

Radioactive Waste Policy Group (RWPG)

**Rolling summary of the current components of the
radioactive waste management policy in the UK**

Version: September 2007

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General principles

1. Introduction

The principles mentioned in this section, which underpin the UK radioactive waste management policy, mirror those used internationally.

The International Atomic Energy Agency's (IAEA's) Safety Standard "Establishing a National System for Radioactive Waste Management" establishes the basic requirements of a radioactive waste management system.

2. Policy Aims

Within the UK, responsibilities for radioactive waste management are allocated in the following way:

The Government maintains and continues to develop a policy and regulatory framework which ensures that:

- Radioactive wastes are not unnecessarily created
- Such wastes as are created are safely and appropriately managed and treated
- They are then safely disposed of at appropriate times and in appropriate ways.

In this context, Government is taken to include both UK Government and the devolved administrations (radioactive waste management policy being a devolved function).

Policy also has the aims of safeguarding the interests of existing and future generations and the wider environment, and in a manner that commands public confidence and takes due account of issues.

The regulators, including the environment agencies, have the duty to ensure that the policy and regulatory framework is properly implemented in accordance with their statutory powers;

Within the framework, the producers and owners of radioactive waste are responsible for developing their own waste management strategies, consulting the Government, regulatory bodies and disposal organisations as appropriate.

They are also responsible for bearing the costs of managing and disposing of the waste, including the costs of regulation and those of related research undertaken both by themselves and by the regulatory bodies.

3. UK Radioactive Waste Categories

In the UK, radioactive waste is classified under the following broad categories, according to its heat-generating capacity and activity content:

High level wastes (HLW)

High level wastes are wastes in which 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. Further information on HLW management can be found in the 'specific policies' section.

Intermediate level wastes (ILW)

Intermediate level wastes are wastes with radioactivity levels exceeding the upper boundaries for low-level wastes, but which do not require heating to be taken into account in the design of storage or disposal facilities. Further information on ILW management can be found in the 'specific policies' section.

Low level wastes (LLW)

Low level wastes are wastes containing radioactive material, other than those acceptable for disposal with ordinary refuse, but not exceeding 4 gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity. (1 GBq = 1000 million becquerels; Bq = 1 disintegration per second. Becquerel is the unit of radioactivity). Further information on LLW management can be found in the 'specific policies' section.

Very low level wastes (VLLW)

Very Low Level Radioactive Waste (VLLW), sub-category of LLW is defined as:

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 0.1m³ of waste containing less than 400 kilobecquerels (kBq) of total activity or single items containing less than 40 kBq of total activity.

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

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

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

OR

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”.

The principal difference between the two definitions is the need for controls on the total volumes of VLLW in the second (high volume) category being deposited at any one particular landfill site.

Categorisation of spent fuel, plutonium and uranium

Historically, spent fuel, plutonium and uranium have generally not been considered to be radioactive wastes. Until now, UK Policy has been that it is up to the owners of these materials to classify them as wastes or not.

With the creation of the Committee on Radioactive Waste Management (CoRWM) (see RWPG National Framework), the formation of the Nuclear Decommissioning Authority and changes in the nuclear industry, however, it is recognised that some of these items may in the future be categorised as radioactive wastes.

CoRWM has consulted widely on whether some or all of these materials may be classified as wastes in the future, and what impact that would have on the long-term management plans for them. CoRWM has concluded that such materials could be disposed of with higher activity wastes via geological disposal.

4. Radiation Protection Principles: Justification, Optimisation, Limitation

Background

The most important principle of radiation protection is to keep all doses as low as possible while still allowing the beneficial use of ionising radiation.

The body that advises on standards of protection of man against ionising radiation is the International Commission on Radiological Protection (ICRP).

Provision of advice to the Government on the applicability of ICRP recommendations in the UK is a statutory responsibility of the Health Protection Agency.

