactivity. This sub-section can be further separated into high volume VLLW and low volume VLLW. High volume VLLW tends to include contaminated rubble and soil (often associated with decommissioning of a nuclear facility) as well as some operational wastes.

Section 1.5 of this topic paper includes more information on the management of each category of radioactive waste.

1.2. Radioactive waste regulation

Historically, the Health and Safety Executive (HSE) has been responsible in the UK for regulating the safety of nuclear installations in the UK. It has delivered this responsibility through a system of licensed nuclear sites.

Radioactive waste produced on other sites is also covered by a robust health and safety framework with the HSE and Environment Agency acting as authorised agencies. The Ministry of Defence and armed forces comply with all relevant safety and environmental legislation unless exemptions apply. If these do apply, it is the Secretary of State's policy to apply standards and arrangements that are, so far as is reasonably practicable, at least as good as those required by the legislation[4].

In 2008 central government commissioned a major review into the UK's nuclear regulatory regime[1]. This review produced a number of recommendations, which included the need to restructure the current nuclear regulatory body, the Nuclear Directorate (part of the HSE). The report recommended the creation of a new sector-specific regulator for the nuclear industry. This has been carried through with the creation of the Office for Nuclear Regulation (ONR) launched on 1st April 2011.

The ONR is a new independent regulator, consolidating civil nuclear and radioactive transport safety and security regulation in one place. It does not affect the current regulatory requirements or standards with which industry must comply, and the vast majority of the costs of the regulator would continue to be recovered in charges from operators in the nuclear industry.

[3] For a technical interpretation, low level waste is defined by the EA as *' radioactive waste having a radioactive contact not exceeding four gigabecquerels per tonne of alpha or 12 gigabecquerels per tonne of beta/gamms activity'*

[4] http://www.hse.gov.uk/foi/internalops/nsd/inspection/gins004.pdf

The disposal of radioactive wastes from nuclear and non-nuclear sites was regulated in the UK under the Radioactive Substances Act 1993 (RAA93). The authorising body (in England) is the Environment Agency. This Act covered the transfer of solid waste for burial, incineration or storage, as well as the discharge of liquid and gaseous radioactive wastes to the environment[5].

The Radioactive Substances Act 1993 has now been superseded by the Environmental Permitting (England and Wales) Regulations 2010 (EPR)[6]. In delivering the objectives underlying this new regime, it is important to note the concepts of "out of scope" of regulation and "exempt from permitting". Guidance is available from central government on what is meant by these concepts. [7]

For radioactive waste arising on non-nuclear licensed sites, the Environment Agency has regulatory responsibility for both accumulation and disposal.

1.3. Delivering a new generation of nuclear power stations

The coalition government has demonstrated strong support for a new generation of nuclear power plants in the UK. The delivery of this new generation of plants will be managed via a planning framework introduced in the 2008 Planning Act.

The Planning Act 2008 introduced a new planning system for nationally significant infrastructure projects in England and Wales. Under this new system, national policy on infrastructure is set out in a series of National Policy Statements (NPSs). Central government has designated a National Policy Statement for Nuclear Power Generation (EN-6) which needs to be read in conjunction with EN-1 – Overarching Energy Policy[8].

The energy NPSs will be used by the Infrastructure Planning Commission (IPC) when it makes decisions on applications for development consent for nationally significant energy infrastructure under the Planning Act 2008. The IPC was formed by the Labour government as part of the Planning Act 2008. Following the change in government in early 2010, a decision was taken by the Coalition to abolish the IPC and transfer its function of examining applications to a Major Infrastructure Planning Unit (MIPU) within the Planning Inspectorate. Until this time the IPC continues to hold this function.

Hinkley Point in Somerset has been identified as one of central government's preferred sites for new nuclear development.

---

[5] http://www.nda.gov.uk/ukinventory/waste/materials-management-regulated.cfm

[6] http://www.environment-agency.gov.uk/business/sectors/117030.aspx

[7] Defra, "Guidance on the scope of and exemptions from the radioactive substances legislation in the UK"; September 2011

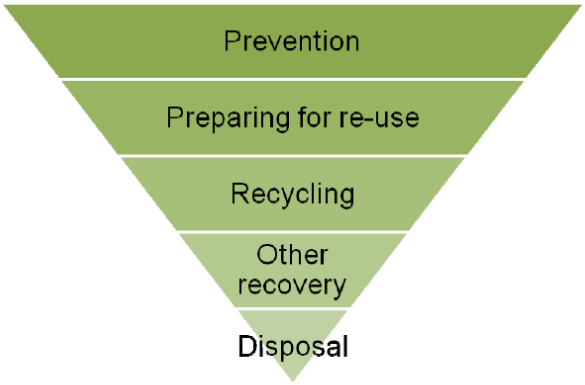
[8] The National Policy Statements on energy infrastructure can be found on the DECC website at: http://www.decc.gov.uk/en/content/cms/meeting_energy/consents_planning/nps_en_infra/nps_en_infra.aspx

1.4. Waste management: basic principles

The management of radioactive waste is a highly complex and regulated subject with a number of governmental and commercial partners involved. A list of major partners is included at the back of this document along with their respective functions.

Before considering the specifics of radioactive waste management in more detail (see section 1.5), it is appropriate to touch on two basic principles that are common to the management of different types of waste.

