SCOTLAND'S HIGHER ACTIVITY RADIOACTIVE WASTE POLICY
SUPPLEMENTARY INFORMATION 2010

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SCOTTISH GOVERNMENT

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Introduction

The purpose of this document is to provide information on radioactivity, radioactive waste and the regulatory framework that governs its management in Scotland. It has been produced to provide supplementary information that may be useful in understanding the issues around the Scottish Government's Consultation Document on the Detailed Policy Statement for higher activity radioactive waste and associated Environmental Report.

The document is split into five sections:

- Guide to radiation and radioactivity
- Radioactive waste
- Legislative framework for radioactive waste
- Glossary of terms
- Abbreviations used in this document, the Consultation Document and the Environmental Report.

SECTION 1

GUIDE TO RADIATION, RADIOACTIVITY AND RADIOACTIVE WASTE

1 GUIDE TO RADIATION, RADIOACTIVITY AND RADIOACTIVE WASTE

Introduction

The purpose of this section is to provide some general information on radioactivity and to explain some of the terms that are used in the Scottish Government's Higher Activity Radioactive Waste Policy Consultation Document and more generally in discussion about radioactivity and radioactive waste issues. It is intended for those who may not be familiar with many of the technical terms used in discussing radioactivity and radioactive waste to help explain what we are talking about.

It is not intended to be a fully comprehensive, technical explanation of radioactivity and radioactive waste as there have already been many books written on this subject that can be referred to.

1.01 What is Radiation?

1.01.01 **Radiation** is the term used to describe energy which is transmitted, or radiated, in the form of particles, waves or rays which can travel through space. Radiation occurs all around us and examples of it include the heat given off by a household electric heater (thermal radiation) to stronger and potentially more harmful forms of radiation which can damage human cells. There are two categories of radiation: **ionising radiation** and **non-ionising radiation.**

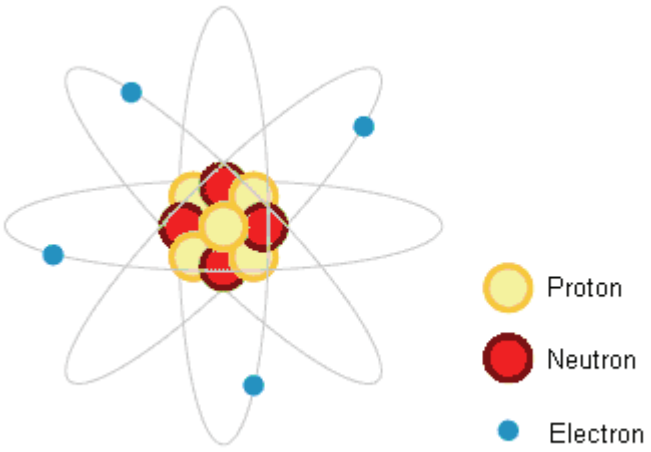
What is ionising radiation?
Ionising radiation includes cosmic rays, x-rays, alpha particles, beta particles and gamma rays. **Non-ionising radiation** includes ultraviolet light, radiant heat, radiowaves and microwaves. When ionising radiation passes through matter it causes **ionisation**. This is the process by which a neutral atom within the matter becomes positively or negatively charged. This has the potential to damage cells and DNA, an important genetic material found in cells. Non-ionising radiation, however, does not produce ionisation when passing through matter and does not have enough energy to damage DNA directly.

This document refers to ionising radiation.

1.02 What is radioactivity?

1.02.01 Everything in the world is made up of extremely small building blocks called atoms. There are stable and unstable atoms. Unstable atoms change spontaneously to become more stable and during this process energy is released in the form of either particles (alpha and beta) or electromagnetic energy (gamma rays). This process of releasing energy is known as **radioactivity** while the energy itself is known as **ionising radiation**.

Figure 1: Illustration of an atom (courtesy NDA)



1.02.02 We are exposed to ionising radiation all of the time from natural sources. This is known as background radiation which includes radiation from rocks containing radioactive elements such as uranium, and cosmic rays from the Sun which enter the Earth's atmosphere. These levels can be higher in some places than in others. Background radiation can also come from naturally occurring radioactive elements that are present in our food and drink.

1.03 How do we use radioactivity?

Nuclear Power

1.03.01 Radioactive materials are used to produce **electricity** in nuclear power stations through the process of **fission**. If enough of the right kind of uranium is assembled in a nuclear reactor, the fission reaction produces heat which is used to create steam, which in turn drives turbines that generate electricity.

What is fission?
Nuclear reactors use the process of fission to produce power. Fission is the splitting of a nucleus into two or more pieces which can produce further chain reactions. Certain radioactive substances, such as Uranium, are known to undergo spontaneous fission at a low rate. In nuclear reactors uranium-235 is bombarded by neutrons to induce fission, this process produces energy, which is quickly converted to thermal energy, which is used to create steam, and in turn electricity.

Medicine

1.03.02 Ionising Radiation can be used in the **diagnosis** and **treatment** of diseases, but the benefit to the patient must outweigh the risk of exposure. Radiation such as x-rays can assist in the diagnosis of diseases by producing images of the inside of the body. The ability of ionising radiation to damage tissue can also be used to treat diseases such as cancers, where cancerous cells can be killed by a direct beam of ionising radiation.

Industry

1.03.03 Ionising Radiation is also used widely in industry for non-destructive testing, allowing various structures to be inspected for flaws and weaknesses without affecting their integrity. Because radioactivity can be easily detected radioactive tracers can be used to investigate areas which would otherwise be inaccessible, e.g. leaks in pipes, fractures in rocks. It can also be used in gauging applications, allowing the thickness or density of a product to be measured without damaging the product itself.

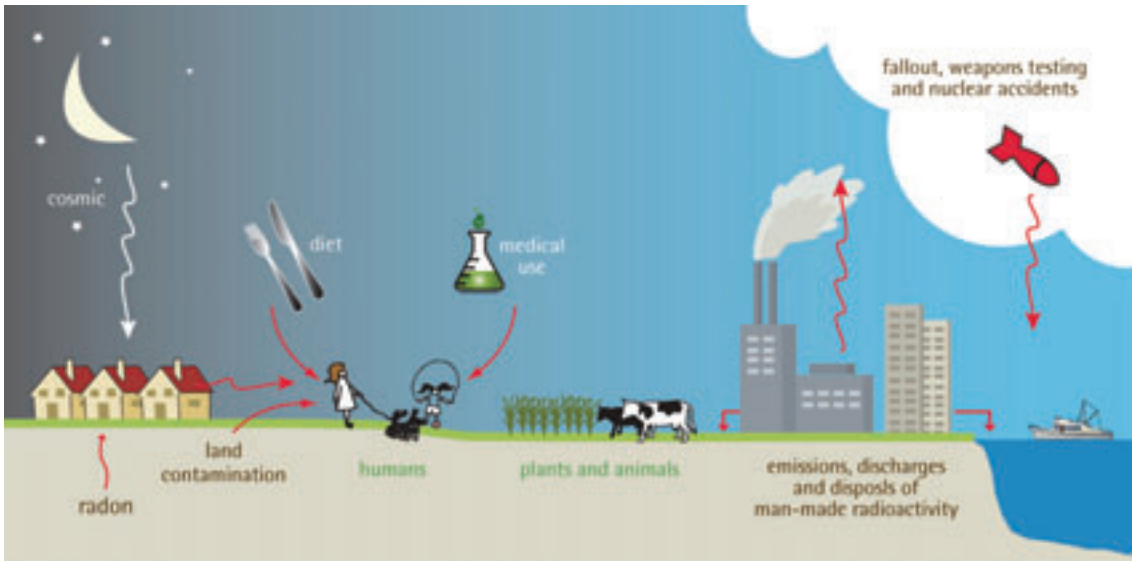
1.04 What are the health effects of radioactivity?

1.04.01 Ionising radiation can damage the tissues in our bodies through the process of **ionisation**. It can cause burns, cancer and hereditary effects and at very high doses radiation sickness. Because of this its use has to be carefully controlled. When people first began to work with radioactivity these effects were not known, however nowadays we can measure the dose a person receives, use shielding to control the source of the radiation, and protective clothing to ensure the safety of those who are at risk of exposure.

1.05 How are we exposed to radiation?

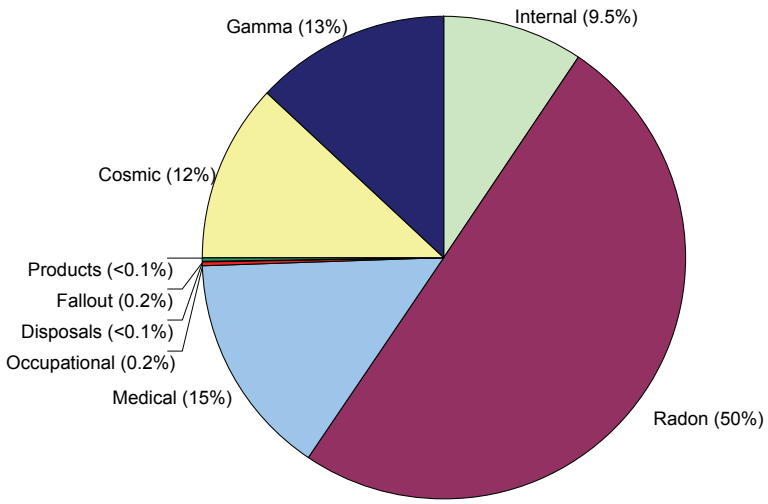
1.05.01 The greatest average exposure to ionising radiation that the public receives is from natural radiation and the largest contributor to this dose is radon gas. The greatest average artificial ionising radiation dose that we receive is from medical use in treatment and diagnosis, although the amount of radiation received is dependant on whether a person has undergone certain medical procedures that use ionising radiation. The public also receives small exposures to ionising radiation from consumer products such as smoke detectors, authorised discharges into the environment from hospitals, industrial premises and nuclear power stations, and historic fallout from nuclear weapons testing and nuclear incidents like Chernobyl.

Figure 2: Main routes of human exposure to sources of natural and man-made radiation (Courtesy SEPA)



1.05.02 People receive a radiation dose from many sources, such as eating or breathing in naturally occurring radioactive materials, being exposed to external radiation naturally present in rocks and building materials and cosmic radiation from the sun.

Figure 3: Sources contributing to the average annual UK ionising radiation dose



1.06 Types of Ionising Radiation

1.06.01 There are three main types of radiation:

- **Alpha (α) radiation** can be the most harmful if breathed in or eaten. However, it can only travel a few centimetres in air and can be stopped by a thin layer of material such as paper, clothing or the skin so is less harmful if it is outside the body.

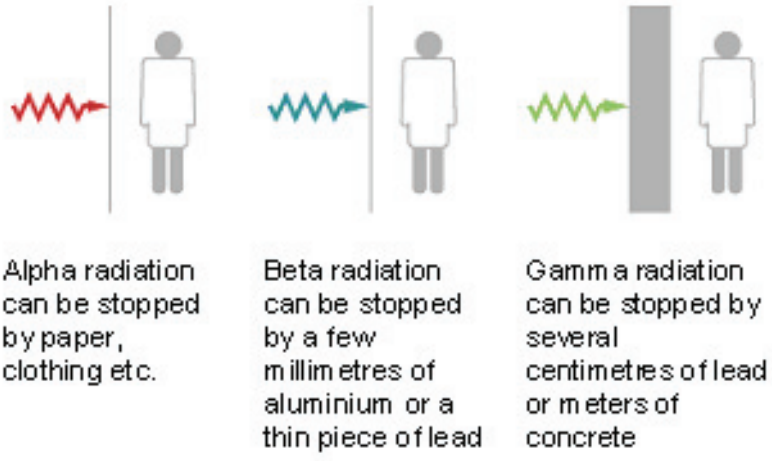
- **Beta (β) radiation** is less harmful than alpha if breathed in or eaten, but can travel further in air and is more penetrating through material. It passes through paper and needs a few millimetres of aluminium or a thin piece of lead to stop it. Similarly it can pass through the skin from outside the body to affect the internal organs.

- **Gamma (γ) radiation** can travel a long way through air and is extremely penetrating: several centimetres of lead or metres of concrete are required to stop it. However, it gets weaker as you move away from the source. This means that it can easily pass through the skin into the body and affect internal organs.

1.06.02 Alpha and beta radiation take the form of particles that are emitted from radioactive material whereas gamma radiation is a form of electromagnetic radiation that is emitted as a wave of energy. This electromagnetic spectrum includes light, ultraviolet rays and X-rays.

1.06.03 We can be protected from external radiation by various levels of shielding.

Figure 4: Illustration of shielding from radioactivity (redrawn by Bell Design)



1.06.04 A nuclear reactor produces substances which give off all three types of radiation: its core is very radioactive. Workers are protected from this radiation by shielding the core with steel and concrete.

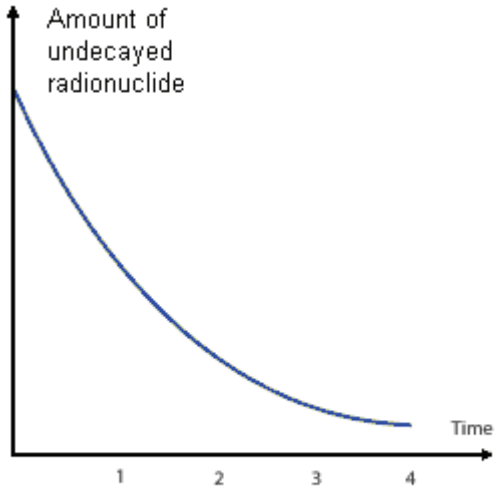
1.06.05 All radioactive materials (including the radioactive wastes produced by nuclear reactors, industry, medicine and defence agencies) require careful handling and monitoring to protect people and the environment.

1.07 Will radioactivity go away?

1.07.01 The amount of ionising radiation given off by a radioactive substance will gradually decrease over time. This is due to a process called **radioactive decay**. The time it takes for the radioactivity to decrease by 50% is called its '**half-life**'. Different radioactive materials have different half-lives: some can be a matter of seconds, some many thousands of years but the amount of radioactivity will always reduce as time goes on.

1.07.02 Radioactive decay and a material's half life are of importance as it can be used to help determine what the best option for dealing with radioactive materials should be. Waste which is highly radioactive but has a short half life may not be dealt with in the same way as waste of a similar radioactive level which has a half life of many thousands of years.

Figure 5: Graph of a radioactivity decay curve (courtesy NDA)



The amount of a radionuclide is reduces by a half after each half-life period

1.07.03 This means that radioactive waste of a certain activity can be stored for a period of time until it decays to below an activity level at which it could potentially be reclassified and disposed of at existing facilities.

1.07.04 Each time a **radionuclide** decays (i.e. emits a neutron, proton or electron) its chemical composition changes. This means each time it decays it becomes a different radionuclide. The original radionuclide is known as the parent and the resulting radionuclide(s) are called **daughter products**. This sequence of events can be repeated many times over, resulting in a radioactive **decay chain**.

What is a radionuclide?
A nuclide is a certain species of atom with a particular composition of protons, neutrons and electrons. A **radionuclide** is an unstable nuclide which emits ionising radiation. For example Thorium-234 and Radon-222 are different radionuclides, uranium-238 and uranium-234 are also different radionuclides as they have different compositions of protons and neutrons.

1.07.05 **Radioactive decay chains** are relevant to the storage and disposal of radioactive waste as the original material placed in a facility will decay to become a different daughter product which could be solid, liquid or gaseous forms. Some of these daughter products may themselves be radioactive but others will be non-radioactive elements.

1.08 How does Material become Radioactive?

1.08.01 Some material is naturally radioactive; however some materials can become radioactive either by being contaminated, activated or both.

1.08.02 Material can become contaminated or activated through medical, industrial and nuclear processes where it comes into contact with radiation.

Contaminated materials

1.08.03 Radioactive contamination is caused by radioactive material being deposited on the surface of objects. The radioactivity may be deposited from airborne sources, from waterborne sources, or from physical contact. Radioactive contamination is generally located on or near the surface of materials like metal or high-density concrete or painted walls. Radioactive contamination can usually be removed from surfaces by washing, scrubbing, spraying, or by removing the outer surface of the contaminated objects.

Activated materials

1.08.04 Activated products are radioactive materials that are created when stable substances are bombarded by neutrons that make them radioactive. Typically these are produced from elements, contained within the steel structure of nuclear reactors.