The system of radiation protection recommended in 1990 by the ICRP in Publication 60 is based on three major principles. These principles are known as justification, optimisation, and dose limitation:

Justification of a practice - the benefit should outweigh the associated risk. i.e. no practice shall be adopted unless it produces a net benefit. In terms of radiation protection, decisions concerning the adoption of new practices or the continuation of existing practices must take into consideration the risks of radiation effects as a result of that practice.

Optimisation of protection - all exposures should be as low as reasonably achievable. Individual doses, the number of people exposed and the likelihood and magnitude of potential exposures should all be kept As Low As Reasonably Achievable, economic and social factors being taken into account. This is known as the ALARA principle.

Dose limitation - the limitation of dose and risk to individuals. i.e. exposure of individuals should be subject to dose and risk limits. The annual public dose limit is 1 mSv* and the annual occupational dose limit for effective dose is 20 mSv.

(Note: mSv = milliSievert = 1×10^{-3} Sieverts. Sievert is the unit of measuring radioactive dose).

Application of these principles in the UK

ICRP recommendations form the basis of European Community (EC) and UK legislation.

Within the European Community, the recommendations of the ICRP are implemented through a Euratom Directive, which is binding on Member States, generally referred to as the Basic Safety Standards (BSS) Directive. This Directive lays down basic safety standards for the protection of the health

of workers and the general public against the dangers arising from ionising radiation.

The 1990 ICRP recommendations have been taken forward in the European context by Council Directive, 96/29/EURATOM, which was adopted by the Council of the European Union on 13 May 1996.

The Directive has been implemented in the UK by a number of different pieces of legislation managing the impact of radiation on the environment, at work, in relation to medical exposures, and in emergency situations.

The implementing legislation includes the Ionising Radiations Regulations 1999 (SI 1999/3232), the Ionising Radiations (Medical Exposures) Regulations 2000 (SI 2000/1059) and the Radioactive Substances Act 1993.

- ICRP recommendations - http://www.icrp.org/educational_area.asp
- Council Directive 96/29/EURATOM (on Europa website) - http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/9629_en.pdf
- Ionising Radiations Regulations 1999 - <http://www.opsi.gov.uk/si/si1999/19993232.htm>
- Ionising Radiations (Medical Exposures) Regulations 2000 - <http://www.opsi.gov.uk/si/si2000/20001059.htm>
- Radioactive Substances Act 1993
http://www.opsi.gov.uk/ACTS/acts1993/Ukpga_19930012_en_1.htm

The justification principle

In early 2004, Defra, the Scottish Executive (SE), the Welsh Assembly Government and the Department of the Environment for Northern Ireland undertook a UK-wide consultation to seek views on draft Regulations: "The Justification of Practices Involving Ionising Radiation Regulations 2004".

The Justification of Practices Involving Radiation Regulations 2004 (SI 2004/1769) came into force on 2 August 2004. The Regulations provide the framework in which future justification decisions in the UK will be taken and they will implement the BSS Directive requirements for justification.

They set out, amongst other things, what applications need to be made, who takes justification decisions and how the Regulations will be enforced.

Guidance accompanies the Regulations and provides applicants and other interested parties with information on their application.

- The Justification of Practices Involving Ionising Radiation Regulations 2004 (SI 2004/1769) - <http://www.opsi.gov.uk/si/si2004/20041769.htm>
- Guidance on the Justification Regulations 2004 - <http://www.defra.gov.uk/environment/radioactivity/government/legislation/justification.htm>

See also:

- International Commission on Radiological Protection (ICRP) - see RWPG International guidelines and regulations.

5. Best Practicable Environmental Option (BPEO) Principle

Background

The BPEO concept was introduced in 1976 by the Royal Commission on Environmental Pollution.

Definition

The BPEO principle has been defined by the Royal Commission on Environmental Pollution in its 12th report (RCEP, 1998) 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."

Uses of BPEO

The Environment Agency (EA) in England and Wales and the Scottish Environment Protection Agency (SEPA) in Scotland and the Environment and Heritage Service (EHS) in Northern Ireland are the independent public bodies responsible for regulating the disposal of radioactive wastes in the UK in order to ensure protection of people and the environment.