The waste hierarchy[9] is a tool used to promote sustainable waste management and is applied to the management of radioactive waste alongside more conventional waste streams. The hierarchy is applied on the basic premise that one should consider how to avoid generating the waste before one considers how to treat or dispose of the waste. If avoidance is impossible the treatment option chosen should lie as close as possible to the top of the hierarchy.



It is recognised by central government that some of the steps in the waste hierarchy will require special consideration in the context of radioactive waste management, when compared with the management of more conventional (non-radioactive) wastes.

A second principle that is common to the management of different types of waste is the desire for waste to be managed as close to the point of generation as possible to avoid 'waste miles'. When considering radioactive waste, this is complicated by the limited number of facilities designed and permitted to accept this waste type.

1.5. Storage, treatment and disposal of radioactive waste

The first sub-section of this paper outlined the different levels of radioactive waste. Each level has different properties and so the storage, treatment and disposal of each level also vary in accordance with the type of material being managed.

In discussions on radioactive waste management, high level waste (HLW) and intermediate level waste (ILW) can be grouped under the heading "higher activity waste" (HAW). This can be useful when considering the overall approach to storage, treatment and disposal.

[9] Revised waste hierarchy (updated following changes to Planning Policy Statement 10) – March 2011.

Higher activity waste

High level waste (HLW) is produced in liquid form as a by-product of the reprocessing of spent fuel. It is not produced at power station sites. This waste is managed by converting the liquid HLW into solid form; this is done by vitrification[10]. The treated HLW is added to glass-forming materials, poured into stainless steel containers and the mixture allowed to solidify. Current standard practice is to store vitrified HLW for at least 50 years, to allow a significant proportion of the radioactivity to undergo a natural decay process and for the waste to cool, thereby facilitating transport and eventual disposal to a repository[11]. High level waste is created, vitrified and stored at Sellafield in Cumbria.

To date spent fuel has not normally been declared as a waste. It is heat producing and needs to be managed accordingly. It can be stored wet in spent fuel ponds or dry in cask or vault storage facilities. If it is declared as a waste it will need to be disposed of in a deep geological repository in a similar way to HLW from reprocessing.

Intermediate level waste also needs to be contained to protect workers and the public from radiation. Typically ILW is produced from reprocessing of spent fuel and from general operations and maintenance at nuclear sites. It can consist of metal (such as fuel cladding) and ion exchange resins from treatment of radioactive liquid. Typically ILW is packaged for disposal by encapsulation in cement or resin in drums or boxes.[12] However, the strategy for the management of operational solid and wet ILW across the Magnox Estate is unencapsulated placement in resilient, self-shielding ductile cast iron containers (DCIC) suitable for interim storage, transport and final disposal, otherwise known as the Ministores concept. The main benefits of DCICs are the potential to save considerable cost and time in decommissioning and enable a prompt start in hazard reduction.

Most ILW is stored initially in shielded tanks, vaults or silos at the site where it is produced.[11] Decommissioning and clean up of nuclear sites generates more ILW.

It is envisaged that storage of higher activity wastes will be needed until a deep geological disposal facility (GDF) is available to accept such material. Central government is committed to the delivery of a GDF for disposal of higher activity wastes. This is a long-term project. More information on the GDF is included in section 2.2 regarding Hinkley Point C and section 3.2.

[10] More information on this process can be found at: http://www.nda.gov.uk/ukinventory/waste/waste-now-hlw.cfm

[11] Information taken from DECC website. Available from: http://mrws.decc.gov.uk/en/mrws/cms/Home/What_is_radiow/What_is_radiow.aspx

[12] http://mrws.decc.gov.uk/en/mrws/cms/Home/What_is_radiow/What_is_radiow.aspx

Low level waste

Low level waste makes up around 90% of the UK's waste by volume. The waste hierarchy can be applied to the management of LLW so that it can be managed in appropriate facilities. It is important to minimise the amount of LLW sent for disposal, not least because there is currently very little dedicated disposal capacity for LLW in the UK.

Historically a LLW Repository (LLWR) near Drigg in Cumbria has accepted LLW for disposal in Vault 8 and, since 2010, for highly-engineered storage in Vault 9.[13] At the LLWR, ISO transport containers containing wastes grouted in cement are placed in a concrete vault. This is the only facility of its kind in the UK and the capacity it provides needs to be carefully managed. Currently it does not have sufficient capacity to meet the UK's future needs for LLW disposal (also see section 3.4).

A planning application was submitted by LLWR Ltd. to Cumbria County Council in July 2011 for substantial additional disposal capacity to extend the lifespan of the facilities near Drigg and also to plan for its eventual capping and closure. This would see the phased construction of Vaults 9a to 14 over approximately 70 years or more. At the time of writing this paper, this application has yet to be determined.

One way to make better use of the capacity at existing facilities is compaction. Most LLW is compacted (if practicable) on-site at or at off-site super compaction facilities to reduce its volume.

Radioactive metallic waste can be diverted to dedicated facilities for processing. Furthermore, some types of nuclear and non-nuclear sources of LLW (including those from medical establishments) are routinely disposed of by incineration in appropriate facilities.[14]

Some wastes with low levels of radioactivity can be sent to specific landfill sites for disposal. The majority of LLW that could be sent for landfill disposal consists of rubble and soil from decommissioning activities (associated with nuclear power plants).[15] Any waste producer wishing to consign LLW to a landfill site will need to have a permit before transferring the LLW.