1.09 What is Radioactive Waste?

1.09.01 The various uses of radioactive substances results in the production of 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. In practice this often comprises of everyday items that have become contaminated by contact with radioactive materials, concrete and other building materials from decommissioning buildings on nuclear sites and components that have become activated in nuclear reactors.

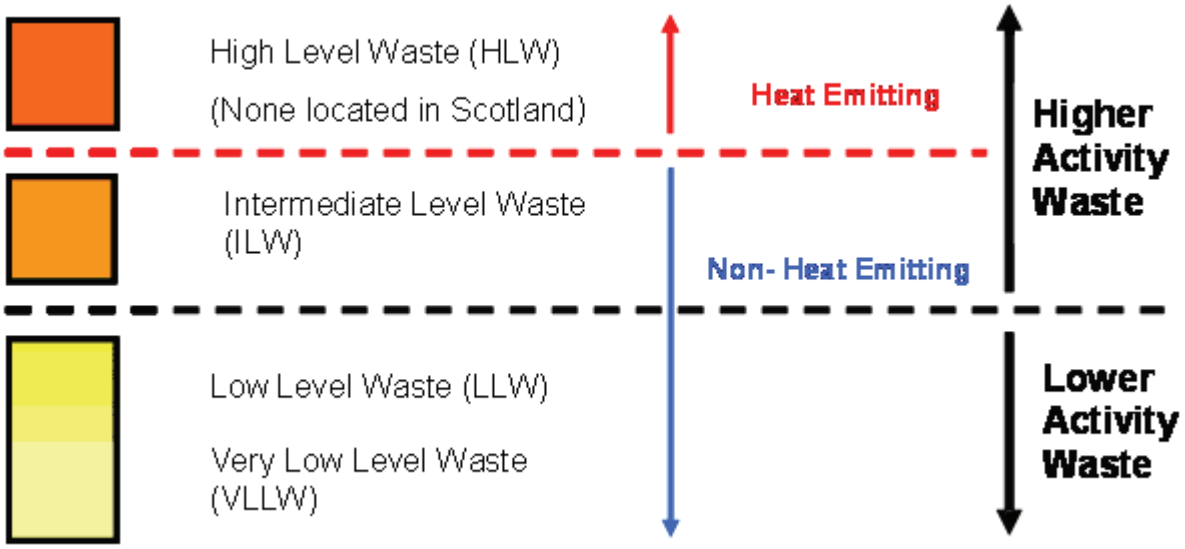
1.09.02 This radioactive waste falls into four categories:

- High Level Waste (HLW),
- Intermediate Level Waste (ILW),
- Low Level Waste (LLW), and
- Very Low Level Waste (VLLW).

1.09.03 There are government policies and regulations to determine how these wastes are managed. For the purpose of these policies, radioactive waste is described as “higher activity waste” or “lower activity waste”. Higher activity waste is high and intermediate level radioactive waste, and lower activity waste is low and very low level radioactive waste.

1.09.04 The following diagram shows the relationship between the different categories of radioactive waste and how they are classed as higher activity or lower activity waste.

Figure 6: Diagram of Waste Categories (Source Scottish Government)



1.10 Radioactive Waste Categories

High Level Waste (HLW)

1.10.01 Waste that contains sufficiently high levels of radioactivity that heat is generated and this needs to be considered during its storage and disposal.

Intermediate Level Waste (ILW)

1.10.02 Waste containing higher concentrations of radioactivity than low level waste, but without the heat generation that occurs in high level waste. These wastes are typically from routine power station maintenance and decommissioning operations and typically consist of metal items such as nuclear fuel casing and nuclear reactor components, graphite from reactor cores, and sludges from the treatment of radioactive liquid effluents.

Low Level Waste (LLW)

1.10.03 Wastes that are within specified concentrations of radioactivity: lower than the levels set for intermediate level waste but higher than the levels set for very low level waste. These wastes may arise from the non-nuclear and nuclear industries and typically consist of everyday items that have become contaminated during use by contact with radioactive materials, and waste from decommissioning operations such as building rubble, soil and metal items such as framework, pipework and reinforcement

Very Low Level Waste (VLLW)

1.10.04 A sub-category of LLW is Very Low Level Waste (VLLW). This is radioactive waste that mainly arises from non-nuclear industries such as hospitals, universities and industrial premises and can be safely disposed of with ordinary (non-radioactive) waste. Typically this waste consists of everyday items used in the handling of radioactive materials such as gloves, vials, paper towels and other laboratory and medical equipment.

SECTION 2

RADIOACTIVE WASTE

2 RADIOACTIVE WASTE

Introduction

This Section describes how radioactive waste is categorised in the UK and provides some information on the type, quantity and description of the radioactive wastes included in the Scottish Government's Higher Activity Radioactive Waste Policy.

Radioactive substances are used in the nuclear and non-nuclear industries for a wide variety of reasons including generation of electricity, medical diagnosis and treatment, research and as part of industrial processes. These uses of radioactive substances results in the production of radioactive waste. Any material contaminated by or incorporating radioactivity above certain activity levels defined in legislation, and for which no further use is envisaged, is known as Radioactive Waste. In practice this radioactive waste often comprises of everyday items that have become contaminated by contact with radioactive materials, concrete and other building materials from decommissioning buildings on nuclear sites and components that have become activated in nuclear reactors.

Radioactive waste is categorised into four groups:

- High Level Waste (HLW),
- Intermediate Level Waste (ILW),
- Low Level Waste (LLW), and
- Very Low Level Waste (VLLW).

The following diagram shows the different categories of radioactive waste and how they fit into the broader descriptions of higher and lower activity waste.

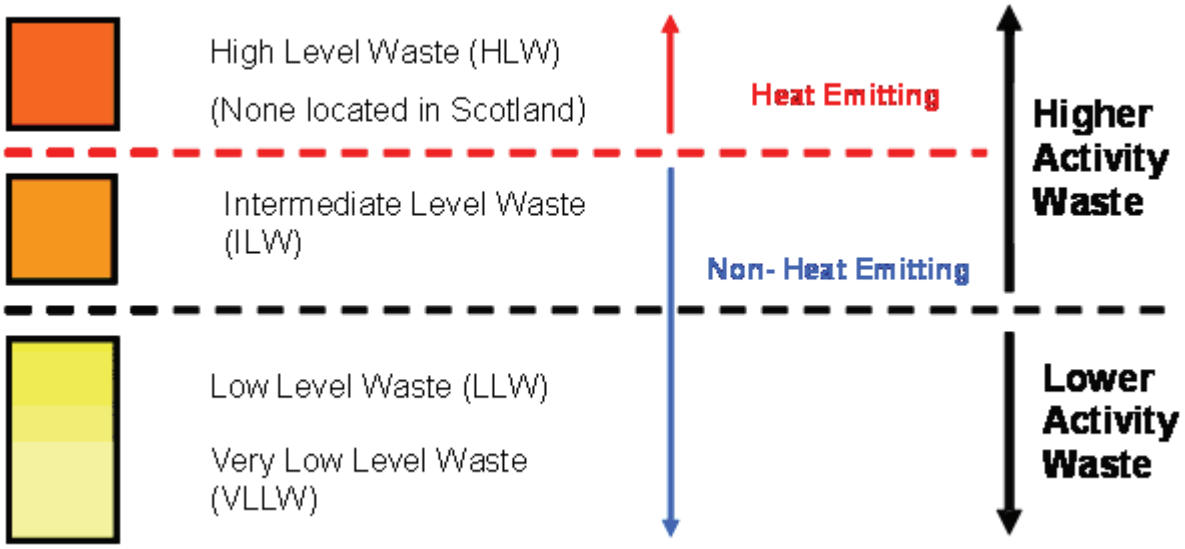
The definitions of low level radioactive waste given in this document are taken from the "Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom" published in March 2007. The definitions of intermediate and high level radioactive waste are taken from Cm2919.

The definitions are those used in the United Kingdom, other countries may use different definitions.

2.01 Categories of radioactive waste

2.01.01 Radioactive waste is divided into categories according to how much radioactivity is contained in the waste and the heat that the radioactive waste produces.

Figure 1: Diagram of Waste Categories (Source Scottish Government)



High Level Waste (HLW)

2.01.02 High Level Waste (HLW) is radioactive waste where the temperature may rise significantly as a result of their radioactivity, so that this factor has to be taken into account in designing storage or disposal facilities.

Intermediate Level Waste (ILW)

2.01.03 Intermediate Level Waste (ILW) is waste with radioactivity levels exceeding the upper boundaries for Low Level Waste (LLW) and which does not generate enough heat for heat generation to need to be taken into account in the design of storage or disposal facilities.

Low Level Waste (LLW) and Very Low Level Waste (VLLW)

2.01.04 Low Level Waste (LLW) is 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 activity".

2.01.05 Very Low Level Radioactive Waste (VLLW), is a sub-category of LLW and is defined differently for low volume and high volume disposals.

2.01.06 **in the case of low volumes ('dustbin loads') – Low Volume VLLW:**
"Radioactive waste which can be safely disposed of to an **unspecified** destination with municipal, commercial or industrial waste ("dustbin" disposal), each 0.1m^3 of waste containing less than 400 kilobecquerels (kBq) of total activity or single items containing less than 40 kBq of total activity.

2.01.07 For wastes containing carbon-14 or hydrogen-3 (tritium):

- in each 0.1m^3, 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."

2.01.08 **in the case of bulk disposals – High Volume 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".

2.01.09 The principal difference between the definitions for high volume and low volume VLLW is the need for controls on the total volumes of VLLW in the high volume category being deposited at any particular landfill site.

2.02 Where does higher activity radioactive waste come from?

2.02.01 The majority of higher activity radioactive waste arises from the operation and decommissioning of nuclear sites in Scotland. However, some higher activity wastes may arise from activities in the non-nuclear industry as well.

2.03 Operational and Decommissioning Wastes

2.03.01 Radioactive wastes are often described as ‘operational wastes’ and ‘decommissioning wastes’.

2.03.02 Decommissioning wastes are produced during the dismantling of nuclear facilities, and make up the bulk by volume of the higher activity waste that will be produced in Scotland. The majority of these wastes are made up of graphite, metals and concrete from reactors and will need to be managed when the reactors are dismantled.

2.03.03 Operational wastes are produced during the research or electricity generation activities that take place on nuclear sites. Examples of operational waste include laboratory consumables or fuel debris, which is produced during the management of spent fuel and comprises parts of the fuel casings.

2.04 Intermediate Level Waste

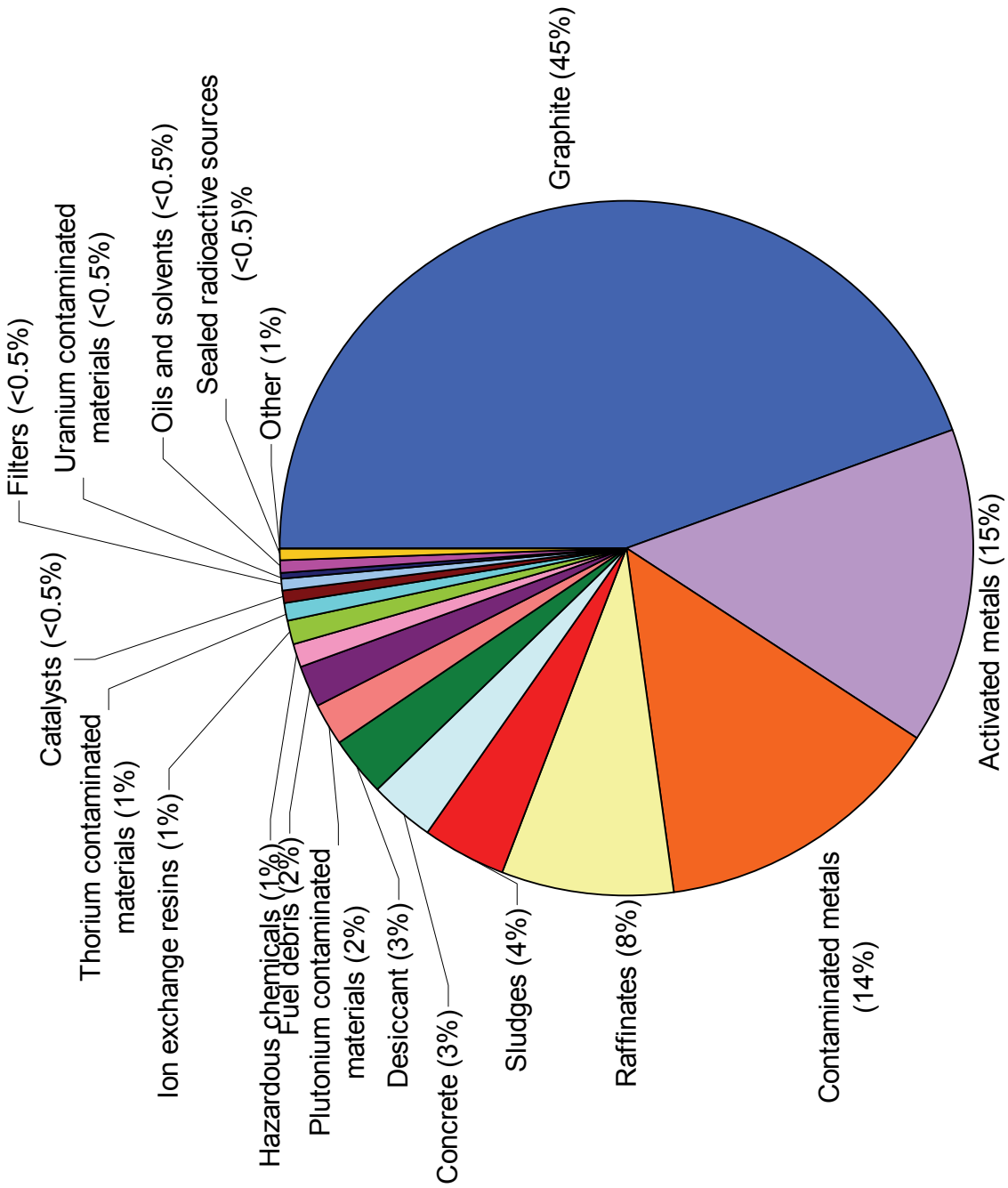
2.04.01 Intermediate Level Waste arises mainly from the reprocessing of spent fuel and from general operations and maintenance at nuclear sites, and can include metal items such as fuel cladding and reactor components, graphite from reactor cores, and sludges from the treatment of radioactive liquid effluents. Currently, ILW is packaged for disposal by mixing it with cement in highly-engineered 500 litre stainless steel drums (or for large items in higher capacity steel or concrete boxes).

2.05 Higher activity radioactive waste in Scotland

2.05.01 The following pie chart is based on data from the 2007 National Inventory and shows the proportion by volume of each higher activity radioactive waste type that is estimated to arise from Scottish nuclear sites. The data used to create this pie chart is given in 2.07 with a breakdown of waste type for each of the nuclear sites in Scotland and how the final packaged volume has been calculated.

Figure 2: Estimated volume of radioactive waste arising in Scotland (m^3)

(See also Table 1)



(Please note due to rounding factors with some small numbers the total percentage comes to over 100%)

2.06 How is the Waste described?

Waste Descriptions

2.06.01 A 'waste description' is a convenient way of grouping types of wastes together which have similar physical, chemical or radionuclide properties and can be used to determine how they might be treated, stored or disposed of.

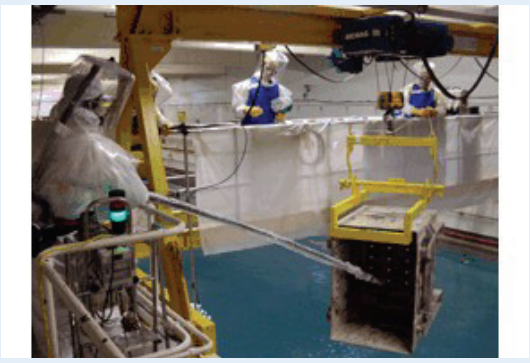
2.06.02 This process is comparable to how domestic waste can be divided into separate groups, such as paper to be recycled or garden waste to be composted. For radioactive materials this gives us a range of broad groupings which then allows for a collective method of treatment, packaging and disposal appropriate to a waste stream's specific properties.

2.06.03 The following pages describe the different types of higher activity waste produced in Scotland. The percentages given are the proportion by volume of each waste type based on information from the 2007 National Inventory.