Operators at nuclear sites must hold authorisations granted by the appropriate Agency in order to make disposals of solid, liquid or gaseous radioactive waste.

The EA and SEPA may require nuclear operators to review waste management strategies to demonstrate that they represent the BPEO. (There are no nuclear sites in Northern Ireland).

Operators are required to give proper consideration to the identification and evaluation of alternatives, in order to ensure that the BPEO has been chosen.

Current situation

The EA and SEPA have compiled guidance for the application of the BPEO principle. The guidance is primarily intended to support the Agencies' assessment of BPEO studies relating to the authorisation of radioactive waste disposal at nuclear sites.

- Guidance for the environment agencies' assessment of BPEO at nuclear sites (on Environment Agency website) - http://www.environment-agency.gov.uk/business/444304/945835/1064129/?version=1&lang=_e

6. Best Practicable Means (BPM) Principle

Background

The concept of BPM, as applied to pollution control, was originally introduced into legislation for the control of emissions into the atmosphere of gases released from chemical processes. It has subsequently been applied to the management of radioactive wastes and discharges.

Definition

The BPM principle has most recently been defined by a statement of the UK Government and the devolved administrations' policy on the decommissioning of nuclear facilities "The Decommissioning of the UK Nuclear Industry's Facilities".

- The Decommissioning of the UK Nuclear Industry's Facilities (on Scottish Executive website) - <http://www.scotland.gov.uk/library5/environment/nucleardecommissioning.pdf>

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 as low as reasonably achievable (ALARA).

Current situation

The Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) has recently published a research report on the application of BPM. The research report can be found on the SNIFFER website:

- Review of the Application of "Best Practicable Means" Within a Regulatory Framework for the Management of Radioactive Wastes (go to Search and enter "UKRSR05" under "SNIFFER CODE") - <http://www.sniffer.org.uk/>

The Environment Agency has published guidance for the application of the BPM principle for non nuclear radioactive waste:

- Guidance on use of Best Practicable Means for non-nuclear radioactive waste - see point 14 (on Environment Agency website) - http://www.environment-agency.gov.uk/commondata/acrobat/rasag_4_generic_920000.pdf

The Environment Agency and the Scottish Environment Protection Agency intend to review the position of nuclear sites after a period of consideration and review of comments received on the SNIFFER research report.

7. Liquid and Gaseous Waste Discharges

Background

The Radioactive Substances Act 1993 (RSA93) provides the framework for regulating the disposal of radioactive waste so as to protect the public and the environment. (Disposal includes the discharge of liquid and gaseous waste).

Regulatory authority under RSA93 lies with the Environment Agency (EA) in England and Wales, the Scottish Environment Protection Agency (SEPA) in Scotland and the Chief Radiochemical Inspector within the Environment and Heritage Service, Northern Ireland. Radioactive waste disposals, including discharges, are made as part of normal operations from premises such as hospitals, research establishments, universities and general industry as well as from the nuclear industry.

Waste disposals, including liquid and gaseous discharges, are strictly controlled by the regulatory authorities by means of authorisations issued under RSA 93, which specify limits and conditions on the nature and quantities of radioactive waste disposed of. Site operators are required to ensure that the authorised discharge limits and conditions are met.

All authorisations for disposal of radioactive waste are periodically reviewed to ensure that they remain fit for purpose. The limits and conditions are revised when there is a need.

UK strategy for radioactive discharges

The Government is committed to progressive and substantial reductions in radioactive discharges.

In relation to policy on the control of radioactive discharges, the UK Strategy for Radioactive Discharges 2001-2020, published on 23 July 2002, describes how the UK will implement agreements reached at meetings of the OSPAR Commission, concerned with prevention of pollution to the marine environment. The UK Strategy for Radioactive Discharges is currently being reviewed, with intention of publishing an update version before the end of 2008.

- The UK Strategy for radioactive discharges 2001-2020 - <http://www.defra.gov.uk/environment/radioactivity/government/discharges/index.htm>

Statutory guidance to EA and SEPA

The Discharge Strategy will take effect in conjunction with statutory guidance the Government will issue to the EA and to SEPA.