If a landfill site operator wishes to dispose of High Volume VLLW they must hold an appropriate permit issued by the Environment Agency. An application for such disposal must be supported by a radiological impact assessment for a specific landfill site. If authorised, the Environment Agency would set an upper mass / volume limit of waste for disposal in this way.

[13] A small fraction of LLW is unsuitable for disposal in this manner, due principally to the concentration of specific radionuclides; as a result, this small fraction would need to be disposed of in a deep geological disposal facility.

[14] http://www.decc.gov.uk/assets/decc/Consultations/low-level-waste-non-nuclear/977-consultation-nni-llw.pdf

[15] http://www.environment-agency.gov.uk/business/sectors/100241.aspx

In cases where the LLW has an activity level above that which would allow it to be disposed of as VLLW, disposal of LLW to landfill sites may be permitted through activity known as "controlled burial". The arrangements for this are as stated above for High Volume VLLW; however, the radiological impact assessment that will be needed to support an application will need to be more detailed and the Environment Agency may include additional conditions in the authorisation to make sure any radiological impacts are suitably controlled.

1.6. Transport

Radioactive waste is classified as dangerous goods (Class 7/9) under EU regulations. As such, the transport of such material is governed by a number of regulations[16] including:

- The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009
- European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2011

The UK has robust legislative and regulatory systems in place for the transport of radioactive wastes, including higher activity waste. Transport of radioactive wastes is, and will continue to be, required to meet a number of national and international requirements to ensure the safety and security of such materials.

NB: refer to section 1.2 for more information on radioactive waste regulation and the Office for Nuclear Regulation (ONR).

[16] All legislation available to view at: http://www.opsi.gov.uk/

2. Radioactive waste generation and management in Somerset

2.1. The national context

As mentioned in section 1, low level waste (LLW) accounts for the majority of solid radioactive waste in the UK (by volume). Operational LLW consists of a wide range of soft and hard matter from routine operations and maintenance. Waste items can include discarded protective clothing, paper towels, filters, plastic bags, pipe work, concrete and soil and rubble. Redundant fuel transport flasks also contribute to the total of LLW[17]. An estimate on future arisings of radioactive waste in the UK from existing commercial and legacy nuclear facilities is summarised in the table below.[18]

All wastes Volumes at 1 April 2010 and estimated for future arisings (m^3)				
	HLW[19]	**ILW**	**LLW**	**Total**
Total	**1,020**	**287,000**	**4,430,000**	**4,720,000**
At 1.4.2010	1,620	94,300	66,000	**162,000**
Future arisings	-601	192,000	4,360,000	**4,550,000**
2010	-96	2,340	47,100	**49,400**
2011-2014	-331	7,700	147,000	**155,000**
2015-2019	-226	9,760	202,000	**211,000**
2020-2029	51.8	17,400	305,000	**323,000**
2030-2039	0	21,600	220,000	**241,000**
2040-2059	0	40,500	893,000	**934,000**
2060-2099	0	65,200	1,490,000	**1,560,000**
Post 2100	0	27,800	1,060,000	**1,080,000**

Radioactive waste is also produced from a few other facilities holding or producing very small amounts of material such as medical or military establishments. These types of establishments are found countrywide along with other small producers such as universities. These producers are not

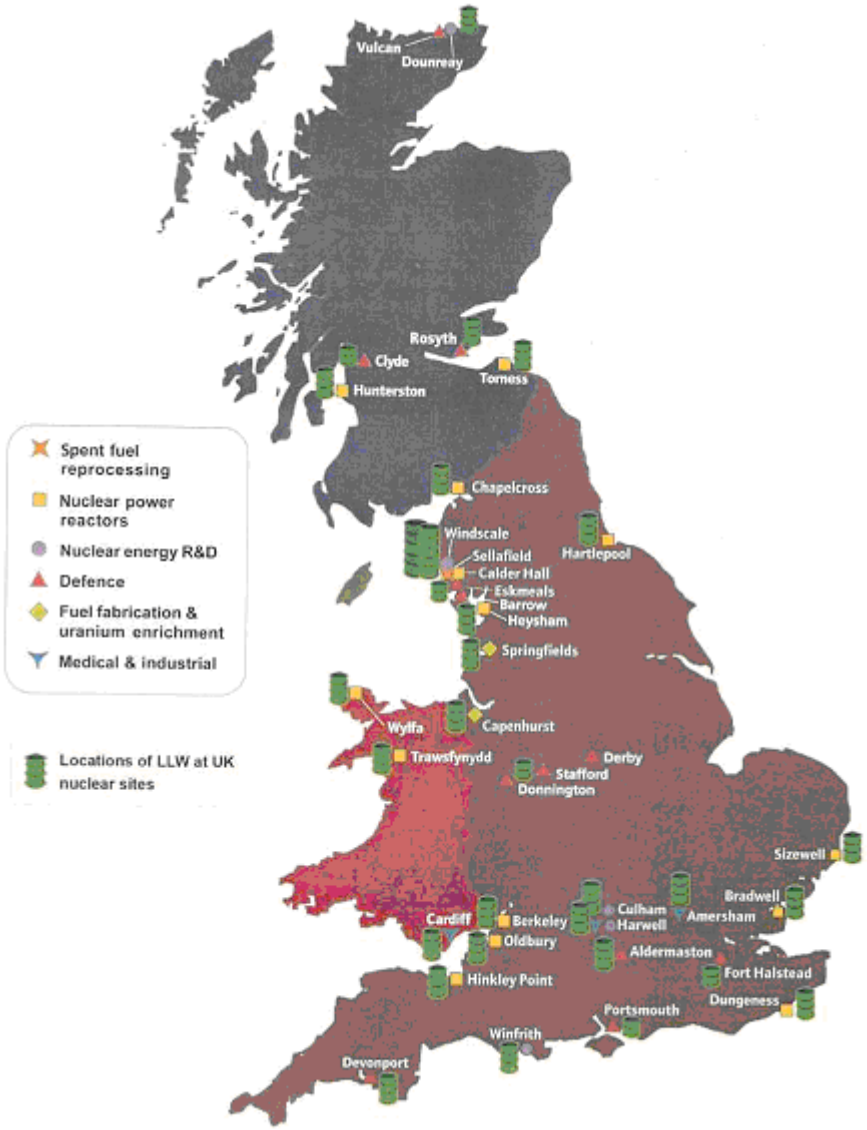
[17] The 2007 UK Radioactive Waste Inventory. Available: http://www.nda.gov.uk/ukinventory/documents/Reports/upload/A-review-of-the-processes-contributing-to-radioactive-wastes-in-the-UK.pdf