Graphite (45%)

Graphite is a solid form of the element carbon that is used in nuclear reactors to slow down neutrons in the reactor core so that fission can take place. Fission is the process of splitting atoms to produce energy. During this process the graphite itself becomes radioactive due to bombardment with neutrons.

Activated Metals (15%)

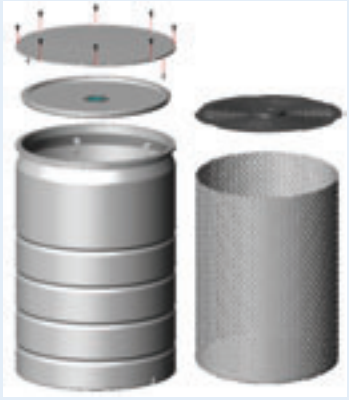


Metal items such as structural components and fuel assembly cladding that have been used inside a reactor. These metal components become radioactive due to bombardment with neutrons.

Contaminated Metals (14%)

Metal items such as tools and pipework that have been contaminated on the surface with radioactivity. Contamination occurs when items are in contact with radioactive material, traces of which are transferred to them. This contamination is often limited to the surface of the metal items

Raffinates (8%)



Raffinates can be held in metal drums like these shown.
Raffinates are waste liquids produced during the reprocessing of nuclear fuel by the process of solvent extraction. The raffinates consist of nitric acid containing a mixture of radioactive fission and activation products left behind after the majority of the uranium and plutonium have been extracted.

Sludges (4%)

Sludges are a mixture of solid and liquid material that comprise waste products from reprocessing operations, and corrosion products from the storage of wastes

Concrete (3%)

Concrete is used in the construction of nuclear reactors and associated facilities for structural, shielding and containment purposes. It can become contaminated during the operational lifetime of the nuclear reactor. Contaminated regions of concrete are removed as waste during the decommissioning of nuclear facilities.

Desiccant (3%)

A desiccant is a substance, usually in the form of small beads, that is used to dry reactor coolant gases. Gases containing tritiated water vapour pass through the desiccant and it traps the water leaving contaminated desiccant behind. Tritiated water is water that contains the radioactive isotope tritium.

Plutonium contaminated materials (2%)

Any material that has been contaminated with the radioactive element plutonium.

These materials can be held in metal drums like these shown.

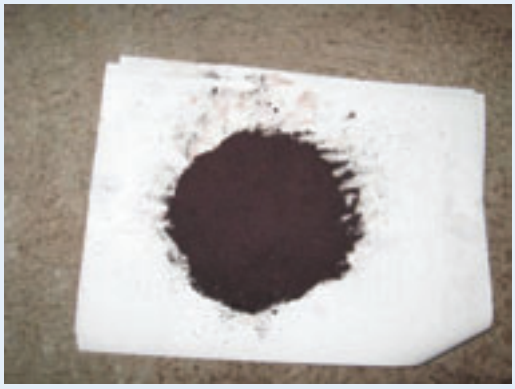
Fuel debris (2%)

Fuel debris consists of small pieces of metallic waste (magnox alloy) produced when parts of the fuel element casings are removed. There is also the possibility of small pieces of metal uranium fuel being present in the waste.

Hazardous chemicals (1%)

Hazardous chemicals, such as acids, are used in various processes associated with the operation and decommissioning of nuclear reactors and associated facilities. These hazardous chemicals become contaminated with radioactive elements during their use and need to be disposed of as radioactive waste.

Ion Exchange Resins (1%)



Ion exchange resins consist of small beads used to remove radioactivity from contaminated liquids. The radioactive ions in the liquid are absorbed onto the resin by the chemical process ion exchange. The resins retain the activity and the cleaned liquids can then be safely disposed of. When the ability of the resins to absorb more radioactive ions is exhausted they become radioactive waste.

Thorium contaminated materials (1%)

Any material that has been contaminated with the radioactive element thorium or materials that contain thorium left after the processing of thorium fuel.

Catalysts (< 0.5%)

A catalyst is a substance that is used to increase or decrease the rate of a chemical reaction. The catalysts can become contaminated during use and become radioactive waste.

Uranium contaminated materials (< 0.5%)

Any material that has been contaminated with the radioactive element uranium.

Oils and solvents (< 0.5%)

Oils and solvents that are used in various processes associated with the operation and decommissioning of nuclear reactors that have been contaminated with radioactivity.

Sealed radioactive sources (< 0.5%)

Sealed radioactive sources consist of radioactive material in a container, which is designed to seal in the radioactive material. Sealed radioactive sources are used in many industry sectors including health, education and manufacturing. In the nuclear industry they are mainly used for the calibration of instruments. Sealed radioactive sources become radioactive waste when they are no longer needed

Other (1%)

Any higher activity radioactive waste that is not included in any of the other categories described.

2.07 How much Waste is there in Scotland?

2.07.01 The following table is based on data from the 2007 National Inventory and shows the volume in cubic metres (m^3) of each higher activity radioactive waste type that is estimated to arise from each of the nuclear sites in Scotland.

2.07.02 The table shows the total stored volume of each waste type and the packaging factor that is applied to give the total packaged volume ready for disposal. The packaging factor shows the amount that the stored volume needs to be multiplied by to give the total volume after treatment and packaging. The volume change is because material might be added or removed during treatment and to include packaging that is added following treatment. This packaging factor and the packaged volume are based on current treatment methods and may change if new treatment and packaging methods are developed.

Table 1: Estimated volume of radioactive waste arising in Scotland (m^3)

(See also Figure 2)

	British Energy		Defence	DSRL	Magnox		Total Stored Volume (m^3)	Packaging Factor	Packaged Volume (m^3)
	Hunter-ston B	Torness	Vulcan and Rosyth	Dounreay	Chapel-cross	Hunter-ston A			
Graphite–LL*	1882	2191	0	194	3647	3434	11348	1.52	17261
Graphite–SL*	467	654	0	7	23	1507	2657	1.52	4042
Activated Metals	671	374	124	1205	888	332	3593	1.98	7112
Contaminated Metals	786	672	0	1385	195	16	3053	2.09	6383
Raffinates	0	0	0	2749	0	0	2749	1.38	3792
Sludges–SL*	33	16	0	0	12	202	263	2.70	710
Sludges-LL*	0	0	0	511	0	0	511	2.70	1381
Desiccant	308	130	0	0	0.4	3	442	3.19	1408
Concrete	0	00	0	451	20	0	471	2.55	1198
Fuel Debris	0	00	0	60	17	565	642	1.37	877
PCM*	0	00	0	1080	0	0	1080	0.65	705
Ion Exchange Resins	31	11	24	16	38	12	132	3.64	481
Thorium	0	0	0	121	0	0	121	2.83	342
Hazardous Chemicals	0	0	0	0	0	200	200	1.63	326
Catalysts	5	9	0	0	0	0	14	3.20	45
Filters	0	0	0	0	0	14	14	1.80	25
UCM*	0	0	0	6	0	0	6	0.57	4
Other	0	0	0	124	38	150	312	1.56	487
Total (m^3)	**4181**	**4057**	**148**	**7909**	**4879**	**6434**	**27608**	**NA***	**46577**

*Note:
LL means “long lived”
SL means “short lived”
PCM means “plutonium contaminated materials”
UCM means “uranium contaminated materials”
NA means “not applicable”

SECTION 3

LEGISLATIVE FRAMEWORK FOR RADIOACTIVE WASTE

3 LEGISLATIVE FRAMEWORK FOR RADIOACTIVE WASTE

Introduction

The management of radioactive waste in Scotland is governed by a framework of Scottish, UK, European Union (EU) and international policy, agreements, obligations and legislation. This framework does not only apply to radioactive waste for its radioactive properties, but also to any non-radioactive properties of the waste.

This section of the Supplementary Information is divided into three parts:

- the first part describes the legislative framework specific to radioactive substances and radioactive waste and the legislative framework that is not specific to radioactivity but to which the management of radioactive waste may be subject because of the non-radioactive properties of the radioactive waste;
- the second part lists the legislation, strategies, policies and guidance that affect the management of radioactive waste; and
- the third part provides a brief description of the organisations involved in the management and regulation of radioactive waste and organisations that have an interest in it.

3.01 Legislative framework

International Treaty obligations and organisations

3.01.01 There are international treaty obligations that affect radioactive waste management policy in the UK including:

- obligations from the European Union (EU);
- the OSPAR Convention; and
- the Joint Convention on the Safety of Spent Fuel Management.

UK Policy also takes account of outputs from the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP). The following paragraphs outline how these treaty obligations and international organisations influence policy in the UK.

Obligations from the European Union

3.01.02 The Euratom Treaty establishing the European Atomic Energy Community was signed in 1957 (Ref. 51) and covers activities involving radioactive substances. The European Court of Justice has ruled that the Euratom Treaty does not apply to defence activities – however, national legislation applies to those activities.

3.01.03 Under Article 37 of the Treaty, Member States have to give the European Commission sufficient information about any plans to dispose of radioactive waste (to air, land or water) to allow the Commission to decide whether the plans could cause radioactive contamination of the water, soil or airspace of another Member State. This information must be provided before the competent authority of the Member State concerned authorises the disposal of the waste.

3.01.04 Under Article 33 of the Euratom Treaty, Member States have to implement appropriate provisions to ensure compliance with the basic standards established under Article 31. In order to meet this requirement, basic standards for protection of workers and the public have been set out in various directives since 1959. The most recent is Council Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation (the Basic Safety Standards (BSS) Directive EC 1996).

3.01.05 Parts of the BSS Directive have been implemented in Scotland through the Radioactive Substances (Basic Safety Standards) (Scotland) Direction 2000 (Ref. 3). The environment agencies comply with these requirements through their role in regulating radioactive waste disposal under RSA 93. As part of their role, they have to make sure that:

- all exposures to ionising radiation of any member of the public and of the population as a whole resulting from the disposal of radioactive waste are kept as low as reasonably achievable (ALARA), economic and social factors being taken into account; and
- the sum of the doses resulting from the exposure of any member of the public to ionising radiation should not exceed an effective dose limit of 1 millisievert (mSv) in a year. In special circumstances, a higher effective dose may be authorised in a single year, provided that the average over five consecutive years does not exceed 1 mSv per year.

3.01.06 The environment agencies must have regard to the following maximum doses to individuals which may result from a defined source, for use at the planning stage in radiation protection:

- 0.3 mSv per year from any source from which radioactive discharges are made; or
- 0.5 mSv per year from the discharges from any single site.

OSPAR Convention

3.01.07 The 1992 OSPAR Convention guides international cooperation on protecting the marine environment of the North-East Atlantic. The OSPAR Radioactive Substances Strategy (Ref. 55) seeks progressive and substantial reductions of discharges, emissions and losses of radioactive substances. The Strategy applies only to discharges to the marine environment. By 2020, it aims to achieve concentrations near to natural background levels in the marine environment for naturally occurring radioactive substances and close to zero for releases of artificial radioactive substances. Natural background levels are the levels of naturally occurring radioactive substances found in the marine environment without any releases from human activities.

3.01.08 In 2002, Defra and the devolved administrations published the 'UK strategy for radioactive discharges 2001–2020' (Ref. 39), which sets out how the UK will implement the OSPAR Radioactive Substances Strategy. The UK strategy does not set individual site limits for radioactive discharges, but rather provides a strategic framework for reducing radioactive discharges from UK installations over the next 20 years. Its aims are:

- 'progressive and substantial reduction of radioactive discharges and discharge limits, to achieve the strategy targets for sectors such as nuclear fuel production and uranium enrichment, nuclear energy production, spent fuel reprocessing and defence;
- progressive reduction of human exposure to ionising radiation arising from radioactive discharges, as a consequence of reductions in discharges, such that a representative member of a critical group of the general public will be exposed to an estimated mean dose of no more than 0.02 mSv a year from liquid radioactive discharges to the marine environment made from 2020 onwards;

- progressive reduction of concentrations of radionuclides in the marine environment resulting from radioactive discharges, such that by 2020 they add close to zero to historic levels.'

3.01.09 The terms 'close to zero' and 'historic levels' are not defined in the OSPAR Strategy. The OSPAR Commission, which manages work under the Convention, is aiming to develop agreed definitions.

3.01.10 In June 2008, Defra and the devolved administrations published for consultation a revised draft UK strategy for radioactive discharges that describes how the UK will continue to implement its commitments under the OSPAR Convention (Ref. 55). The revised strategy builds on the UK strategy published in 2002 and expands its scope to include aerial, as well as liquid discharges, from decommissioning as well as operational activities, and from the non-nuclear sector (for example, hospitals, universities and research laboratories) as well as the nuclear industry.

3.01.11 The objectives of the revised draft UK strategy are:

- to implement the UK's obligations, rigorously and transparently, in respect of the OSPAR Radioactive Substances Strategy intermediate objective for 2020;
- to provide a clear statement of Government policy and a strategic framework for discharge reductions, sector by sector, to inform decision making by industry and regulators

3.01.12 The expected outcomes of the revised draft UK strategy are:

- progressive and substantial reductions in radioactive discharges
- progressive reductions in concentrations of radionuclides in the marine environment resulting from radioactive discharges, such that by 2020 they add close to zero to historic levels;
- progressive reductions in human exposures to ionising radiation resulting from radioactive discharges, as a result of planned reductions in discharges.

3.01.13 The revised draft UK strategy sets out the radiological, environmental and other principles that the regulatory bodies will apply when setting discharge authorisations. It does not set individual site limits for radioactive discharges, but it does set targets at the sectoral level which it expects to be achieved by 2020 and by 2030 and a strategic framework for addressing radioactive discharges over the next 20 years. Discharges from five nuclear sectors are considered in the strategy:

- nuclear fuel production and uranium enrichment, nuclear energy production, spent fuel reprocessing, research facilities and defence facilities. Discharges from the non-nuclear sectors are also discussed.

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

3.01.14 The UK has ratified the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Ref. 57), sponsored by the IAEA.

3.01.15 The Joint Convention applies to spent fuel and radioactive waste from civilian nuclear reactors and applications. The Joint Convention also applies to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities.

3.01.16 One of the objectives of the Joint Convention is:

- 'to ensure that during all stages of spent fuel and radioactive waste management there are effective defences against potential hazards so that individuals, society and the environment are protected from harmful effects of ionising radiation, now and in the future, in such a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations.'

3.01.17 This objective fits with our duty to contribute to sustainable development. It is also central to the aims and objectives of this guidance.

3.01.18 Also under the Joint Convention, the UK must:

- establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management;
- ensure that the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;
- take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

International Atomic Energy Agency

3.01.19 The IAEA has published advice on the legal and governmental responsibilities for the safety of nuclear facilities, the safe use of sources of ionising radiation, radiation protection, managing radioactive waste and transporting radioactive material safely. The environment agencies regard the IAEA's advice as a statement of good practice.

3.01.20 The IAEA's advice sets out the responsibilities and functions of regulatory bodies involved in nuclear, radiation, radioactive and transport safety. The IAEA has identified that:
'In fulfilling its statutory obligations, the regulatory body shall:

a) establish, promote or adopt regulations and guides upon which its regulatory actions are based;
b) review and assess submissions on safety from the operators both prior to authorisation and periodically during operation as required;
c) provide for issuing, amending, suspending or revoking authorisations, subject to any necessary conditions, that are clear and unambiguous and which shall specify (unless elsewhere specified):
    - the facilities, activities or inventories of sources covered by the authorisation;
    - the requirements for notifying the regulatory body of any modifications to safety related aspects;
    - the obligations of the operator in respect of it's facility, equipment, radiation source(s) and personnel;

- any limits on operation and use (such as dose or discharge limits on the duration of the authorisation);
- conditioning criteria for radioactive waste processing for existing or foreseen waste management facilities;
- any additional separate authorisations that the operator is required to obtain for the regulatory body;
- the requirements for incident reporting;
- the reports that operator is required to make to the regulatory body;
- the records that the operator is required to retain and the time periods for which they must be retained; and
- the emergency preparedness arrangements.

d) carry out regulatory inspections;
e) ensure that corrective actions are taken if unsafe or potentially unsafe conditions are detected; and
f) take the necessary enforcement action in the event of violations of safety requirements.'

International Commission on Radiological Protection

3.01.21 The ICRP is an independent advisory body that provides recommendations and guidance on radiation protection. ICRP has no formal power to impose its proposals, but most countries adhere closely to its recommendations. In March 2007, ICRP approved a new set of fundamental recommendations on protecting people and the environment against ionising radiation (Ref. 58). These recommendations update ICRP's previous recommendations from 1990 (Ref. 60). ICRP has stated that the overall estimate of the risk of various kinds of harmful effects after exposure to radiation remains fundamentally the same as in the 1990 recommendations.