A draft EA statutory guidance has been issued to other government departments for comments before being sent out for public consultation which will be followed with the finalised guidance.

The Scottish Executive is preparing statutory guidance to SEPA and consulted in October 2005 on proposed Statutory Guidance from the Scottish Ministers to the Scottish Environment Protection Agency on the UK Strategy for Radioactive Discharges. The consultation closed in January 2006. See:

- Consultation on statutory guidance to SEPA on radioactive discharges (on Scottish Executive website) - <http://www.scotland.gov.uk/Publications/2005/10/18103157/31578>

Guidance on authorisation of discharges of radioactive waste to the environment

The EA has drafted interim guidance to its inspectors on setting limits and their inclusion within authorisations.

The content reflects the methodology already adopted in recent casework, e.g. for the Sellafield site authorisations. The guidance will be finalised and published once the Government's statutory guidance to EA is published.

Principles for the assessment of prospective public doses: interim guidance

In December 2002, the environment agencies in collaboration with the National Radiological Protection Board (now the Radiation Protection Division of the Health Protection Agency) and the Food Standards Agency prepared a guidance document to define a set of principles and provide guidance on the assessment of public doses for the purpose of authorising discharges of radioactive waste to the environment.

This document will be finalised once statutory guidance to the Environment Agencies on regulation of radioactive discharges is published by Government.

- Principles for the assessment of prospective public doses: interim guidance (on SEPA website) - http://www.sepa.org.uk/pdf/radioactivity/prospective_public_dose.pdf

International guidelines and regulations

8. Introduction

The Government's radioactive waste management policy is framed within the context of international guidelines and regulations.

A number of different organisations are involved, each with a distinct role:

- European Union legislation and the Euratom Treaty
- International Commission on Radiological Protection (ICRP)
- International Atomic Energy Agency (IAEA)
- Nuclear Energy Agency (NEA)

9. European Union legislation and the Euratom Treaty

Within the European Union (EU), the European Commission (EC) has competence for radiation protection and radioactive waste management.

The legal basis for the activities of the EC in this field, and for Community legislation relating to radiation protection is the Euratom Treaty, which was signed in 1957 and established the European Atomic Energy Community.

There are a number of different kinds of EU legislative instruments.

Council Directives (or framework laws) have the aim of establishing uniformity across the Community by the setting of common objectives.

Directives are binding on Member States as regards these objectives, but leave Member States the freedom to decide how best to introduce the required measures into their legal systems.

Regulations on the other hand are directly applicable in law in all Member States.

Other legislative instruments include Recommendations, Decisions, Resolutions and Opinions.

Council Decisions relate to specific individual cases and may be addressed to Member States, firms or individuals. They have direct effect in law.

The other instruments, though not binding on Member States, nonetheless play a role in defining EU policy and practice.

Euratom Treaty

- Euratom Treaty - http://ec.europa.eu/energy/nuclear/legislation/euratom_en.htm

UK activities involving radioactive substances are governed by legislation set down under the Euratom Treaty. The UK became a signatory of the Treaty on its accession to the European Union in 1972.

Chapter 3 of the Treaty, covering Health and Safety provisions, is of particular significance to radioactive waste management in the UK.

The Euratom Treaty itself only contains one specific reference to radioactive waste management; this is in Article 37.

Article 37 states that each member state shall provide the Commission with general data relating to any plan for the disposal of radioactive waste to determine the effect of the plan on water, soil or airspace of another member state.

Article 35 requires the UK to undertake measurement of radioactivity in the general environment (air, water and soil) and gives the Commission the right of access to verify these arrangements.

Article 36 requires appropriate authorities to periodically communicate to the Commission information on the checks referred to in Article 35.