[18] This information quoted directly from the Nuclear Decommissioning Authority website as part of their bi-annual inventory of radioactive waste. Available on: http://www.nda.gov.uk/ukinventory/documents/Reports/upload/2010-UK-Radioactive-Waste-Inventory-Main-Report.pdf

[19] Future arisings of HLW have negative volumes. This is because Sellafield has reported future arisings of HLW to show that the volume of accumulated waste (liquid plus vitrified product) will fall as liquid waste existing at 1.4.2010 and forecast in the future is conditioned to a vitrified product.

included in a central government bi-annual waste inventory, but instead are amalgamated into a UK wide document[20]

Radioactive waste is managed on 36 sites in the UK[21] shown on the following map (excluding Northern Ireland – which has no major waste producers of radioactive waste). This network includes nine operating nuclear power stations; and one of these nine sites is Hinkley Point in Somerset.



22

[20] The UK Small Sources document can be accessed on http://www.nda.gov.uk/ukinventory/documents/Waste_Stream_Data_Sheets/Site_WSDS/loader.cfm?url=/commonspot/security/getfile.cfm&pageid=866

[21] http://www.nda.gov.uk/ukinventory/summaries/

[22] Map taken from:

http://www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/energy%20mix/nuclear/radioactivity/llw-policystatement070326.pdf

2.2. Radioactive waste management in Somerset

The main producer of radioactive waste in Somerset is the Hinkley Point complex. This is comprised of three sites. Hinkley A is non-operational and is being decommissioned. Hinkley B is operational. Hinkley C is currently in planning development stage. Further information on each site is shown below.

Hinkley Point A

Hinkley Point A comprises of two Magnox reactors that generated electricity from 1965 until 2000. Defuelling of the twin reactors was completed in 2004.

Location	Somerset
Nuclear operation period	Operated from 1965 to 2000
Status	Decommissioning
Site licensee	Magnox Electric Ltd
Responsible organisation	Nuclear Decommissioning Authority

In a report written for the NDA by Entec UK there is an estimated amount of 5,447 m^3 of Intermediate Level Waste generated during decommissioning with the majority of this coming from the final site clearance phase of the process. Once this waste has been packaged, it will amount to around 7,347m^3 of waste for final disposal. As well as this, it is anticipated that there will be around 43,764m^3 of Low Level Waste (LLW), which once packaged will give rise to around 57,074m^3 of waste for final disposal[23].

There is a valid (extant) planning permission currently for Hinkley Point A which comprises of a building for the treatment and storage of on-site intermediate level radioactive waste. This facility has not yet been constructed.

Hinkley Point B

Hinkley Point B comprises of two operating Advanced Gas-Cooled Reactors (AGR) that became operational in 1976. It is expected that the station will continue to generate electricity up to 2016. A decision will be taken in 2013 as to the shut down date of this facility; there is potential for this date to be extended in five year increments.

British Energy is responsible for Hinkley Point B. British Energy was acquired by EDF energy in early 2009.

[23] Strategic Environmental Assessment. Site Specific Baseline – Hinkley Point A. May 2010. Entec on behalf of NDA.
http://www.nda.gov.uk/documents/loader.cfm?url=/commonspot/security/getfile.cfm&pageid=30077

Location	Somerset
Nuclear operation period	Operating since 1976
Status	Operational
Site licensee	EDF Energy
Responsible organisation	EDF Energy

Hinkley B has an on-site incinerator which has been used to treat low level waste that arises within the facility – this includes a broad range of dry solid wastes including paper and other cellulose compounds (clothing) plastics, rubber and also liquid waste such as oils[24]. However, this is no longer in use.

Hinkley B also has a small landfill, which has been used for the disposal of non radioactive waste arising on this site. This is no longer in use.

Hinkley Point C

EDF Energy in consortium with Centrica plc has submitted an application to the Infrastructure Planning Commission to build two European Pressurized Water reactors (EPR).