3.01.22 In the UK, the Health Protection Agency (HPA) advises the Government on whether the recommendations of ICRP are acceptable and applicable. HPA has published advice on the recommendations in ICRP 103 (Ref. 58). HPA's main recommendations are that:

- the linear no threshold model remains the basis for setting radiological protection standards and criteria, because it represents the scientific consensus;
- no changes should be made to the dose limits in the UK;
- a maximum dose constraint of 0.15 mSv per year should apply to exposure of the public from any new source

3.01.23 The ICRP recommendations also inform possible changes to the Basic Safety Standards Directive and, consequently, the UK's legislation for implementing the Directive.

UK Legislation and Policy

Radioactive Substances Act 1993

3.01.24 The environment agencies regulate disposal of radioactive waste from premises, including nuclear licensed sites, under the Radioactive Substances Act (RSA 93). The agencies also regulate the keeping and use of radioactive materials and the accumulation of radioactive waste on sites other than nuclear licensed sites.

3.01.25 The Scottish Environment Protection Agency regulates the disposal of radioactive waste in Scotland whilst the Environment Agency carries out a similar role in England and Wales and the Northern Ireland Environment Agency carries out this role in Northern Ireland.

3.01.26 RSA 93 does not apply to the Ministry of Defence (MOD). However, in accordance with the Secretary of State for Defence's Policy Statement on Safety, Health and Environmental Protection (Ref. 40), MOD operates to standards and implements management arrangements that are, so far as reasonably practicable, at least as good as those required by the legislation. In addition, the MOD has in place, or is developing, Memoranda of Understanding with each of the environment agencies to help ensure appropriate standards of environmental protection.

Other environmental legislation

3.01.27 The environment agencies have other regulatory responsibilities relating to nuclear licensed sites and non-nuclear premises including the following:

- abstracting water (for example, for process use or during construction) may require a licence under the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (Ref. 29);
- discharging aqueous effluent (for example, from cooling or dewatering during construction) requires a consent under the Water Environment (Controlled Activities) (Scotland) Regulations 2005;

- some 'conventional' plant (for example, combustion plant used as auxiliary boilers and emergency standby power supplies, and incinerators used to dispose of combustible waste) may require a permit under the Pollution Prevention and Control Regulations (Scotland) 2000 (PPC 00) (Ref. 28);
- disposing of waste by depositing it on or into land, including excavation materials from construction, may require a permit under PPC 00 or PPC 03;
- protecting conservation sites and biodiversity under the Conservation (Natural Habitats &c.) Regulations 1994 (Ref. 34).

3.01.28 The contaminated land regimes (both radioactive and non-radioactive) make provision in relation to certain historical contamination to ensure that it is suitably dealt with.

3.01.29 In the UK, the environment agencies and the Health and Safety Executive together form the competent authorities for the Control of Major Accident Hazards Regulations 1999 (COMAH 99) (Ref. 35) On-site storage of certain substances may fall under these regulations.

Water Framework Directive and Groundwater Directive

3.01.30 The Water Framework Directive (WFD) (Ref. 92) requires the development and implementation of a strategic framework for the management of the water environment, and establishes a common approach to protecting and setting environmental objectives for groundwaters and surface waters within the European Community.

3.01.31 In Scotland, the WFD is implemented through the Water Environment and Water Services (Scotland) Act 2003 (Ref. 29)

3.01.32 The WFD sets out general provisions for the protection and conservation of groundwater. It sets objectives for groundwater quality, including an objective to meet "good chemical status" by 2015, an objective on pollution trends, and an objective to prevent or limit the input of pollutants to groundwater. The 2006 Groundwater Directive (EC 2006/118/EC) (Ref. 97) clarifies these objectives and sets out specific measures to prevent and control groundwater pollution.

3.01.33 Both the WFD and the 2006 Groundwater Directive together make up the complete new groundwater regime. The 2006 Groundwater Directive will operate alongside the 1980 Groundwater Directive (80/68/EEC) (Ref. 98) ("the 1980 Directive") until December 2013, when the latter will be repealed under Article 22(2) of the WFD. The two Groundwater Directives adopt similar approaches to preventing groundwater pollution but there will need to be adjustments to the existing controls to accommodate the changes brought about by both the WFD and the 2006 Groundwater Directive. Overall the 2006 Groundwater Directive takes a slightly more comprehensive but more risk-based approach to pollution prevention and control than the 1980 Directive.

3.01.34 The exclusion for radioactive substances that applied in the 1980 Groundwater Directive does not appear in the 2006 Groundwater Directive. It is anticipated that new regulations to transpose the 2006 Groundwater Directive into UK law will apply to radioactive substances. The new regulations are expected in 2009 and the environment agencies will need to take these into account when determining applications for authorisation of radioactive waste disposal under RSA 93 (or equivalent legislation).

Best Practicable Means

3.01.35 A review report describing Best Practicable Means (BPM) and its use in optimising control over radioactive substances was published in 2005 (Ref. 41). The report sets out the regulatory framework for assessing the application of BPM in relation to airborne, liquid and solid radioactive waste. The review considered application of BPM assessment to nuclear licensed sites (both operational and those being decommissioned) and non-nuclear premises (for example, hospitals, universities, industrial premises) for which authorisations under the RSA 93 are granted.

3.01.36 The environment agencies view BPM as a way of building more thinking about environmental protection into managing radioactive substances.

Best Practicable Environmental Option

3.01.37 The environment agencies have published guidance on how they assess Best Practical Environmental Option (BPEO) studies at nuclear licensed sites (Ref. 42).

3.01.38 The guidance was developed to provide environment agencies' staff with a framework for assessing BPEO studies submitted by site operators in relation to authorisation under RSA 93. It sets out the main principles of the BPEO process and its role in decision-making. It also addresses issues such as input from stakeholders, uncertainty and costs. BPEO studies can help find ways of disposing of waste that minimise effects on the environment.

3.01.39 The BPEO guidance is subject to review in the light of technical developments in radioactive waste management.

Health and Safety at Work etc. Act 1974 and Nuclear Installations Act 1965

3.01.40 Under the Health and Safety at Work Act 1974 (ref. 32), employers are responsible for ensuring the safety of their workers and the public. In Great Britain, the HSE has responsibilities under the Act for securing the health, safety and welfare of people at work and for protecting others against risks to health or safety in connection with the activities of people at work.

3.01.41 For nuclear installations, employers' responsibilities for health and safety are reinforced by the Nuclear Installations Act 1965 (NIA 65) as amended (Ref. 5). Under NIA 65, a site cannot have nuclear plant on it unless the user has been granted a site licence by HSE. This licensing function is administered by HSE's Nuclear Directorate, which grants a licence with conditions attached. The Nuclear Directorate has published 'Safety Assessment Principles for Nuclear Facilities' (Ref. 43) that apply to its assessment of safety cases for nuclear facilities.

3.01.42 Nuclear licensed sites are exempt from the requirements under RSA 93 for registration of keeping and use of radioactive materials and authorisation for accumulation of radioactive waste as these activities are regulated by HSE's Nuclear Directorate under NIA 65. However, nuclear licensed sites are not exempt from the requirements under RSA 93 for disposing of radioactive waste. HSE must consult the relevant environment agency about creating, accumulating or disposing of radioactive waste. The environment agencies have Memoranda of Understanding with HSE to make sure regulatory activities on nuclear licensed sites are effectively co-ordinated.

Nuclear Industries Security Regulations 2003

3.01.43 In the UK, civil nuclear operators must have site security plans dealing with the security arrangements to protect nuclear licensed sites and the nuclear material on these sites. The Nuclear Directorate's Office for Civil Nuclear Security (OCNS) within the HSE is the security regulator for the UK's civil nuclear industry. It is responsible for approving security arrangements within the industry and enforcing compliance. OCNS conducts its regulatory activities under the Nuclear Industries Security Regulations 2003 (Ref. 14).

Nuclear Safeguards Act 2000

3.01.44 Nuclear safeguards are measures to verify that states comply with their international obligations not to use nuclear materials (plutonium, uranium and thorium) for nuclear explosives purposes. The Nuclear Safeguards Act 2000 (Ref. 8) put in place the legal powers and duties needed to enable the UK to fulfil its obligations under an Additional Protocol to the Nuclear Non-Proliferation Treaty of 1968 (Ref. 61).

3.01.45 The Euratom Treaty also includes requirements to apply safeguards to civilian nuclear activities. The European Court of Justice has ruled that Euratom Directives do not apply to defence activities.

3.01.46 The UK Safeguards Office within the Nuclear Directorate of the HSE oversees the application of nuclear safeguards in the UK.

HSE advice and guidance

3.01.47 In 2001, HSE published 'Reducing Risk, Protecting People' (Ref. 49). The document sets out an overall framework for decision taking by HSE to ensure consistency and coherence across the full range of risks falling within the scope of the Health and Safety at Work Act 1974. The framework is a development of the method, which HSE applies to controlling risk at nuclear power stations, published as 'The tolerability of risks from nuclear power stations' (Ref. 44).

3.01.48 HSE has published 'Safety Assessment Principles for Nuclear Facilities' (SAPs) that apply to the assessment of safety cases for nuclear facilities. The principles apply to nuclear safety and radioactive waste management. Other conventional hazards are excluded, except where they have a direct effect on nuclear safety or radioactive waste management. The SAPs provide a framework for making consistent regulatory judgements on nuclear safety cases.

3.01.49 HSE, the Environment Agency and SEPA have published joint guidance on management of higher activity radioactive waste on nuclear licensed sites (Ref. 37). In the guidance, management of radioactive waste means the whole process of managing waste from its generation to (but not including) its disposal. Higher-activity radioactive waste means all radioactive waste other than:

- low-level radioactive waste that will be disposed of promptly at the Low Level Waste Repository near Drigg or to its successor facility; and
- very low-level radioactive waste that will be disposed of promptly at suitably authorised disposal facilities.

3.01.50 Disposal of these low activity radioactive wastes is addressed in the UK Government and devolved administrations' 'Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom' (Ref. 45). The policy statement covers all aspects of generating, managing and regulating solid LLW.

Radiological Protection Advice

3.01.51 The Health Protection Agency (HPA) has published its updated advice on radiological protection objectives for the land-based disposal of solid radioactive waste (Ref. 46). The new advice will replace that provided previously in 1992 by the National Radiological Protection Board (NRPB). The functions of the National Radiological Protection Board were incorporated into HPA in April 2005 and radiation protection as part of health protection is within the HPA's remit.

3.01.52 HPA's advice is intended for the detailed risk assessment of solid radioactive waste disposal facilities at the planning stage. Given the long half-life of some radioactive wastes, an important principle behind the advice is that people in the future should have the same level of protection as people have today. The primary focus of the proposed advice is therefore on the situation after the facility has closed rather than the operational period when it is receiving waste for disposal.

3.01.53 HPA's main role is in reducing the dangers to health from infections, chemical and radiation hazards. It provides advice, through the Department of Health, to all government departments and devolved administrations throughout the UK.

Radioactive material transport regulation

3.01.54 Radioactive waste will be transported to a disposal facility under strict controls and in accordance with national and international regulations applicable to the mode of transport used (i.e. road, rail, or sea). These "modal" regulations are based on the transport regulations issued by the IAEA. The IAEA regulations, first published in 1964, are the primary technical basis for the safe transport of radioactive material and have been subjected to periodic review and update since their introduction. This review and update process will continue, reflecting current experience and technical developments. Compliance with these regulations will provide the necessary levels of safety during transport.

3.01.55 The international and national modal regulations and the IAEA transport regulations on which they are based are designed to protect persons, property and the environment when radioactive material is transported in the public domain. All activities associated with the transport of the radioactive waste, which will include the performance characteristics and quality of manufacture of the packaging used to contain the waste, are subjected to verification and audit by the Department for Transport (DfT). DfT's audit process provides assurance that controls and processes are in place in accordance with the regulations, confirming that the necessary levels of safety during transport are achieved.

3.01.56 Some categories of very low activity waste material may be transported unpackaged provided it is shown that such material:

- meets stringent external contamination and dose rate limits which are prescribed in the modal regulations;
- will not deteriorate during transport releasing radioactive material into the environment above the prescribed stringent limits. Transport of radioactive materials within the boundaries of nuclear licensed sites is not regulated by DfT. It is regulated by HSE through a condition in the site licence.

Regulation of disposal facilities for solid radioactive waste

3.01.57 Near-surface disposal facilities for solid radioactive waste will need an authorisation from the relevant environment agency under RSA 93 (or equivalent legislation).

3.01.58 There will also be requirements for environmental regulatory processes or consents for other activities, covered in separate guidance, such as waste management, operation of combustion plant or water abstraction.

3.01.59 The relevant environment agency will ensure that the required permits are delivered without imposing unnecessary administrative burdens on a developer. This will require coordination of permitting activities across different regulatory regimes. It might involve a project-based approach overseen by a project manager with expertise in radioactive substances regulation. The project manager would provide the main point of contact for the developer and would be supported by regulators with expertise in other relevant regimes.

3.01.60 Near-surface facilities might not necessarily fall within the definition of a nuclear licensed site under NIA 65, but these facilities would need to meet the requirements under the Health and Safety at Work etc. Act 1974 and the Ionising Radiations Regulations 1999 (Ref. 10).

3.01.61 If a near-surface disposal facility was developed on an existing nuclear licensed site, it would need to meet to the requirements of the licence issued by HSE under NIA 65.

3.02 References to legislation, policy, strategy and guidance

The web links given in this section are correct as of 1 December 2009.

3.02.01 Legislation specific to Radioactive Substances

Scotland

1) The Contaminated Land (Scotland) Regulations 2000 (SSI 2000 No. 178) (http://www.oqps.gov.uk/legislation/ssi/ssi2000/ssi_20000178_en_1)
2) The Radioactive Contaminated Land (Scotland) Regulations 2007 (SI 2007 No. 179) (http://www.opsi.gov.uk/legislation/scotland/ssi2007/ssi_20070179_en_1)
3) The Radioactive Substances (Basic Safety Standards) (Scotland) Direction 2000 (http://www.opsi.gov.uk/legislation/scotland/ssi2000/20000100.htm)
4) The Radioactive Substances HASS (Scotland) Directions 2005 (http://www.scotland.gov.uk/Publications/2005/09/-18)

United Kingdom

5) The Nuclear Installations Act 1965 (http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1965/cukpga_19650057_en_1)
6) The Food and Environment Protection Act 1985 (FEPA) (http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1985/cukpga_19850048_en_1)
7) The Radioactive Substances Act 1993 (http://www.opsi.gov.uk/acts/acts1993/ukpga_19930012_en_1)
8) The Nuclear Safeguards Act 2000 (http://www.opsi.gov.uk/acts/acts2000/ukpga_20000005_en_1)

9) The Energy Act 2004 (http://www.opsi.gov.uk/acts/acts2004/ukpga_20040020_en_1)
10) The Ionising Radiations Regulations 1999 (http://www.opsi.gov.uk/si/si1999/uksi_19993232_en.pdf)
11) The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (http://www.opsi.gov.uk/si/si1999/uksi_19992892_en.pdf)
12) The Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR) (http://www.opsi.gov.uk/si/si2001/20012975.htm)
13) The Transfrontier Shipment of Radioactive Waste Regulations 2008 (http://www.opsi.gov.uk/si/si2008/uksi_20083087_en_1)
14) The Nuclear Industries Security Regulations 2003 (SI 2003 No. 403) (http://www.opsi.gov.uk/si/si2003/20030403.htm)
15) Nuclear Industries Security (amendment) Regulations 2006 (SI 2006 No. 2815) (http://www.opsi.gov.uk/si/si2006/20062815.htm)
16) The Justification of Practices Involving Ionising Radiation Regulations 2004 (http://www.opsi.gov.uk/si/si2004/20041769.htm)
17) The High-activity Sealed Radioactive Sources and Orphan Sources Regulations 2005 (http://www.opsi.gov.uk/si/si2005/20052686.htm)
18) The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (http://www.opsi.gov.uk/si/si2009/pdf/uksi_20091348_en.pdf)
19) The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (as amended) (http://www.opsi.gov.uk/si/si1997/19972367.htm)