- Radioactivity and European legislation - <http://www.defra.gov.uk/environment/radioactivity/government/international/index.htm>
- Community legislation in force - overview http://ec.europa.eu/energy/nuclear/legislation/community_en.htm
- Council Directive 96/29/Euratom (on Europa website)
Council Directive of 13 May 1996 laying down basic safety standards for the health protection of the general public and workers against the dangers of ionizing radiation. http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/9629_en.pdf
- Council Directive 92/3/Euratom (on Europa website)
Council Directive of 3 February 1992 on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community (to be repealed 25/12/2008 and replaced by Council Directive 2006/117/Euratom). http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/923_en.pdf
- Council Directive 2003/122/Euratom (on Europa website)
Council Directive of 22 December 2003 on the control of high-activity sealed radioactive sources and orphan sources - http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_346/l_34620031231en00570064.pdf
- Treaty establishing the European atomic energy community - http://europa.eu/scadplus/treaties/euratom_en.htm
- European Commission: nuclear issues - http://ec.europa.eu/energy/nuclear/index_en.html

See also:

- Control of radioactive sources (HASS Regulations 2005) - see RWPG Specific Policies
- Import and export of radioactive wastes - see RWPG Specific Policies

10. International Commission on Radiological Protection (ICRP)

Background

The International Commission on Radiological Protection (ICRP) is an independent Registered Charity in the UK and currently has its Scientific Secretariat in Sweden.

- International Commission on Radiological Protection website - <http://www.icrp.org/>

The ICRP was established in 1928 to advance for the public benefit the science of radiological protection, in particular by providing recommendations and guidance on all aspects of protection against ionising radiation. ICRP is generally regarded as the authoritative international body that advises on standards of protection against ionising radiation.

The activities of ICRP are financed mainly by voluntary contributions from national and international bodies with an interest in radiological protection. Some additional funds accrue from royalties on ICRP publications.

Although not mandatory, the recommendations of the ICRP are very influential and form the basis of regulation of the risks from radiation in most countries of the world.

Provision of advice on the applicability of ICRP recommendations to the UK is a statutory responsibility of the Radiation Protection Division of the Health Protection Agency (HPA) - formerly the National Radiological Protection Board (NRPB).

ICRP Publication 60

The Commission's most recent recommendations for a system of radiological protection are contained in Publication 60, published in 1991. These take account of research into the risks posed by exposure to radiation and also extend the conceptual framework of radiation protection.

The position taken in ICRP 60 regarding protection of the environment is that "the standard of environmental control needed to protect man to the degree currently thought desirable will assure that other species are not put at risk."

In the light of growing recognition that the protection of the environment merits radiological assessment in its own right, the ICRP set up a task group to examine the issue.

In June 2003 ICRP published "A Framework for Assessing the Impact of Ionising Radiation on Non-Human Species" (ICRP Publication 91, ISBN 0-08-044310-9).

- Summary of the current basic Recommendations of ICRP (Publication 60) (on ICRP website) - http://www.icrp.org/educational_area.asp

ICRP Review of the 1990 Recommendations

Work on the next set of fundamental ICRP recommendations, intended to replace the 1990 Recommendations in ICRP Publication 60, has been in progress for several years.

The ICRP has consulted widely on its draft revised recommendations. Publication of the new recommendations is expected in autumn 2007.

ICRP also consulted on the "foundation documents" underpinning the recommendations. Comments on the "foundation documents" have been taken into account in the review and revision of the draft recommendations.

Links

- History, policy, procedures of the ICRP - <http://www.icrp.org/prod03.asp>
- Constitution of ICRP - <http://www.icrp.org/prod03.asp>
- ICRP publications - <http://www.icrp.org/products.asp>

See also:

- Radiation protection principles: justification, optimisation, limitation – see RWPG General Principles

11. International Atomic Energy Agency (IAEA)

Background

The International Atomic Energy Agency (IAEA) is an agency set up by the United Nations in 1957 as the world's "Atoms for Peace" organisation and is the international centre of cooperation in the nuclear field.

- [International Atomic Energy Agency](http://www.iaea.org/) - <http://www.iaea.org/>

The Agency has 137 Member States and works with its Member States and multiple partners worldwide to promote safe, secure and peaceful nuclear technologies.