The management of radioactive wastes at Hinkley C is proposed by EDF Energy to align with the Government's "Waste Base Case" as set out in the Government's December 2010 "Consultation on Funded Decommissioning Guidance for New Nuclear Power Stations".

The strategy for LLW generated by Hinkley Point C, which is perceived to be in line with Government and regulatory policy, is for the waste generated throughout nuclear power plant operations and decommissioning to be subject to the Waste Hierarchy and, where necessary disposed of as soon as reasonably practicable, following application of the treatment to minimise volume and perform appropriate conditioning or packaging.

Quoting from EDF's application for Development Consent Order, the ultimate disposal of the wastes is expected to be via one of the following main routes depending on the radioactivity level of the waste produced, its physical characteristics and its chemical properties:

- off-site treatment of metals, ultimately for recycling, via commercially available routes subject to meeting the relevant Conditions for Acceptance (CfA);
- off-site incineration of combustible wastes using commercially available routes subject to meeting relevant CfA. There would be no on-site incineration of wastes;
- use of appropriate authorised disposal facility for exempt and VLLW disposal (notably for soil, rubble and aggregates) where no reuse or recycling options are viable, subject to meeting relevant CfA;

[24] p53 LLW Strategic Review from the NDA – published 2008

- transfer of suitable LLW for super-compaction prior to disposal at the Low Level Waste Repository (LLWR) to minimise disposal volume; and
- disposal of LLW directly to LLWR would be utilised only where the above alternatives are not practicable.

The strategy for ILW and spent fuel at Hinkley Point C is reliant on two long-term interim stores at the HPC site:

- the ILW Interim Storage Facility (ILW ISF) would store packages of conditioned ILW ; and
- the Interim Spent Fuel Store (ISFS) would wet store spent fuel.

ILW will be retrieved, conditioned and packaged on-site on a campaign basis throughout the operational phase of Hinkley C. Cylindrical pre-cast concrete casks, will be used for the packaging and the ILW will be conditioned either in cement or epoxy resin, depending on the chemical and physical characteristics of the waste. This will result in a passively safe package ready for interim storage. These packages would be stored in an on-site interim ILW store for the duration of operations. The stored ILW packages would be removed from the ILW store when a Geological Disposal Facility is available to accept new build waste for final disposal.

EDF anticipates that the ILW ISF would be emptied of waste and decommissioned within 20 years of end of generation, although its lifespan is capable of extension if necessary through refurbishment or replacement of equipment and structures. It explains that a reactor that begins generation in 2018, with a 60 year generating life, could have all ILW packaged and ready for transfer to a GDF by around 2098 (which is significantly earlier than the currently anticipated start date for disposal of new build wastes, 2130). EDF states that the current scheduling for transfer of ILW to the GDF has not been optimised for new build waste, but that optimisation should allow earlier disposal of new build ILW.

For the purposes of decommissioning planning, EDF assumes that GDF scheduling can be optimised to allow transfer of ILW during the main site decommissioning phase, but that if optimisation requires a further period of interim storage at the HPC site, it is possible that the ILW ISF may need refurbishment.

The spent fuel at Hinkley B is sent off site to Sellafield for reprocessing. However, in line with the Government's "Waste Base Case" for new nuclear power stations, the spent fuel at Hinkley C will be stored on site until a national Geological Disposal Facility is available for transfer and the spent fuel is ready for final disposal.

Spent fuel continues to generate heat after it is removed from the reactor because of the way in which the radioactive atoms within the spent fuel become non-radioactive over time (called “radioactive decay”). The radioactivity in spent fuel declines to about one hundredth of its original level within a year and to one thousandth of its original level within 40 years. Spent fuel removed from a reactor must be cooled for an initial period before it can be placed into interim storage. For the UK EPR this will take place within the reactor fuel pond.

The process for on-site storage of spent fuel comprises a period of initial cooling within the reactor fuel pond (10 years), following which the spent fuel assemblies would be transferred to the separate on-site spent fuel Interim Storage Facility (ISFS). Quoting from EDF Part One Sustainability Evaluation[25]: "Hinkley Point C new and spent fuel would be handled in the fuel building. Spent fuel is highly radioactive and would be stored under water in a fuel pond for 10 years, and then transferred to an on site interim fuel store pending final disposal in the proposed national geological disposal facility".

EDF explain that the ISFS would be designed so as to be capable of operating independently of other parts of the site in recognition of the need, under current assumptions, for its lifetime to extend beyond the decommissioning of other facilities on site. Spent fuel from nuclear reactors is not currently categorised as waste since it can be re-processed, although this is subject to legal challenge. According to the Local Government Association, facilities to manage this material may still require planning permission from the Waste Planning Authority.[26]

Bearing in mind the current position, it is clear there are uncertainties around the duration of long-term interim storage in the proposed ILWSF and ISFS. In optimistic scenarios, these stores might ‘only’ be required for a few tens of years beyond end of generation (requiring acceleration of the GDF programme and optimisation of disposal schedules for new build wastes). On current ‘base case’ assumptions, the stores would be required for at least 50 years beyond end of generation (with the start of disposal in 2130). On pessimistic scenarios, the stores could be required for even longer (if the GDF programme is delayed significantly or if a second GDF is required for new build higher activity wastes).