3.02.02 Legislation that might govern the management of radioactive waste because of its non-radioactive properties

Scotland

20) The Land Reform (Scotland) Act 2003 (http://www.opsi.gov.uk/legislation/scotland/acts2003/asp_20030002_en_1)
21) The Water Environment and Water Services (Scotland) Act 2003 (http://www.opsi.gov.uk/legislation/scotland/acts2003/asp_20030003_en_1)
22) The Nature Conservation (Scotland) Act 2004 (http://www.opsi.gov.uk/legislation/scotland/acts2004/asp_20040006_en_1)
23) The Environmental Assessment (Scotland) Act 2005 (http://www.opsi.gov.uk/legislation/scotland/acts2005/asp_20050015_en_1.htm)

24) The Planning etc. (Scotland) Act 2006 (http://www.opsi.gov.uk/legislation/scotland/acts2006/asp_20060017_en_1)
25) The Climate Change Act 2008 (http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1.htm)
26) The Flood Risk Management (Scotland) Act 2009 (http://www.opsi.gov.uk/legislation/scotland/acts2009/pdf/asp_20090006_en.pdf)
27) The Marine (Scotland) Bill (as introduced) 2009 (http://www.scottish.parliament.uk/S3/bills/25-MarineScot/b25s3-introd.pdf)
28) The Pollution Prevention and Control (Scotland) Regulations 2000 (SSI 2000 No.3223) (http://www.opsi.gov.uk/legislation/scotland/ssi2000/ssi_20000323_en.pdf)
29) The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (http://www.opsi.gov.uk/legislation/scotland/ssi2005/ssi_20050348_en.pdf)
30) The Contaminated Land (Scotland) Regulations 2005 (SSI 2005 No. 658) (http://www.opsi.gov.uk/legislation/scotland/ssi2005/draft/sdsi_0110697936_en.pdf)
31) The Air Quality Standards (Scotland) Regulations 2007 (http://www.opsi.gov.uk/legislation/scotland/ssi2007/ssi_20070182_en_1)

United Kingdom

32) Health and Safety at Work, etc. Act 1974 (http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1974/cukpga_19740037_en_1)
33) The UK Climate Change Act 2008. (http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1.htm)
34) The Conservation (Natural Habitats, &c.) Regulations 1994 (SI 1994 No. 2716) (http://www.opsi.gov.uk/si/si1994/uksi_19942716_en_1.htm)
35) The Control of Major Accident Hazards Regulations 1999 (SI 1999 No. 743) (http://www.opsi.gov.uk/si/si1999/19990743.htm)

3.02.03 Policy, Strategy and Guidance specific to Radioactive Substances

Scotland

36) SEPA Guidance on Near-surface Disposal Facilities on Land for Solid Radioactive Waste (2009)(http://www.sepa.org.uk/radioactive_substances/radioactive_waste/near-surface_disposal.aspx)

United Kingdom

37) The management of radioactive waste on nuclear licensed sites (2007) Part I The Regulatory Process (http://www.sepa.org.uk/radioactive_substances/rs_publications/idoc.ashx?docid=ef329ccb-61e2-4b63-8771-4422d2e49887&version=-1)
38) UK Strategy for Radioactive Discharges 2006-2030 (http://www.decc.gov.uk/Media/viewfile.ashx?FilePath=What%20we%20do%5CUK%20energy%20supply%5CEnergy%20mix%5CNuclear%5Cradioactivity%5C1_20090722135916_e_@@_dischargesstrategy.pdf&filetype=4)
39) UK Strategy for Radioactive Discharges 2002 – 2020 (http://www.scotland.gov.uk/Resource/Doc/46746/0024243.pdf)
40) Secretary of State's Policy Statement on Health, Safety and Environmental Protection. A Policy Statement by the Secretary of State for Defence (http://www.mod.uk/NR/rdonlyres/C7C22714-98F6-4777-871D-B6F49233D99C/0/sofs_signed_policy_statement2009.pdf)
41) Review of the Application of 'Best Practicable Means' Within a Regulatory Framework for the Management of Radioactive Wastes (http://www.fwr.org/environw/ukrsr05.htm)
42) Guidance for the Environment Agencies' Assessment of Best Practicable Environmental Option Studies at Nuclear Sites (http://209.85.229.132/search?q=cache:mxNAzeBs5XwJ:www.sepa.org.uk/radioactive_substances/publications/idoc.ashx%3Fdocid%3D2e360a4b-d0b8-4abe-9e1c-51eba529bbd0%26version%3D-1+Guidance+for+the+Environmental+Agencies+Assessment+of+Best+Practicable+Environmental&cd=1&hl=en&ct=clnk&gl=uk)
43) Safety Assessment Principles for Nuclear Facilities. 2006 Edition, Version 1. HSE (http://www.hse.gov.uk/nuclear/saps/saps2006.pdf)
44) The tolerability of risk from nuclear power stations (http://www.hse.gov.uk/nuclear/tolerability.pdf)
45) Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom (http://www.scotland.gov.uk/Resource/Doc/30701/0048172.pdf)

46) Radiological Protection Objectives for the Land-based Disposal of Solid Radioactive Wastes: Advice from the Health Protection Agency (http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1234946176833)
47) Radiological Protection Objectives for the Land-Based Disposal of Solid Radioactive Wastes. (http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1234946176833)
48) HPA advice on application of ICRP's 2007 recommendations to the UK. (http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1246519364845)
49) Reducing Risks, Protecting People. HSE's decision-making process. (http://www.hse.gov.uk/risk/theory/r2p2.pdf)
50) Radiological Protection Objectives for the land-based disposal of solid radioactive wastes. Documents of the NRPB: Volume 3, No. 3 (http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1253205588833?p=1219908766891)

European Union

51) EU (1957) European Atomic Energy Community (EURATOM treaty) (http://europa.eu/legislation_summaries/institutional_affairs/treaties/treaties_euratom_en.htm)
52) Council Directive 96/29/EURATOM (Laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation) (http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/9629_en.pdf)
53) EC Directive on Nuclear Safety (http://ec.europa.eu/energy/nuclear/safety/safety_en.htm)
54) EC Directive 2008/68/EC on the inland transport of dangerous goods (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:260:0013:0059:EN:PDF)

International

55) OSPAR Commission (2003) Radioactive Substances Strategy

56) IAEA (1994) *Convention on Nuclear Safety* (http://www.iaea.org/Publications/Documents/Conventions/nukesafety.html)

57) IAEA (1997) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (http://www.iaea.org/Publications/Documents/Conventions/jointconv.html)

58) International Commission on Radiological Protection Publication 103 (ICRP 2007). (http://www.icrp.org/docs/ICRP_Publication_103-Annals_of_the_ICRP_37%282-4%29-Free_extract.pdf)

59) Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety. IAEA Safety Standard Series No. GS-R- 1 (http://www-pub.iaea.org/MTCD/publications/PDF/Pub1093_scr.pdf)

60) ICRP Publication 60: 1990 Recommendations of the International Commission on Radiological Protection. (http://www.sciencedirect.com/science?_ob=PublicationURL&_tockey=%23TOC%234965%231991%23999789998%23491003%23FLP%23&_cdi=4965&_pubType=J&_auth=y&_acct=C000047720&_version=1&_urlVersion=0&_userid=7922358&md5=7b5676a1986009a29219b5777b4f9367)

61) Protocol additional to the Agreement between the United Kingdom of Great Britain and Northern Ireland, the European Atomic Energy Community and the International Atomic Energy Agency for the application of standards in the United Kingdom of Great Britain and Northern Ireland in connection with the Treaty on the non-proliferation of nuclear weapons (www.fco.gov.uk/resources/en/pdf/pdf15/fco_cm6664_protadd**non**prolif)

62) Regulations for the Safe Transport of Radioactive Material 2005 Edition. IAEA Safety Standards Series No. TS-R-1 (http://www-pub.iaea.org/MTCD/publications/PDF/Pub1225_web.pdf)

63) UN – Recommendations on the transport of dangerous goods (UNECE) (http://www.unece.org/trans/danger/publi/unrec/rev15/15files_e.html)

64) ADR – European Agreement concerning the international carriage of dangerous goods by road (2009 Edition) (UNECE) (http://www.unece.org/trans/danger/publi/adr/adr2009/09ContentsE.html)

65) RID – Regulations Concerning the international carriage of dangerous goods by rail (2009 edition) (OTIF) (http://www.otif.org/fileadmin/user_upload/otif_verlinkte_files/05_gef_guet/06_notifi_09/A_81-03_502_2009_E.pdf)
66) International Maritime Dangerous Goods (IMDG) Code (Amendment 34-08) (IMO) (http://www.imo.org/Safety/mainframe.asp?topic_id=158#4)
67) OECD Reversibility and Retrievability in Geological Disposal of Radioactive Waste – Reflections at the International Level, NEA-3140, Paris 2001 (http://www.nea.fr/html/rwm/reports/2001/nea3140.pdf)

3.02.04 Policy, Strategy and Guidance that might govern the management of radioactive waste because of its non-radioactive properties

Scotland

68) Scotland's Biodiversity – It's In Your Hands. A strategy for the conservation and enhancement of biodiversity in Scotland (2004) (http://www.scotland.gov.uk/Resource/Doc/25954/0014583.pdf)
69) Better Health Better Care Action Plan (2007) (http://www.scotland.gov.uk/Resource/Doc/206458/0054871.pdf)
70) Adapting Our Ways: Managing Scotland's Climate Risk: Consultation to inform Scotland's Climate Change Adaptation Framework (http://www.climatic.org/documents/national%20adapatation%20strategy%20consultation.pdf)
71) Scottish Soil Framework (Consultation Proposals, 2008) and supporting Working Group Reports (http://www.scotland.gov.uk/Resource/Doc/230042/0062298.pdf)
72) SEPA (2008) River Basin Management Plans Scotland River Basin District /Solway Tweed River Basin District (http://www.sepa.org.uk/water/water_publications/river_basin_planning.aspx)
73) Scottish Executive Environment Group (2002) Scotland's Bathing Waters A Strategy for Improvement (http://www.scotland.gov.uk/Publications/2006/03/23151924/0)
74) Scottish Historic Environment Policy (SHEP) (October 2008) (http://www.historic-scotland.gov.uk/es/largertext/shep.pdf)
75) SNH Natural Heritage Futures (2002) (http://www.snh.org.uk/futures/Data/pdfdocs/overview.pdf)
76) Scotland's National Transport Strategy (2006) (http://www.scotland.gov.uk/Resource/Doc/157751/0042649.pdf)

77) Strategic Transport Projects Review (2008) (Draft Subject to SEA Consultation) (http://www.transportscotland.gov.uk/reports/road/j10194b-002.htm)
78) National Waste Plan (2003) (http://www.scotland.gov.uk/Resource/Doc/47133/0009763.pdf)
79) Consultation Paper on Potential Legislation Measures to Implement Zero Waste (2008) (http://www.scotland.gov.uk/Resource/Doc/1056/0063943.pdf)
80) Choosing Our Future – Scotland's Sustainable Development Strategy (2005) (http://www.scotland.gov.uk/Resource/Doc/47121/0020703.pdf)
81) National Planning Framework 2 (2008) (http://www.scotland.gov.uk/Resource/Doc/254599/0075380.pdf)
82) Scottish Planning Policy (Draft 2009) (http://www.scotland.gov.uk/Resource/Doc/286452/0087208.pdf)

United Kingdom

83) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Working Together for Clean Air (2000) (http://www.scotland.gov.uk/Resource/Doc/1052/0002243.pdf)

European Union

84) Council Directive 79/409/EEC on the conservation of wild birds (http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1979/L/01979L0409-20070101-en.pdf)
85) Council Directive 92/43/EEC the conservation of natural habitats and of wild fauna and flora (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:html)
86) EU Biodiversity Strategy (1998)(http://ec.europa.eu/environment/docum/pdf/com_98_42_en.pdf)
87) EU (2002) Environmental Noise Directive (2002/49/EC) (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:189:0012:0025:EN:PDF)
88) EU (2004) Environmental Liability Directive (2004/35/CE) (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:143:0056:0075:EN:PDF)
89) 1996/62/EC Directive on ambient air quality assessment and management (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0062:EN:HTML)

90) 1999/30/EC Directive relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0030:EN:HTML)
91) EU Thematic Strategy on Air Pollution (2005) (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0446:FIN:EN:PDF)
92) European Commission (2006) *Thematic Strategy for Soil Protection* (http://ec.europa.eu/environment/soil/pdf/com_2006_0231_en.pdf)
93) Water Framework Directive 2000/60/EC (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2000L0060:20090113:EN:PDF)
94) Council of Europe, European Landscape Convention 2000 (http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm)
95) EU (2006) Waste Framework Directive (2003/12/EC) – replaces 75/442/EEC) (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0009:0021:EN:PDF)
96) EU (2006) European Strategy for Sustainable Development (http://ec.europa.eu/energy/green-paper-energy/doc/2006_03_08_gp_document_en.pdf)
97) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:327:0001:0072:EN:PDF)
98) Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:372:0019:0031:EN:PDF)
99) Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances (http://www.rec.org/magyariroda/Documents/Dangerous%20Substances%20in%20Water.doc)

International

100) UN Convention on Biological Diversity (1992) (http://www.cbd.int/doc/legal/cbd-un-en.pdf)

101) Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979) (http://conventions.coe.int/Treaty/en/Treaties/Word/104.doc)

102) Convention on Wetlands of International Importance 1971 (amended 1982 and 1987) (http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-31-38^20671_4000_0__)

103) OSPAR Commission (2003) *Biodiversity and Ecosystems Strategy* (http://www.ospar.org/html_documents/ospar/html/Revised_OSPAR_Strategies_2003.pdf#nameddest=biodiversity)

104) UN (1998) Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental matters (http://www.unece.org/env/pp/documents/cep43e.pdf)

105) Kyoto Protocol (1997) (http://unfccc.int/resource/docs/convkp/kpeng.pdf)

106) OSPAR Commission (1992) *Convention for the Protection for the Marine Environment of the North East Atlantic* (http://www.ospar.org/html_documents/ospar/html/OSPAR_Convention_e_updated_text_2007.pdf)

107) UN (2001) *Stockholm Convention on Persistent Organic Pollutants (POPs)* (http://chm.pops.int/)

108) OSPAR Commission (2003) Hazardous Substances Strategy (http://www.ospar.org/html_documents/ospar/html/Revised_OSPAR_Strategies_2003.pdf#nameddest=hazardous_substances)

109) OSPAR Commission (2003) Eutrophication Strategy (http://www.ospar.org/documents/DBASE/Publications/p00189_Eutrophication%20Status%20Report%202003.pdf)

110) UN (2002) World Summit on Sustainable Development, Johannesburg (http://www.un.org/jsummit/html/basic_info/basicinfo.html)

3.03 Organisations associated with the management of higher activity radioactive waste

The following governmental and non-governmental organisations are associated with the management of higher activity radioactive waste and the purpose of this section is to give a brief overview of their functions.

Government Policy and Legislation

Scottish Government
(http://www.scotland.gov.uk/Home)

Department of Energy and Climate Change (DECC)
(http://www.decc.gov.uk/)
The Department of Energy and Climate Change (DECC) was created in October 2008, to bring together:

- energy policy (previously with the Department for Business, Innovation and Skills), and
- climate change mitigation policy (previously with the Department for Environment, Food and Rural Affairs).

Waste Producers and Waste Owners

Babcock Marine
(http://www.babcock.co.uk/opco/marine/)
Babcock Marine is a strategic UK provider of engineering and support services to the Royal Navy.

British Energy (BE)
(http://www.british-energy.com/)
British Energy Group plc is a wholly owned subsidiary of EDF S.A. that owns and runs two nuclear power stations in Scotland: Torness in East Lothian and Hunterston B in Ayrshire.

Dounreay Site Restoration Limited (DSRL)
(http://www.dounreay.com/)
Dounreay Site Restoration Limited (DSRL) is the site licence company responsible for the closure programme at Britain's former centre of fast reactor research and development at Dounreay, Caithness. It is a wholly-owned subsidiary of UKAEA and operates under contract to the Nuclear Decommissioning Authority (NDA).

Magnox North Limited
(http://www.magnoxnorthsites.com/)
Magnox North is a nuclear licensed company whose site operations include defueling and decommissioning the former generating power stations at Chapelcross in Dumfriesshire and Hunterston A in Ayrshire.

Magnox South Limited
(http://www.magnoxsouthsites.com/)
Magnox South is a nuclear licensed company whose site operations include defueling and decommissioning at nuclear sites in England.