The UK joined the IAEA as a member state in 1957 and the Department for Business, Enterprise and Regulatory Reform (BERR) is the UK Government Department which sponsors IAEA.

IAEA and Radioactive Waste Management

IAEA promotes the safe use of radioactive substances through a series of Safety Standard documents (<http://www-ns.iaea.org/standards/> setting down best practice in the following fields:

- Nuclear energy production
- Radioactive waste management

- Radioactive materials transport safety
- Radiation protection.

The obligations of the Contracting Parties with respect to the safety of spent fuel and radioactive waste management are based to a large extent on the principles contained in the IAEA Safety Fundamentals document "The Principles of Radioactive Waste Management", published in 1995.

IAEA committees

Four IAEA sponsored committees oversee separate work areas:

- Nuclear Safety Standards Committee (NUSSC)
- Waste Safety Standards Committee (WASSC)
- Transport Safety Standards Committee (TRANSSC)
- Radiation Safety Standards Committee (RASSC).

These in turn report to the Commission on Safety Standards (CSS).

Radioactive Substances Division of Defra provides the UK representative on WASSC:

- Waste Safety Standards Committee (WASSC) - <http://www-ns.iaea.org/committees/default.asp>

IAEA and the Joint Convention

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the first legal instrument to directly address these issues on a global scale, was opened for signature on 29 September 1997.

On 12 March 2001 the UK ratified the Joint Convention. The Convention requires contracting parties to submit national reports and to attend periodic review meetings.

The Joint Convention applies to spent fuel and radioactive waste resulting from civilian nuclear reactors and applications and to spent fuel and radioactive waste from military or defense programmes, if and when such materials are transferred permanently to and managed within exclusively civilian programmes, or when declared as spent fuel or radioactive waste for the purpose of the Convention by the Contracting Party.

The Convention also applies to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities.

The UK's first national report, demonstrating its compliance with the Convention, was provided to the IAEA in May 2003. An updated UK national report was submitted to the IAEA in October 2005 for discussion at the Review Meeting in May 2006. The next review meeting will be in May 2009.

Copies of both reports, questions/answers from contracting parties, and the UK's presentation to the 2006 meeting are available

- National report on compliance with the obligations of the joint convention - <http://www.defra.gov.uk/environment/radioactivity/government/international/iaea.htm>
- Joint Convention - background and publications - <http://www-ns.iaea.org/conventions/waste-jointconvention.htm>
- UK's first national report in May 2003 and the updated UK national report May 2006- <http://defraweb/environment/radioactivity/government/international/iaea.htm>

12. Nuclear Energy Agency (NEA)

Background

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, based in Paris, France.

- Nuclear Energy Agency website - <http://www.nea.fr/>

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.

The NEA works closely with the International Atomic Energy Agency (IAEA) in Vienna - a specialised agency of the United Nations - and with the European Commission in Brussels.

NEA and Radioactive Waste Management

NEA's goal with regards to radioactive waste management is to assist Member Countries in the area of management of radioactive waste and materials, being focused on the development of strategies for a safe, sustainable and broadly acceptable management of all types of radioactive waste, in particular for the management of spent fuel and long-lived waste.

The work of the NEA's Radioactive Waste Management Committee (RWMC) is mainly focused on the management of long-lived waste and decommissioning, with emphasis on institutional, regulatory and technical aspects.

A RWMC Working Group, the Forum on Stakeholder Confidence, is examining societal issues and public involvement in decision making on radioactive waste management.

- Radioactive waste management and related NEA publications, committees and working groups - <http://www.nea.fr/html/rwm/welcome.html>

- Organisation for Economic Co-operation and Development - <http://www.oecd.org/home/>

13. OSPAR

Background

The 1992 OSPAR Convention is the current instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic.

- OSPAR website - <http://www.ospar.org/>

It combined and up-dated the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution.

The work under the convention is managed by the OSPAR Commission and guided by the Ministerial Declarations and Statements made at the adoption of the Convention and at the subsequent Ministerial Meetings of the OSPAR Commission in 1998 and 2003.