---

25 http://hinkleypoint.edfenergyconsultation.info/Preferred_Proposal_Documents/Sustainability%20Evaluation/27%20Sustainability%20Evaluation.pdf

26 http://www.lga.gov.uk/lga/aio/2058365

3. Planning for radioactive waste

3.1. Introduction

Planning effectively for the provision of storage, treatment and disposal of radioactive waste poses a variety of problems, not least because the timescales involved in radioactive waste management are far in excess of any statutory document, plan period or government term.

Climate change is one factor that exemplifies the challenges over timescale. In its 2008 White Paper on Nuclear Power central government classes nuclear power as a low carbon energy supply that is helping the country to cut carbon dioxide emissions and mitigate climate change.[27] In Somerset, a consultation on waste planning issues and options undertaken in late 2007 highlighted some concerns about the potential impact of flooding at Hinkley Point arising from a rise in sea-level. Consideration will need to be given on flood risk and what adaptation measures are appropriate.

The following sections outline the need for radioactive waste management facilities nationally and the how local planning can help to meet this need.

3.2. The need for a deep level geological disposal repository

The UK Government[28] has for some time been investigating the potential of and need for a deep level geological disposal repository. This could be used for final disposal of ILW, HLW and spent fuel that is declared a waste. The principle of this facility is to isolate the waste inside a suitable rock formation to ensure that no significant quantities of radioactivity reach the surface. This is the Nuclear Decommissioning Authority's preferred strategy and is being implemented in a number of countries worldwide including France, Finland and Sweden. While there are currently no operational deep geological disposals facilities worldwide the programmes in Finland and Sweden are on course to deliver operational repositories by 2020 and 2025 respectively.

In 2001 the UK government commenced the Managing Radioactive Waste Safety (MRWS)[29] programme with the aim of identifying a long term solution in the form of a geological disposal repository. The government is currently pursuing an approach of voluntarism (that is a willingness to participate) from local authorities. Copeland Borough, Allerdale Borough and Cumbria County

[27] 2008 White Paper – Nuclear Power

[28] This refers to England only – the Scottish Parliament does not support geological disposal as an acceptable future storage but continues to support robust interim storage and further research. The Welsh Assembly has currently reserved its position.

[29] http://mrws.decc.gov.uk/

councils have grouped together and are currently undertaking local consultations as to whether they should participate in the process.[30]

The UK government has not set a fixed delivery timetable, but in planning the implementation of the national policy of geological disposal, the NDA has assessed that a UK facility could be operational for the disposal of legacy ILW by about 2040, with legacy High Level Waste/spent fuel emplacement beginning about 2075. This disparity between timeframes appears to be accounted for by the longer construction time needed for the HLW repository areas. The emplacement of existing and committed legacy radioactive wastes is anticipated to be completed around 2130[31].

The British Geological Survey reported in 2006 that 'over 30% of the UK has suitable geology for siting a deep geological disposal facility' and the Committee for Radioactive Waste Management (CoRWM), who provide oversight and advice to Government on waste management issues, found that 'there is high confidence in the scientific community that there are areas of the UK where the geology and hydrogeology at 200 metres or more below ground will be stable for a million years and more into the future'.[32]

3.3. The need for interim storage

Until such time as one or more geological disposal facilities are available to accept "legacy" waste and waste from new nuclear build, it is important to plan appropriately for the long-term interim storage of intermediate and high level radioactive waste i.e. higher activity wastes (HAW).

Currently such waste is stored in surface stores at over twenty sites in the UK. Storage on a timescale of decades is a necessary part of radioactive waste management given the time that will be required to implement geological disposal.

An interim store for packaged waste, suitable for geological disposal, is a robust engineering facility with a design life of typically 100 years, resistant to foreseeable incidents such as flooding and severe weather conditions. Such interim stores provide protection for wastes packages from environmental threats such as atmospheric salts and high humidity, which could have an impact on the long term integrity of the package.

To prevent the release of radiation or of hazardous materials in the wastes to the outside environment, a number of engineered barriers are provided as listed below[33]:

- the waste form
- the container

[30] http://www.westcumbriamrws.org.uk/

[31] National Policy Statement for Nuclear Power Generation (EN-6)

[32] National Policy Statement for Nuclear Power Generation (EN-6).

[33] http://mrws.decc.gov.uk/en/mrws/cms/Waste/Interim_storag/Interim_storag.aspx

- shielding (either of the package or of the store structure)
- the external store structure.

3.4. The need for alternatives to the LLW repository near Drigg

Historically the majority of the UK's Low Level Waste (LLW) has been sent to the LLW repository near Drigg, Cumbria. This facility is operated by LLW Repository Ltd. under contract to the Nuclear Decommissioning Authority, and the bulk of the waste is from nuclear power plants, with a smaller proportion arising from the defence, medical and educational establishments, and from industry. This facility is managed by UK Nuclear Waste Management Ltd, parent body of LLW Repository Ltd on behalf of the NDA.

The potential capacity of this facility is well below the current forecast volume of LLW that must be dealt with in the future. An application was submitted last year to Cumbria County Council for substantial additional disposal capacity to extend the lifespan of this facility (see section 1.5). This application has yet to be determined.

In 2007 the UK Government carried out a policy review regarding LLW, and a new policy was announced that sets out a more flexible approach for managing solid LLW in the long term.