Ministry of Defence (MoD)
(http://www.mod.uk/DefenceInternet/Home/)

Nuclear Decommissioning Authority (NDA)
(http://www.nda.gov.uk/)
The NDA was set up on 1 April 2005, under the Energy Act 2004. It is a non-departmental public body with designated responsibility for managing the liabilities at specific sites. These sites are operated under contract by site licensee companies. The NDA has a statutory requirement under the Energy Act 2004, to publish and consult on its Strategy and Annual Plans, which have to be agreed by the Secretary of State and Scottish Ministers.

United Kingdom Atomic Energy Authority (UKAEA)
(http://www.ukaea.org.uk/)

Scottish Site Liaison Groups

The purpose of the Site Stakeholder Groups (SSG) is to be the prime interface between the community, the site operator and, if appropriate, the Nuclear Decommissioning Authority (NDA). In this role SSGs exist to:

- provide an active, two-way channel of communication between the site operator, the NDA and local stakeholders;
- give an opportunity for questioning the operator, the NDA and regulators;
- allow stakeholders the opportunity to comment on and influence strategies and plans;
- represent local views and input timely advice to the NDA;
- comment on the performance of NDA and its contractor with regard to achievement of plans, value for money etc.;
- commission and receive reports about site activities and their impact on for example safety, the environment and health;

- review arrangements for such matters as emergency response;
- scrutinise and input into the prioritisation of work programmes;
- provide views and comments to the NDA on the future of the site;
- provide views on the NDA contract with and the performance of the operator;
- set up sub-groups to address specific issues relevant to the clean up programmed; and
- set up wider local consultation via public meetings and other mechanisms as required.

Chapelcross Stakeholder Group
(http://www.sitestakeholdergroups.org.uk/chapelcross/)

Dounreay Stakeholder Group (DSG)
(http://www.dounreaystakeholdergroup.org/)

Hunterston Site Stakeholder Group
(http://www.sitestakeholdergroups.org.uk/hunterston/)

Rosyth Stakeholder Group

Torness Local Liaison Committee (LLC)

Regulators

Department for Transport (DfT)
(http://www.dft.gov.uk/)
Regulation of the safety of radioactive material transport packages in Great Britain is the responsibility of the Department for Transport (DfT). The DfT exercises its statutory powers of enforcement on behalf of the Secretary of State for Transport for the transport of radioactive material by road, and for package designs for all modes of transport.

Environment Agency (EA)
(http://www.environment-agency.gov.uk/)
The environmental regulator for England and Wales. The Agency's role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water (surface water, groundwater) and land. The Environment Agency also regulates nuclear sites under the Environmental Permitting Regulations and issues consents for non-radioactive discharges.

Nuclear Installations Inspectorate (NII)
(http://www.hse.gov.uk/nuclear/)
The Health and Safety Executive (HSE) is the statutory body responsible for the enforcement of health and safety law on nuclear sites in Great Britain. HSE is the licensing authority for nuclear installations in Great Britain and, through its Nuclear Installations Inspectorate (NII), regulates the nuclear, radiological and industrial safety of nuclear installations. The NII regulates the keeping and use of radioactive material and the storage of radioactive waste on Nuclear Licensed sites under this regime.

Office for Civil Nuclear Security (OCNS)
(http://www.hse.gov.uk/nuclear/ocns/)
The Office for Civil Nuclear Security (OCNS) is a Division within HSE's Nuclear Directorate responsible for regulating security arrangements in the civil nuclear industry, including security of nuclear material in transit, exercising statutory powers on behalf of the Secretary of State for Business, Innovation and Skills (BIS).

Scottish Environment Protection Agency (SEPA)
(http://www.sepa.org.uk/)
The Scottish Environment Protection Agency (SEPA) is Scotland's environmental regulator. SEPA's main role is to protect and improve the Scottish environment by regulating activities that can cause harmful pollution. SEPA also has responsibility for carrying out monitoring of the quality of Scotland's air, land and water. The regulations SEPA implements also control the keeping and use of radioactive material and the accumulation and disposal of radioactive waste on certain premises.

Other UK sources of information

British Geological Survey (BGS)
(http://www.bgs.ac.uk/)
The British Geological Survey provides expert services and impartial advice in all areas of geoscience.

Committee on Radioactive Waste Management (CoRWM)
(http://www.corwm.org.uk/default.aspx)
CoRWM was set up in 2003 to provide independent advice to Government on the long-term management of the UK's solid higher activity radioactive waste. In October 2007, CoRWM was reconstituted with revised Terms of Reference and new membership. The Committee will provide independent scrutiny and advice to UK Government and devolved administration Ministers on the long-term radioactive waste management programme, including storage and disposal.

Environment Link
(http://www.scotlink.org/)
Scottish Environment Link is the forum for Scotland's voluntary environment organisations - over 30 member bodies representing a broad spectrum of environmental interests with the common goal of contributing to a more environmentally sustainable society.

Food Standards Agency (FSA)
(http://www.food.gov.uk/)
The independent Government department set up by the Act of Parliament in 2000 to protect the public's health and consumer interests in relation to food.

Friends of the Earth Scotland
(http://www.foe-scotland.org.uk)
Friends of the Earth Scotland is an environmental campaigning organisation.

Greenpeace
(http://www.greenpeace.org.uk/)
Greenpeace is an environmental campaigning organisation.

Health Protection Agency (HPA)
(http://www.hpa.org.uk/)
A UK-wide Non Departmental Public Body (NDPB) that advises on the health and wellbeing of the population. The Radiation Protection

Division, formerly the National Radiological Protection Board, which is part of the Centre for Radiation, Chemical and Environmental Hazards, carries out the HPA's work on ionising and non-ionising radiations.

Historic Scotland
(http://www.historic-scotland.gov.uk/)
Historic Scotland is an executive agency of the Scottish Government that is charged with safeguarding the nation's historic environment and promoting its understanding and enjoyment on behalf of Scottish Ministers.

Scottish Councils Committee On Radioactive Substances (SCCORS)

Scottish Natural Heritage (SNH)
(http://www.snh.org.uk/)
Scottish Natural Heritage (SNH) is a Government body responsible to Scottish Government Ministers and through them to the Scottish Parliament. The role of SNH is to look after the natural heritage, help people to enjoy and value it, and encourage people to use it sustainably.

Nuclear Free Local Authorities Scotland (NFLA)
(http://nfznsc.gn.apc.org/)
Nuclear Free Local Authorities is the local government voice on nuclear issues and tackle in practical ways, and within their powers, the problems posed by civil and military nuclear hazards.

International

European Union (EU)
(http://europa.eu/)
The European Union is an economic and political union of 27 member states that was established by the Treaty of Maastricht on 1 November 1993.

International Atomic Energy Agency (IAEA)
(http://www.iaea.org/)
The IAEA is an independent international organisation related to the United Nations that was set up in 1957 as the world's "Atoms for Peace" organisation. The Agency works with its Member States and multiple partners worldwide to promote safe, secure and peaceful nuclear technologies. The IAEA has provided advice on the safety of nuclear facilities, including for managing waste and transporting material. The IAEA also sets out responsibilities for regulatory bodies, including providing further guidance, the conditions within which authorisations should be made, undertaking inspections and enforcement action. Transportation is strictly controlled by a number of regulations including IAEA's regulations, which are defined to protect people and the environment through controlling packaging, processes, and safety measures.

International Commission on Radiological Protection (ICRP)
(http://www.icrp.org/)
The ICRP is an independent non-governmental organisation that was formed in 1928 to advance for public benefit the science of radiological protection. The ICRP provides recommendations and guidance on protection against the risks associated with ionising radiation, from artificial sources widely used in medicine, general industry and nuclear enterprises, and from naturally occurring sources. In preparing its recommendations, ICRP considers the fundamental principles and quantitative bases upon which appropriate radiation protection measures can be established, while leaving to the various national protection bodies the responsibility of formulating the specific advice, codes of practice, or regulations that are best suited to the needs of their individual countries.

Organisation for Economic Co-operation and Development (OECD) (http://www.oecd.org/home)
The OECD brings together the governments of countries committed to democracy and the market economy from around the world to:

- Support sustainable economic growth
- Boost employment
- Raise living standards
- Maintain financial stability
- Assist other countries' economic development
- Contribute to growth in world trade
- The Organisation provides a setting where governments compare policy experiences, seek answers to common problems, identify good practice and coordinate domestic and international policies.

OECD Nuclear Energy Agency (OECD NEA) (http://www.nea.fr/)
The Nuclear Energy Agency (NEA) is a specialised agency within the Organisation for Economic Co-operation and Development (OECD), an intergovernmental organisation of industrialised countries. The mission of the NEA is to assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for the safe, environmentally friendly and economical use of nuclear energy for peaceful purposes. To achieve this, the NEA works as: a forum for sharing information and experience and promoting international co-operation; a centre of excellence which helps Member countries to pool and maintain their technical expertise; a vehicle for facilitating policy analyses and developing consensus based on its technical work.

OECD Forum on Stakeholder Confidence (http://www.nea.fr/html/rwm/fsc.html)
The Forum on Stakeholder Confidence (FSC) is a working group of the OECD NEA that facilitates the sharing of experience in addressing the societal dimension of radioactive waste management and explores means of ensuring an effective dialogue with the public with a view to strengthening confidence in the decision-making processes.

World Association of Nuclear Operators (WANO) (http://www.wano.org.uk/)
The World Association of Nuclear Operators (WANO) is an organisation created to improve safety at every nuclear power plant in the world.

SECTION 4

GLOSSARY

4 GLOSSARY

Accessible environment
Those parts of the environment in contact with or readily available for use by humans.

Active institutional control
Control of a disposal site for solid radioactive waste by an authority or institution authorised under RSA 93, involving monitoring, surveillance and remedial work as necessary, as well as control of land use.

Activity
The number of atoms of a radioactive substance which decay (radioactive decay) by nuclear disintegration each second. The unit of activity is the Becquerel (Bq).

Advanced Gas-cooled Reactor (AGR)
The reactor type used in the UK's second generation nuclear power plants.

ALARA (as low as reasonably achievable)
The ALARA principle is contained in the Euratom Basic Safety Standards Directive 96/29, which is transposed into UK law. Essentially, it means that all reasonable steps should be taken to protect people. In making this judgement, factors such as the costs involved in taking protection measures are weighed against benefits obtained, including the reduction in risks to people.

Alpha radiation
Alpha radiation takes the form of particles (helium nuclei) ejected from a decaying (radioactive) atom. Alpha particles cause ionisation in biological tissue which may lead to damage. The particles have a very short range in air (typically a few cm) and alpha particles present in materials that are outside of the body are prevented from causing biological damage by the superficial dead skin cells, but become significant if inhaled or swallowed.

Annual dose constraint
A restriction on annual dose of 0.3 millisieverts (mSv) to an individual from a single source of radiation exposure, applied at the design and planning stage of any activity to ensure that when aggregated with doses from all sources, excluding natural background and medical procedures, the dose limit (1mSv per annum) is not exceeded. The UK dose constraint derives from international advice.

Assay methods
Methods used to estimate the total radionuclide content of a waste type. This includes external measurements of dose rate at the surface of the waste and sampling of the waste itself.

Assessed radiological risk
See Radiological risk.

Authorised discharge limit
A limit on the discharge of one or more specified radionuclides to air or water in accordance with an authorisation under RSA 93.

Backfill
The materials used to fill in and close off the void areas or an underground repository, such as vaults, silos, and drift tunnels, which usually occurs after the radioactive waste has been emplaced; thus “backfilling the waste”.

Baseline inventory
An estimate of the higher activity radioactive waste and other materials that could be regarded as wastes.

Becquerel (Bq)
The standard international unit of radioactivity equal to one radioactive decay per second. Becquerels are abbreviated to Bq. Multiples of Becquerel’s commonly used to define radioactive waste activity are: kilobecquerels (kBq) equal to 1 thousand Bq; megabecquerels (MBq) equal to 1 million Bq; gigabecquerels (GBq) equal to 1 thousand million Bq; terabecquerels (TBq) equal to 1 million million Bq.

Biosphere
That part of the environment normally inhabited by living organisms. In practice, the biosphere is generally taken to include the atmosphere and the Earth's surface, including the soil and surface water bodies, seas and oceans and their sediments. There is no generally accepted definition of the depth below the surface at which soil or sediment ceases to be part of the biosphere, but this might typically be taken to be the depth affected by basic human actions, in particular farming.

Borehole
A cylindrical excavation, made by a drilling device. Boreholes are drilled during site investigation and testing and can also be used for waste emplacement in repositories and monitoring.

Borehole disposal
The concept of disposing of some forms of radioactive waste in extremely deep boreholes, a number of kilometres down in the Earth's crust.

Best Practicable Environmental Option (BPEO)
In the context of authorisations under Radioactive Substances Act 1993 (RSA93), for nuclear sites, the options' assessment method currently used is Best Practicable Environmental Option (BPEO). BPEO was described by the Royal Commission on Environmental Pollution, Twelfth Report (Cm 210) 1988 as "…. the outcome of a systematic and consultative decision-making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long-term as well as in the short term". A BPEO study is usually carried out by or on behalf of the waste producer and assessed by the relevant environment agency as a basis for its regulatory decision-making.

Best Practicable Means (BPM)
BPM is a term used by the Environment Agency (EA) and Scottish Environment Protection Agency (SEPA) in authorisations issued under the Radioactive Substances Act. Essentially, it requires operators to take all reasonably practicable measures in the design and operational management of their facilities to minimise discharges and disposals of radioactive waste, so as to achieve a high standard of protection for the public and the environment. BPM is applied to such aspects as minimising waste creation, abating discharges, and monitoring plant, discharges and the environment. It takes account of such factors as the availability and cost of relevant measures, operator safety and the benefits of reduced discharges and disposals. If the operator is using BPM, radiation risks to the public and the environment will be ALARA.

Beta radiation
Beta radiation takes the form of particles (electrons) emitted from the nucleus of a decaying (radioactive) atom. Beta particles cause ionisations in biological tissue which may lead to damage. Most beta particles can pass through the skin and penetrate the body, but a few millimetres of low density materials, such as aluminium, will generally stop them.

Beta/gamma radiation
Beta radiation is usually accompanied by the emission of gamma rays, hence the term “beta/gamma radiation”.

Chapelcross
Site of a Magnox power station (four reactors) in Dumfriesshire that opened in 1959. It was the first nuclear power station in Scotland. Operations ceased in June 2004.

Clean-up
The decontamination and decommissioning of a nuclear licensed site.

Closure
Technical and administrative actions to put a Disposal facility in its intended final state after the completion of waste Emplacement.

Cm2919
The Command White Paper “Review of Radioactive Waste Policy – Final Conclusions” (1995); although to an extent overtaken by events, this remains an important statement of the UK Government’s position on radioactive waste.

Collective radiological impact
An indicator of the total radiological consequences from a particular source of exposure on a defined population over some period of time.

Concentrate and contain
A term normally used to describe a form of management for radioactive waste where radioactivity is concentrated and contained to prevent its migration into the environment and facilitate its management.

Conceptual model
A set of qualitative assumptions used to describe a system, or part of a system, in the real world.

Conditioned waste
Radioactive waste that has been treated or processed by converting it to a solid stable form in preparation for long-term storage or disposal.

Conservative (of assumptions and data)
Selection of cautious assumptions, or worst case data values, for the purposes of modelling.

Consignment
Any load of radioactive material, packaged or unpackaged, that is presented for transport.

Consignor (of waste)
An organisation or person that sends waste to a facility for disposal.

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.

Criticality
The point at which a nuclear chain reaction occurs as a result of the concentration of certain types of radioactive materials.

Decay chains
These generally refer to the three naturally occurring series of radionuclides, all of which start with a single parent nuclide (uranium-238, uranium-235 and thorium-232) each of which decays via a number of radioactive daughters of different half lives and activity type (i.e. alpha or beta/gamma radiation), eventually ending with stable nuclides of lead.

Decay storage
The process of allowing material containing short-lived radionuclides to decay (see half life) so that the final waste is less radioactive and easier to dispose of as radioactive waste, or until the point where the waste becomes exempt from specific regulatory requirements. Used extensively in hospitals and research establishments, and to some extent by the nuclear industry.

Decision point
A point defined in a voluntary agreement where a developer would seek regulatory agreement before proceeding with an activity. This would generally be before decisions by the developer to invest substantial amounts of time and resources.

Decommissioning
The process whereby a nuclear facility, at the end of its economic life, is taken permanently out of service. The term “site clean-up” is sometimes used to describe the work undertaken to make the site available for other purposes.