Focusing on LLW disposal, the "*Policy for the Long Term Management of Solid Low Level Radioactive Waste Management in the United Kingdom*" published in March 2007 states that there are various options available that may be considered for the disposal of the wide spectrum of waste types and activity concentrations within LLW. These are:

- *disposal to facilities that have yet to be constructed to take ILW (where this is deemed to be necessary);*
- *disposal to near-surface facilities of the kind employed at the LLWR near Drigg, where disposal is by way of compaction, grouting and placement in a concrete vault;*
- *disposal to specific areas of, or adjacent to, nuclear licensed sites (e.g. the current landfill-type disposal at British Nuclear Group Sellafield) or to disposal facilities that might, in future, be constructed at, or adjacent to, nuclear sites;*
- *in-situ disposal; that is, burial at the point of arising;*
- *disposal at specified landfill sites for LLW and high volume VLLW, including the practice of "controlled burial", providing that this meets specified regulatory requirements: such use of specified landfill sites, subject to meeting regulatory requirements, supersedes paragraph 117 of Cm2919;*
- *general disposal of low volume VLLW to an unspecified destination, together with municipal, commercial or industry wastes;*
- *incineration."*

This sets the policy context, which helped to inform the UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry (August 2010). This LLW Strategy helps to make best use of the LLWR, in part by emphasising the importance of the waste hierarchy:

"It should be recognised that avoiding disposal at LLWR should not automatically mean disposing of waste elsewhere. Disposal capacity for all wastes is a precious resource and must be used sparingly; as such every effort should be made to avoid the use of disposal wherever possible."

The application of the waste hierarchy is common to all waste types. This is also supported in more recent national policy and strategy. National Policy Statement for Energy (EN-1) July 2011 states that: *"Disposal of waste should only be considered where other waste management options are not available or where it is the best overall environmental outcome".* And the NDA Strategy (effective from April 2011) outlines its key principles for strategic decisions about radioactive waste management as follows (p40):

"Strategic decisions about waste management are informed by the following key principles:

- *risk reduction is a priority*
- *centralised and multi-site approaches should be considered where it may be advantageous*
- *waste should be minimised*
- *the Waste Hierarchy should be used as a framework for waste management decision making and enables an effective balance of priorities including value for money, affordability, technical maturity and the protection of health, safety, security and the environment."*

Consequently, it is important to support the diversion of radioactive waste up the waste management hierarchy, which helps to make best use of LLWR as mentioned above. The strategic importance of LLWR is noted in the UK LLW Strategy as follows:

"LLWR is a key asset to the UK. LLW has been disposed of at LLWR since 1959. Continued availability of this facility is central to this strategy, ensuring that the UK is able to effectively manage LLW. The strategy looks to extend the life of this facility to ensure capacity for the long term."

In considering other disposal options, the UK LLW Strategy states:

"Alternative disposal options include: 1) the use of existing landfill sites; 2) development of new facilities on or adjacent to sites to dispose of waste from that site; 3) development of new facilities on or adjacent to sites to dispose of waste from a number of sites; 4) use of new facilities away from nuclear sites to dispose of wastes from one or a number of sites on a regional or national basis."

In its section on "Planning and decision making" the UK LLW Strategy notes that: *"Whilst the desire to avoid excessive transportation of materials is an important consideration, it must be balanced with all the other relevant factors on a case-by-case basis. In the case of radioactive wastes, as with some hazardous wastes, the number of appropriate facilities may mean that the nearest appropriate facility is a considerable distance from where waste is generated"*.

3.5. The role of local waste planning

It is important that Somerset County Council, as Waste Planning Authority for Somerset (excluding Exmoor National Park) considers radioactive waste matters appropriately in its planning activities. Consequently, the Waste Core Strategy Development Plan Document for Somerset needs to address the issue of radioactive waste management. In preparing a robust Strategy the County Council must take account of a range of factors, informed by national policy and guidance, and local evidence.

The Somerset Waste Local Plan, adopted in February 2005, has two policies on nuclear (rather than radioactive) materials:

> **Policy W14 – Nuclear waste disposal**
> 'Planning permission will not be granted for facilities for disposal/permanent storage of nuclear waste in Somerset'
>
> **Policy W15 – Nuclear waste treatment and storage**
> 'Planning permission for facilities for the treatment or temporary storage of nuclear waste will not be granted unless:
>
> - The waste arises solely from the operation or decommissioning of the plant at Hinkley Point; and
> - Any treatment is confined to processes essential prior to transport or storage; and
> - Temporary storage is confined to intermediate level waste with a specified end date for that storage and
> - There is no national facility for intermediate level waste storage or disposal'

Since 2005, national policy and strategy has evolved. Sections 3.1 to 3.4 have already mentioned various elements of this evolving position which help the County Council to consider its role and responsibilities in this complex area.

Focusing on waste planning and related policy, although there is no specific Planning Policy Statement (PPS) for radioactive waste, PPS10 on 'Planning for Sustainable Waste Management' highlights the Government's policy of moving the management of waste up the waste hierarchy, and the need for 'positive planning' that provides 'sufficient opportunities for new waste

management facilities of the right type, in the right place, and at the right time'. It is noted that a key planning objective in PPS 10 states:

> *"help secure the recovery or disposal of waste without endangering human health and without harming the environment, and enable waste to be disposed of in one of the nearest appropriate installations;"*

PPS10 also states that planners should 'take account of any waste management requirement identified nationally'. This provides an explicit linkage between PPS10 and more specific policies and strategies for radioactive waste management.

A briefing note issued by NuLeAF[34] includes the following points for waste planning authorities to consider:

- the development of LLW disposal facilities on or adjacent to nuclear licensed sites
- the increased use of controlled burial at landfill or incineration for LLW and VLLW
- the development of ILW treatment, conditioning and storage facilities at nuclear licensed sites
- the decommissioning of nuclear plant
- the siting of a geological repository

The briefing note follows on with where new facilities might be proposed at some point in the future, local planning policy should take account of:

- the nature and purpose of potential facilities
- the need for such facilities
- the potential lifetimes of facilities
- the Government's agenda in promoting further nuclear power facilities and the implications of these in a waste sense (i.e. potential importation of waste material to be treated or stored in Somerset)
- the inventory of wastes to be managed in the facility, including the possibility of the 'import ' of wastes from other sites or areas within the UK
- the benefits package that might be associated with the facility.

The final point in the above bulleted list is picked up in the Government Review of Waste Policy in England 2011, which states that *"The principle that those most impacted should benefit most should operate across all scales from street to neighbourhood to local authority. How to achieve this should be*

[34] NuLeAF – BP13 available for download: http://www.nuleaf.org.uk/nuleaf/DisplayArticle.asp?ID=6516

part of an ongoing dialogue between communities, local authorities, waste management companies and developers. Other industries, for example wind generation, have addressed this issue through the development of industry protocols for providing community benefits in relation to infrastructure development, and we will explore with the waste management industry whether such approaches could be suitable for waste infrastructure." [35]

Permanent nuclear waste storage facilities have been strongly resisted in previous Somerset planning policy. Policy in respect of temporary facilities has been very restrictive as per Policy W15 noted above. If proposals for nuclear waste storage associated with Hinkley Point come forward in the future robust provision for community benefits should form part of planning proposals. This is to reflect Government thinking and would follow arrangements made at the LLW facility near Drigg in Cumbria.

Clearly, there may be further planning impacts from the Localism Act, the National Planning Policy Framework, the forthcoming National Waste Management Plan and the shuffling of roles involving the IPC.

Provision must also be made for non-nuclear industry sources of waste, such as those from hospitals, universities and military establishments in Somerset. The UK radioactive waste inventory does not provide data on arisings from these sources. There is no evidence to suggest that Somerset generates significant amounts of non-nuclear radioactive waste; Somerset has no university campus and only a select number of medical and military establishments that may produce this waste type. In emerging national guidance[36], central government states that planning authorities should not make bespoke arrangements for this waste type.

[35] Furthermore, it is noted that according to the Government Review of Waste Policy in England 2011 "*There is no requirement for individual authorities to be self sufficient in terms of waste infrastructure and transporting waste to existing infrastructure to deliver the best environmental solution should not be considered a barrier.*"

[36] A national strategy for non-nuclear industry radioactive waste is expected to be published soon.

4. Governing organisations

Who	Function	Information
Nuclear Decommissioning Authority	• Decommissioning and clearing of civil nuclear facilities • Ensuring that all the waste products, both radioactive and non-radioactive, are safety managed • Implementing Government policy on the long term management of nuclear waste • Developing UK wide nuclear Low Level Waste (LLW) strategy and plans • Scrutinising decommissioning plans.	www.nda.gov.uk
Magnox	Management and operations contractor currently responsible for operation and decommissioning ten nuclear sites on behalf of their owner, the Nuclear Decommissioning Authority (NDA).	www.magnoxsouthsites.com
NuLeAF	NuLeAF seeks to build capacity within local government to engage effectively with nuclear legacy management and works to represent the views of member local authorities to national bodies.	http://www.nuleaf.org.uk
CoRWM	Provides independent scrutiny and advice on the UK's management of its solid radioactive waste, including plans for interim storage and geological disposal of higher activity waste.	http://www.corwm.org.uk
DECC	Exists as a Government body to take the Government's lead on	http://www.decc.gov.uk

	tackling energy policy and delivering on a low carbon and resource efficient energy supply.	
Defra	Provides data and information on generic radioactivity within the environment, including sources from nuclear power plants. Information currently under review following change of Government.	www.defra.gov.uk
Environment Agency	Environment regulator for England	www.environment-agency.gov.uk
Low level waste repository (ltd)	Management and Operations contractor for the Low Level Waste Repository operating under contract to the NDA.	http://www.llwrsite.com/
Office for Civil Nuclear Security	Responsible for regulating security arrangements	http://www.hse.gov.uk/nuclear/ocns/
Radioactive Materials Transport Division	Part of Department for Transport. Responsible for regulating transport of radioactive materials.	http://www.dft.gov.uk/pgr/freight/dgt1/road/guidance/guidance/guidance7class/theradiologicalimpactofthetr1178
Office for Nuclear Regulations (part of the HSE)	The regulator for the civil nuclear industry in the United Kingdom. Created on April 1, 2011, the ONR is formed from the merger of the Health and Safety Executive's Nuclear Directorate (the Nuclear Installations Inspectorate, Office for Civil Nuclear Security the UK Safeguards Office)	http://www.hse.gov.uk/nuclear/