Decommissioning wastes
These wastes are produced during the dismantling of nuclear facilities, and make up the bulk of the higher activity waste that will be produced in Scotland. The majority of these wastes are made up of graphite, metals and concrete, from reactors and will need to be managed when the reactors are dismantled.

Decontamination
Removal or reduction of radioactive contamination.

Delicensing
The process of removal from regulatory control by the Health and Safety Executive, of a nuclear site, which has been licensed under the Nuclear Installations Act 1965.

Depleted uranium
Uranium containing a lesser mass percentage of uranium-235 than in natural uranium.

Deterministic assumption
Fixed assumption, taken to have a probability of 1, made for the purpose of exploring, developing, or establishing the environmental safety case.

Developer (of a disposal facility)
The organisation responsible for developing a disposal facility before waste disposal begins.

Devolved administrations
Collective term for the Scottish Government, Welsh Assembly Government and the Department of Environment Northern Ireland.

Dilute and disperse
A term normally describing a form of management for radioactive waste where radioactivity is released from a facility as a gas or liquid and is diluted in the air or marine environment.

Disposability
The degree to which packaged conditioned waste meets the standards for final disposal.

Disposal
In the context of solid waste, disposal is the emplacement of waste in a suitable facility without intent to retrieve it at a later date; retrieval may be possible but if retrievability is intended, the appropriate term is storage.

Disposal facility (for solid radioactive waste)
An engineered facility for the disposal of solid radioactive wastes.

Disposal system
All the aspects of managing the waste, the disposal facility and its surroundings that affect the radiological impact.

Dose
A general term used as a measure of the dose absorbed by man from radiation, measured in sieverts, and its sub-multiples (millisieverts – mSv - equal to one thousandth of a sievert, or microsieverts, equal to one millionth of a sievert). Radiation dose is received from many sources – of the average annual dose of 2.6 mSv, 85 per cent comes from natural background radiation, 14 per cent from medical sources and the remaining one per cent from miscellaneous man-made sources.

Dose guidance level (for human intrusion)
In the context of near-surface disposal facilities, the dose standard against which the radiological consequences of human intrusion are assessed. It indicates the standard of environmental safety expected but does not suggest that there is an absolute requirement for this level to be met.

Dounreay
Located in Caithness on the north coast of Scotland, the site was established on a former naval base as the centre for UK fast reactor research. It is now engaged on a major decommissioning and site restoration programme to deal with the legacy of past operations.

Drigg
Site of the National Low Level Waste repository in Cumbria.

Emplacement (of waste in a disposal facility)
The placement of a waste package in a designated location for disposal, with no intent to reposition or retrieve it subsequently.

Encapsulation
Immobilisation of waste by mixing it with a matrix material within a container in order to produce a more solid and stable waste form.

Energy Act 2004
An Act of Parliament which, inter alia, established the NDA and set out its duties and responsibilities for the decommissioning and clean-up of the UK's public civil nuclear sites.

Environment Act 1995
An Act of Parliament which established the Scottish Environment Protection Agency (SEPA) in Scotland and the Environment Agency (EA) in England and Wales.

Environmental Impact Assessment (EIA)
A legal requirement under EU Directive 85/337/EEC (as amended) for certain types of project, including various categories of radioactive waste management project. It requires information on the environmental impacts of a project proposal to be submitted by the developer and evaluated by the relevant competent authority (the planning authority, HSE or other regulators concerned).

Environmental safety
The safety of people and the environment both at the time of Disposal and in the future.

Environmental safety case
The collection of arguments, provided by the developer or operator of a disposal facility, that seeks to demonstrate that the required standard of Environmental safety is achieved.

Environmental safety culture
The characteristics and attitudes of organisations and individuals that ensure that the protection of people and the environment receives proper attention.

Environmental safety functions
The various ways in which components of the disposal system may contribute towards environmental safety, e.g. the host rock may provide a physical barrier function and may also have chemical properties that help to retard the migration of radionuclides.

Environmental safety strategy
An approach or course of action designed to achieve and demonstrate environmental safety.

Euratom Treaty
The legislative basis for the activities of European Union countries in the nuclear energy field.

European Commission (EC)
The executive body of the European Union. Its primary roles are to propose and implement legislation, and to act as guardian of the treaties which provide the legal basis for the European Union.

European Union (EU)
The European Union of countries of which the United Kingdom is a member. The EU issues its own legislation which the UK, as a member state, is obliged to follow.

Exemption Order (EO)
The Radioactive Substances Act 1993 (RSA93) makes provision for certain low activity materials and wastes, when used for certain purposes and when managed in particular ways, to be exempt from particular regulatory provisions made under the Act.

Exempt waste
Radioactive wastes are considered exempt from regulatory control if they fall outside the scope of RSA 93 or there is an extant exemption order.

Exposed group
For a given source, any group of people within which the exposure to radiation is reasonably homogeneous; where the exposure is not certain to occur, the term 'potentially exposed group' is used.

Fission
Fission is the splitting of a nucleus into two or more pieces which can produce further chain reactions.

Fit for purpose
A term applied to waste disposal facilities which are engineered to a degree that is commensurate with the types of wastes they will receive.

Fuel/Nuclear Fuel
Material containing fissile nuclides which, in a reactor, produces the neutrons necessary to sustain a neutron chain reaction.

Fusion
A nuclear reaction in which atomic nuclei of low atomic number fuse to form a heavier nucleus with the release of energy

Gamma radiation
An electromagnetic radiation similar in some respects to visible light, but with higher energy. Gamma rays cause ionisations in biological tissue which may lead to damage. Gamma rays are very penetrating and are attenuated only by shields of dense metal or concrete, perhaps some metres thick, depending on their energy. Their emission from a radionuclide during radioactive decay is usually accompanied by particle emission (beta or alpha particles**)**.

Geological disposal
A long term management option involving the emplacement of radioactive waste in an engineered underground geological disposal facility or repository, where the geology (rock structure) provides a barrier against the escape of radioactivity and there is no intention to retrieve the waste once the facility is closed.

Groundwater pathway
When water flows underground, it finds a route through the rock via cracks and fissures to flow to its destination. This is termed the groundwater pathway; drinking water is frequently obtained by drilling into underground reservoirs on the groundwater pathway. This is one route through which radioactivity from a geological depository could be brought back to the surface.

Grouting
A means of encapsulating radioactive waste by mixing it with, for example, cementatious material.

Guidance on Requirements for Authorisation (GRA)
A 2009 document issued by the EA, SEPA and DOE Northern Ireland entitled “Near –surface Disposal Facilities on Land for Solid Radioactive Wastes”.

Half-life
The time required for one half of the atoms of a given amount of a particular radionuclide to disintegrate through radioactive decay. Each radionuclide has a unique half-life, and half lives vary from fractions of a second through to many thousands of years.

Hazard
A property or situation that in certain circumstances could lead to harm.

Heat generating waste
Waste that generates heat above a particular level as it decays, a specific attribute of High Level Radioactive Waste. The heat generated decreases with time.

High Level Waste (HLW)
Radioactive wastes in which the temperature may rise significantly as a result of their radioactivity, so this factor has to be taken into account in the design of storage or disposal facilities.

Higher activity radioactive waste – definition for Scottish Government higher activity waste policy
It includes the following categories of radioactive waste: high level waste, intermediate level waste, a small fraction of low level waste with a concentration of specific radionuclides.

Highly enriched uranium
Uranium in which the proportion of the isotope uranium-235 has been increased above a concentration of 20%.

Hold point
A point defined in an appropriate regulatory document, beyond which an activity must not proceed without regulatory approval. A hold point would generally be before a decision by the developer to invest substantial amounts of time and resources.

Human intrusion
Any human action that accesses the waste or that damages a barrier providing an environmental safety function after the period of authorisation.

Hunterston A
A Magnox power station in Ayrshire which opened in 1964 and ceased operation in 1989.

Immobilisation
Conversion of waste into a less mobile or non-mobile form by, for example, grouting or encapsulation.

Incineration
A waste treatment process of burning combustible waste which reduces its volume and produces residues which contain the original radioactivity although at a higher concentration.

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 solid radioactive waste in all waste categories (i.e. LLW, ILW, HLW).

Intergenerational equity
An ethical concept which means the consideration by the present generation who have created (and benefited from use of) radioactive materials, of the role of future generations in the management of long lived radioactive waste.

Intermediate level waste (ILW)
Radioactive wastes exceeding the upper activity boundaries for LLW but which do not need heat to be taken into account in the design of storage or disposal facilities.

Inventory limits
Limits and conditions set by the regulators on volumes, radionuclides and/or activity concentrations for waste disposal.

Ionisation
When radiation (alpha, beta, and gamma activity) interacts with matter, it can cause atoms and molecules to become unstable (creating ions). This process is called ionisation. Ionisation within biological tissue from radiation is the first stage in radiation leading to possible change or damage within the tissue.

Ionising radiation
Radiation that produces ionisation in matter, for example alpha particles, beta particles, gamma rays, x-rays and neutrons. When radiations such as these pass through the tissues of the body, they have sufficient energy to damage DNA.

Ionising Radiations Regulations 1999 (IRR99)
The main legal requirements, enforced by the HSE, concerning the control of exposure to radiation arising from the use of radioactive materials and radiation generators in work activities.

Landfill
The disposal of waste by shallow burial. 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.

Legacy waste
Radioactive waste which already exists or which will arise from current (as at 2009) planned nuclear site operations.

Liabilities
The costs involved in decommissioning; the processing, long term management, storage and final disposal of waste materials and spent fuel; and the environmental remediation of nuclear sites.

Low Level Waste Repository (LLWR)
The Low Level Waste Repository near the village of Drigg in West Cumbria has operated as a disposal site since 1959.

London Dumping Convention
The London Convention of 1972 is an international treaty that limits the wastes that can be disposed of at sea.

Long lived waste
Radioactive waste that contains radionuclides that have a half-life or more than 30 years.

Low Level Waste (LLW)
LLW is defined as “radioactive waste having a radioactive content not exceeding 4 gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity”.

Luminising
The process of using a radionuclide with a material that emits light when irradiated, for example, radium was used in old watches and instrument dials so their numbers could be seen as a green glow in the dark.

Magnox
The magnesium alloy used as a cladding material in Magnox fuel.

Magnox reactor
A term for the first generation of British power reactors (at Berkeley, Bradwell, Calder Hall, Chapelcross, Dungeness A, Hinkley Point A, Hunterston A, Oldbury, Sizewell A, Trawsfynydd and Wylfa) from the use of “Magnox” as the cladding material

Managing Radioactive Waste Safely (MRWS)
A phrase covering the whole process of public consultation, work by CoRWM,
and subsequent actions by Government, to identify and implement the option, or combination of options, for the long term management of the UK’s higher activity radioactive waste.

Maritime and Coastguard Agency (MCA)
Body with responsibility for developing, promoting and enforcing high standards of marine safety within British territorial waters and ports.

Millisievert (mSv)
See dose

Mixed Oxide Fuel (MOX)
Nuclear fuel consisting of uranium oxide and plutonium oxide for use in nuclear reactors.

Model
A representation or description of a system (or part of a system) in the real world, designed to show or explore how the system would behave under specified conditions.

Moderator
A substance used in a nuclear reactor to slow down fast neutrons

Monitoring
Taking measurements to demonstrate compliance with regulatory requirements and to provide reassurance to the public. This may include measuring levels of radioactivity in samples taken from the environment, and also measuring geological, physical and chemical parameters that are relevant to Environmental safety and that might change as a result of construction and operation of any facility for radioactive waste treatment, storage or disposal.

MOX (Mixed Oxide Fuel)
Fuel made up of around 95% uranium and 5% plutonium.

Multi barrier concept
Two or more natural or engineered barriers used to isolate radioactive waste in, and prevent radionuclide migration from a repository.

Multiple-function environmental safety approach
An approach to Environmental safety which relies on multiple Environmental safety functions.

NDPB (Non-Departmental Public Body)
A non-departmental public body (NDPB) is a national or regional public body, working independently of ministers to whom they are nevertheless accountable.

Near-surface disposal facilities
Facilities located at the surface of the ground or at depths down to several tens of metres below the surface. Near-surface facilities may use the geology (rock structure) to provide an environmental safety function, but some may rely solely on engineered barriers.

Neutrons
Elementary particles of about the same mass as a proton but without an electric charge, present in all atomic nuclei except those of ordinary hydrogen

New build
New build of a nuclear power station.

Non-Governmental Organisations (NGOs)
In its broadest sense, a non-governmental organisation is one that is not directly part of the structure of Government.

Non-nuclear industry waste
Non-nuclear industry waste is a general term for the radioactive waste produced by those industries and organisations that use radioactive materials but are not involved in the production or nuclear energy or nuclear weapons. These industries are typically in the medical, educational, industries and oil and gas sectors. The nature of non-nuclear industry radioactive waste and the radionuclides contained in it vary widely because of the wide-ranging use of radioactive substances in the non-nuclear industry.

Non-nuclear premises
Premises registered by one of the environment agencies to keep and use radioactive materials or authorised to accumulate or dispose of radioactive waste under the Radioactive Substances Act 1993. Non-nuclear premises include hospitals, universities and some industrial premises. Non-nuclear premises are not licensed by the Nuclear Installations Inspectorate (part of HSE).

Nuclear energy
Energy obtained by nuclear fission or fusion.

Nuclear fission
See fission

Nuclear fuel cycle
All nuclear fuel related operations associated with the production of nuclear energy, including: the mining and milling of ores, enrichment, manufacture or fuel, operation of nuclear reactors, spent fuel reprocessing, and all related radioactive waste management activities.

Nuclear fusion
See fusion

Nuclear Installations Act 1965 (NIA65)
UK legislation which provides for the operation and regulation of nuclear installations within the UK.

Nuclear licensed site
Any site which is the subject of a licence granted by the Nuclear Installations Inspectorate (part of HSE) under the Nuclear Installations Act 1965. Nuclear licensed sites include nuclear power stations, nuclear fuel production and reprocessing sites, sites undertaking storage of and/or research into nuclear materials, and major plant producing radioisotopes.

Nuclear Safeguards
Measures to verify that States comply with their international obligations not to use nuclear materials (plutonium, uranium and thorium) for nuclear explosives purposes. Global recognition of the need for such verification is reflected in the requirements of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) for the application of safeguards by the International Atomic Energy Agency (IAEA). Also, the Treaty Establishing the European Atomic Energy Community (the Euratom Treaty) includes requirements for the application of safeguards by the European Commission.

Nuclear safety case
Documentation provided by a nuclear site licensee to demonstrate that the site meets the nuclear safety requirements of the Nuclear Installations Inspectorate (part of HSE).

Nuclear security
Protection of nuclear licensed sites and the nuclear material on them. This includes, for example, physical protection, the roles of security guards and the UK's Civil Nuclear Constabulary, protection of sensitive data and technologies, and the trustworthiness of the individuals with access to them.

Nuclear technology
Technology that involves the reactions of the nuclei of atoms. It forms the basis for nuclear power plants and supporting research and operations.

Nuclear waste
A general term for the radioactive waste produced by those industries involved with nuclear energy and nuclear weapons' production.

Nuclide
An atom specified by its atomic number and atomic mass.

Operational Environmental Safety Case
The compilation of documents prepared for consideration by the EA, demonstrating that the public are sufficiently protected whilst the LLWR near Drigg is under institutional control, from hazards which may arise as a result of the disposal of radioactive wastes on the site, in accordance with an authorisation under RSA93.

Operational wastes
These radioactive wastes are produced during the research or power production activities that take place on the nuclear sites. Examples of operational waste include laboratory consumables or fuel debris, which is produced during the management of spent fuel and comprises parts of the fuel casings.

Operator (of a disposal facility)
The organisation responsible for operating a disposal facility after waste emplacement has begun. This operator will need to hold an authorisation under RSA 93.

Optimisation
Optimisation is the process of ensuring that all radiation exposures of the public are as low as reasonably achievable (see ALARA). Optimisation is achieved by employing best practicable means (BPM). Optimisation, justification and limitation are the three key principles of radiation protection recommended by the International Commission on Radiological Protection in 1990 and which form the basis of European Community and UK legislation.

Options assessment
See Best Practicable Environmental Option

OSPAR (Oslo – Paris convention)
Convention which established requirements on the level of nuclear and non-nuclear discharges to the marine environment of the North East Atlantic, the North Sea and the Irish Sea.

Overpacking
A secondary outer container for one or more waste packages, used for handling, transport, storage and/or disposal.

Packaged radioactive waste
The loading of waste into a container for long term storage and/or disposal. In most cases this included conditioning of the waste and is in accordance with the requirements for handling, transport, storage and /or disposal.

Partitioning
The separating out, by physical and chemical methods, or radioactive elements contained in a waste stream to permit their further treatment.

Passive safety
The need to provide and maintain a safety function by minimising the need for active safety systems, monitoring or prompt human intervention. Requires radioactive wastes to be immobilised and packaged in a form that is physically and chemically stable. The package should be stored in a manner that is resistant to degradation and hazards, and which minimises the need for control and safety systems, maintenance, monitoring and human intervention.

Period of authorisation
The period of time while disposals are taking place and any period afterwards while the site is under active institutional control.

Planning authorities
A general term for those regional planning bodies and local authorities throughout the UK who are responsible for the preparation of planning strategies and for determining applications for construction and operation of waste treatment and disposal facilities that may be sited in their area of responsibility.

Plutonium
A radioactive element occurring in very small quantities in nature in uranium ores but mainly produced artificially, e.g. in nuclear reactors. Plutonium can be separated from spent nuclear fuel by reprocessing. Plutonium can be used in nuclear fuel, in nuclear weapons and as a power source for space probes.

POCO (Post Operational Clean Out)
The first stage in preparing nuclear plant for care and maintenance after operations have ceased.

Post-Closure Safety Case
The compilation of documents prepared for consideration by the environment agencies, demonstrating that the public will be sufficiently protected after the period of institutional control, from hazards which may arise as a result of the disposal of radioactive waste at the LLWR near Drigg, in accordance with an authorisation under RSA93.

Potential exposure (to ionising radiation)
Exposure to ionising radiation that is not certain to occur.

Potentially exposed group
See Exposed group.

Pressurised Water Reactor (PWR)
Reactor type using ordinary water under high pressure as coolant and neutron
moderator. PWRs are widely used throughout the world for electricity generation. The Sizewell B reactor in Suffolk is of this design.

Probability distribution (of dose)
A distribution of exposures to ionising radiation that expresses the probability that a given exposure or range of exposures will occur.

Prospective dose
An assessed dose of the future radiological impact of proposed discharges of
radioactive waste into the environment.

Proximity principle
The Proximity Principle is a key element of EU environmental and municipal waste management policy. It was introduced in Article 5 of the Waste Framework Directive (75/442/EEC as amended by Directive 91/156/EEC) in 197, and is incorporated into UK waste strategy documents (see ref 11 in the Policy Statement). It means to enable waste to be disposed of in one of the nearest appropriate installations.

Radiation stability
The ability of a material to withstand radiation damage.

Radioactive decay
The process by which radioactive material loses activity, e.g. alpha activity naturally. The rate at which atoms disintegrate is measured in Becquerels.

Radioactive half-life
See half-life.

Radioactive material
Material designated in national law as being subject to regulatory control because of its radioactive properties.

Radioactive Substances Act 1993 (RSA 93)
UK legislation which governs the keeping and use of radioactive material and the accumulation and disposal of radioactive waste. The Radioactive Substances Act is regulated by the environment agencies, i.e. SEPA in Scotland, the EA in England and Wales and the NIEA in Northern Ireland.

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.

Radioactively contaminated land
Land that is contaminated with radioactivity from past practices or work activities, or from the after-effects of radiological incidents, and which may give rise to harm to people. Intervention should be considered for land which is contaminated to the extent that a dose of 3mSv/year may be received by any individual.

Radioactivity
Atoms undergoing spontaneous random disintegration, usually accompanied by the emission of radiation.

Radioisotope
Different radioactive forms of the same element, for example caesium-134 and caesium-137 are both radioisotopes of the element caesium.

Radiological capacity of a disposal facility
An inventory of radioactive material that a facility is capable of accepting based on the environmental safety case.

Radiological risk
The probability per unit time that an individual will suffer a serious radiation-induced health effect as a result of the presence of a radiation source, for example, a disposal facility. In this context, a serious radiation-induced health effect includes three components: (a) fatal cancer adjusted for loss of life expectancy; (b) non-fatal cancer adjusted for life impairment; and (c) severe heritable effects. Radiological risk can only be assessed and not measured.

Radionuclide
A term which refers to a radioactive form of an element, for example, carbon-14 and caesium-137.

Reactor core
That part of the reactor which contains the fuel elements

Reactor pressure vessel
A reactor vessel designed to withstand a substantial operating pressure

Regulators
Those bodies responsible for the regulation of the nuclear industry and non-nuclear industry.

Regulatory Impact Assessment (RIA)
The RIA is a requirement of Government. It is a tool designed for delivering better regulation, and the RIA process is aimed at helping Government departments deliver successful policy. It is an analysis of the likely impacts of a policy change and the range of options for implementing it. It considers: any form of regulation (for example, formal legislation, codes of practice or information campaigns); the full range of potential impacts (economic, social and environmental); and where the impact may fall (business, the public sector, the voluntary sector or other groups). RIA should be carried out for all policy changes, whether European or domestic, which could affect the public or private sectors, charities, the voluntary sector or small businesses.

Repository
A permanent disposal facility for radioactive wastes.

Reprocessing
A physical or chemical separation operation to extract uranium or plutonium for re-use from spent nuclear fuel.

Retrievability
A characteristic of the design of the waste package and/or the disposal facility that facilitates recovery of waste after emplacement.

Reversibility
denotes the possibility of reversing one or a series of steps in repository planning or development at any stage of the programme. This implies the review and, if necessary, re-evaluation of earlier decisions, as well as the means (technical, financial, etc.) to reverse a step. Reversibility denotes the fact that fallback positions are incorporated in the disposal policy and in the actual technical programme. Reversibility may be facilitated, for example, by adopting small steps and frequent reviews in the programme, as well as by incorporating engineering measures. In the early stages of a programme, reversal of a decision regarding site selection or the adoption of a particular design option may be considered. At later stages, during construction and operation, or following emplacement of the waste, reversal may involve the modification of one or more components of the facility, or even the retrieval of waste packages from parts of the facility.
(see Ref 62 above)

Risk
The chance that someone or something that is valued will be adversely affected by a hazard, where a hazard is the potential for harm that might arise, for example, from ionising radiation.

Risk assessment
An assessment of radiological risk.

Risk guidance level
A level of radiological risk from a disposal facility which provides a numerical standard for assessing the environmental safety of the facility after the period of authorisation.

Risk informed
The concept that risk calculations from proposed waste management practices should be part of the process for securing safety and determining best options for managing the waste.

Risk target
A level of radiological risk from a single disposal facility which provides a numerical standard for assessing the long term performance of the facility.

Safety case
A 'safety case' is the written documentation demonstrating that risks associated with a site, a plant, part of a plant or a plant modification are as low a reasonably practicable and that the relevant standards have been met. Safety cases for licensable activities at nuclear sites are required as license conditions under the NIA65.

Scenario
A postulated or assumed set of conditions and/or events.

Sealed source
A source whose structure is such as to prevent, under normal conditions of use, any dispersion of the radioactive substances into the environment.

Seismic survey
A technique for determining the detailed structure of the rocks underlying a particular area by passing acoustic shock waves into the rock strata and detecting and measuring the reflected signals.

Sellafield
NDA owned nuclear licensed site in Cumbria comprising nuclear fuel storage, reprocessing and manufacturing facilities.

Separated plutonium
Plutonium that has been separated from spent nuclear fuel by reprocessing.

Short-lived nuclides
Radioactive nuclides with a half-life of less than 30 years. Thus, radioactive waste described as short-lived would reduce in activity by a factor of 1000 within 300 years.

Short-lived waste
Radioactive waste that contains radionuclides that have half lives of 30 years or less, for which there is negligible heat output and the alpha emitting radionuclides are present at concentrations below 400 Bq/g and it is free of beta emitting radionuclides of half lives above 30 years.

Sievert
The S.I. unit of radiation dose; one millisievert (mSv) is a thousandth of a sievert and one microsievert (μSv) is one millionth of a sievert.

Site
For a disposal facility, the piece of land where the facility is, or is intended to be, located. More generally, the piece of land where one or a number of sources of radioactivity are, or are intended to be, located.

Site characterisation
Surface and sub-surface investigations to determine the suitability of a site for a disposal facility for solid radioactive waste and to gather information about the site to support an environmental safety case.

Site constraint
The site-related dose constraint applies to the aggregate exposure resulting from discharges from a number of sources with contiguous boundaries at a single location. It includes the radiological impact of current discharges from the entire site, but excludes the impact of direct radiation and historical discharges. The site constraint of 0.5 mSv/year applies irrespective of whether different sources on the site are owned and operated by the same or by different organisations.

Special precautions burial
See controlled burial

Specific activity
Of a radionuclide, the activity per unit mass of that nuclide; of a material, the activity per unit mass or volume of the material in which the radionuclides are essentially uniformly distributed.

Spent fuel (Spent nuclear fuel)
Used fuel assemblies removed from a nuclear power plant reactor.

Staged authorisation
A regulatory process in which a developer of a disposal facility for solid radioactive waste must not proceed beyond predefined hold points without approval of the relevant environment agency.

Stakeholders
In the context of this document, people or organisations, having a particular knowledge of, interest in, or be affected by, radioactive waste, examples being the waste producers and owners, waste regulators, non-Governmental organisations and local communities and authorities.

Step-wise process
A process in which the regulator would agree with the developer a number of decision points (or steps) during development of a disposal facility for solid radioactive waste, beyond which an activity may not proceed without agreement from the regulator.

Storage
The emplacement of waste in a suitable facility with the intent to retrieve it at a later date.

Strategic Environmental Assessment (SEA)
SEA refers to the type of environmental assessment legally required by the Environmental Assessment (Scotland) Act 2005 in the preparation of certain plans, programmes and strategies. The authority responsible for the plan, programme or strategy must prepare an environmental report on its likely significant effects, consult the public on the report and the plan or programme proposals, take the findings into account, and provide information on the plan or programme as finally adopted.

Structural integrity
The ability of an engineered structure to function safely and reliability throughout its life.

Substitutions
The contractual arrangements by which wastes resulting from reprocessing carried out in the UK for overseas customers can be retained and other wastes – equivalent in radiological terms – can be returned. If implemented, substitution would mean that the UK would retain some overseas-owned ILW and LLW and return an additional amount of HLW together with the overseas-owned HLW due, in any case, to be returned.

Sustainable development
A principle underpinning planning. It is the idea of ensuring a better quality of life for everyone, now and for future generations. A widely used definition was drawn up by the World Commission on Environment and Development in 1987: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

Thermal stability
The ability of a material to withstand damage caused by heat or changes in temperature.

Thorium
A naturally occurring, weakly radioactive element and an alternative to uranium as a nuclear fuel.

Transmutation
The conversion of one element into another. Transmutation is under study as a means of converting longer-lived radionuclides into shorter-lived or more manageable radionuclides.

Tritium
A radioactive isotope of hydrogen with a mass about three times that of ordinary hydrogen

UK Radioactive Waste Inventory
A compilation of data on UK radioactive waste holdings, produced about every three years. The latest version, for a holding date of 1 April 2007, was published in June 2008. It was produced by Defra and the NDA. It is the latest public record of information on the sources, quantities and properties of Low Level Waste (LLW), Intermediate Level Waste (ILW) and High Level Waste (HLW) in the UK. It comprises of a number of reports and additional detailed information on the quantities and properties of radioactive wastes in the UK that existed at 1 April 2007 and those that were projected to arise after that date.

Unconditioned waste
Radioactive waste in its initially generated state, prior to its preparation and packaging for longer term storage and/or disposal in a solid and stable form.

Uranium
A radioactive element commercially extracted from uranium ores. By nuclear fission (the nucleus splitting into two or more nuclei and releasing energy) it is used as a fuel in nuclear reactors to generate heat.

Very Low Level Waste (VLLW)
Covers wastes 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 as it has arisen by various means, such as disposal with domestic refuse directly at landfill sites or indirectly after incineration.

Vitrification
Process of incorporating materials into molten glass. Vitrification is a technology applied to the solidification of liquid high level waste from the reprocessing of spent fuel.

Waste acceptance criteria
Quantitative and/or qualitative criteria, specified by the operator of a disposal facility and approved by the regulator for radioactive waste to be accepted for disposal.

Waste characterisation
Determination of the physical, chemical and radiological properties of waste.

Waste consignment
Any waste sent by a consignor to a disposal facility.

Waste form
Waste in its physical and chemical form after treatment. The waste form is a component of the waste package.

Waste hierarchy
A hierarchical approach to minimise the amounts of waste requiring disposal. The hierarchy consists of non-creation where practicable; minimisation of arisings where the creation of waste is unavoidable; recycling and reuse; and, only then, disposal.

Waste manager
Any organisation that currently has responsibility for the safe and environmentally responsible disposition of specific radioactive wastes in accordance with regulatory requirements, and the funding thereof. The organisation may or may not equate to the waste producer, who generated the waste in the first instance, as the responsibilities listed above may have passed to another organisation in the interim.

Waste package
The Waste form and any container(s) and internal barriers (e.g. absorbing materials and liner), prepared in accordance with requirements for handling, transport, storage and disposal.

Waste producer
The organisation that produced radioactive waste in the first instance. The waste producer may or may not equate to the current waste manager, as responsibility for the waste may have been passed to another organisation in the interim.

Waste stream
This is a convenient way of grouping types of wastes together which have similar physical, chemical or radionuclide properties. This process is comparable to how domestic waste can be divided into separate groups, such as paper to be recycled or garden waste to be composted. For radioactive materials this gives us a range of broad groupings which then allows for a collective method of treatment, packaging and disposal appropriate to a waste stream's specific properties. The decommissioning of a large nuclear reactor would be likely to result in the creation of a number of waste streams, e.g. graphite from the core, activated steel.

SECTION 5

ABBREVIATIONS

Abbreviations

ALARA	As Low As Reasonably Achievable
AQMA	Air Quality Management Areas
BIS	Department for Business, Innovation and Skills
BPEO	Best Practicable Environmental Option
BPM	Best Practicable Means
BSS	Basic Safety Standards Directive (Council Directive 96/29/Euratom)
COMAH	Control of Major Accident Hazards Regulations 1999
CoRWM	Committee on Radioactive Waste Management
COVRA	Central Organisation for Radioactive Waste
DfT	Department for Transport
DNA	Deoxy Ribonucleic Acid
DOENI	Department of the Environment for Northern Ireland
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
ER	Environmental Report
EqIA	Equality Impact Assessment
EU	European Union
GRA	Guidance on Requirements for Authorisation
HAW	Higher Activity radioactive Waste
HAW	Higher Activity Waste
HLW	High Level radioactive Waste
HPA	Health Protection Agency
HS	Historic Scotland
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection

ILW	Intermediate Level radioactive Waste
JNCC	Joint Nature Conservation Committee
LAW	Lower Activity Waste
LLW	Low Level radioactive Waste
LLWR	Low Level Waste Repository
MCA	Maritime and Coastguard Agency
MOD	Ministry of Defence
mSv	milli Sievert
NDA	Nuclear Decommissioning Authority
NEA	Nuclear Energy Agency
Near Surface GRA	Near-surface Disposal Facilities on Land for Solid Radioactive Wastes Guidance on Requirements for Authorisation
NETCEN	National Environmental Technology Centre
NEWMDB	Net Enabled Waste Management Database
NIA65	Nuclear Installations Act 1965
NII	Nuclear Installations Inspectorate
NRPB	National Radiological Protection Board
OCNS	Office for Civil Nuclear Security
OECD	Organisation for Economic Cooperation and Development
ORR	Office of the Rail Regulator
PPC	Pollution Prevention and Control Regulations
PPS	Plans, programmes and strategies
RBMP	River Basin Management Plan
RSA93	Radioactive Substances Act 1993
SAC	Special Area of Conservation
SAPs	Safety Assessment Principles for Nuclear Facilities
SBAP	Scottish Biodiversity Action Plan
SPA	Special Protection Area

SCCORS	Scottish Councils Committee on Radioactive Substances
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SHEP	Scottish Historic Environment Policy
SNH	Scottish Natural Heritage
SNP	Scottish National Party
SSSI	Site of Special Scientific Interest
VLLW	Very Low Level radioactive Waste
UKCIP09	UK Climate Impacts Programme 2009
WFD	Water Framework Directive

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