The work applies the ecosystem approach to the management of human activities. It is organised under six strategies, one of which is for radioactive substances.

Links

- 1992 OSPAR Convention - <http://www.ospar.org/eng/html/1992-ospar-convention.htm>
- OSPAR Commission - <http://www.ospar.org/eng/html/welcome.html>
- OSPAR Ministerial Declarations and Statements - <http://www.ospar.org/eng/html/md/welcome.html>
- Ecosystem approach to the management of Human Activities - <http://www.ospar.org/eng/html/md/welcome.html>

OSPAR Radioactive Substances Strategy

The Radioactive Substances Strategy sets the objective of preventing pollution of the maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances

The ultimate aim is to reach concentrations in the environment close to background values for naturally occurring radioactive substances and reaching close to zero for artificial radioactive substances.

In achieving this objective, the following issues should, inter alia, be taken into account:

- Legitimate uses of the sea

- Technical feasibility
- Radiological impacts to man and biota.

As its timeframe, the Radioactive Substances Strategy further declares that by the year 2020 the Commission will ensure that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero.

Implementation of the Radioactive Substances Strategy is being taken forward through the OSPAR Radioactive Substances Committee (RSC).

The UK Government is committed to progressive and substantial reductions in radioactive discharges.

At the 1998 meeting of the OSPAR Commission in Sintra, Portugal, the UK agreed the OSPAR Strategy for Radioactive Substances.

Following an extensive consultation exercise the UK Strategy for Radioactive Discharges, which delivers the UK's commitments under the OSPAR Radioactive Substances Strategy, was published by Defra in July 2002. The strategy is currently under review.

Links

- Radioactive Substances Strategy - <http://www.ospar.org/eng/html/strategies/strategy-05.htm>
- UK Strategy for Radioactive Discharges - <http://www.defra.gov.uk/environment/radioactivity/government/discharges/index.htm>
- EU Directives on Radioactivity and Radioactive Substances - <http://www.defra.gov.uk/environment/radioactivity/government/international/index.htm>
- Report by the UK on Intentions for Action at the National Level to Implement the OSPAR Strategy with Regard to Radioactive Substances - <http://www.defra.gov.uk/environment/radioactivity/government/international/ospar.htm>

See also:

- Liquid and gaseous waste discharges – see RWPG General Principles

National framework

14. Introduction

Responsibility for radioactive waste management lies with the producers and owners of the waste.

- The Government decides on matters of overall policy
- The regulators regulate in accordance with legal requirements and ensure that Government policy is implemented
- The producers and owners of the waste must manage the waste in ways that meet the legal and policy requirements.

15. Legal and policy bodies responsible for radioactive waste management in UK

Legislation and overall policy for radioactive waste management in the UK is the responsibility of Defra and the Devolved Administrations.

Radioactive waste policy is devolved to the Scottish Parliament and the National Assembly for Wales. However, the Secretaries of State for Business, Enterprise and Regulatory Reform and for Defence remain accountable for the management of radioactive wastes kept or stored at civil and defence related nuclear licensed sites in England, Wales and Scotland.

- Defra is responsible for legislation and policy relating to radioactive waste in England.
- The Scottish Executive is responsible for legislation and policy relating to radioactive waste in Scotland.
- The Welsh Assembly Government is responsible for legislation and policy relating to radioactive waste in Wales.
- The Department of the Environment in Northern Ireland is responsible for legislation and policy relating to radioactive waste in Northern Ireland.
- Environment Ministers are accountable to their respective Parliaments or Assembly for radioactive waste policy in their areas of the UK.

Other Departments such as the Department of Health, the Ministry of Defence and the Food Standards Agency also have a close interest, as does the Health and Safety Executive (HSE) and the Environment Agency (EA) for England and Wales, the Scottish Environment Protection Agency (SEPA) for Scotland and the Chief Radiochemical Inspector of the Environment and Heritage Service (EHS) for Northern Ireland.

The Department for Business, Enterprise and Regulatory Reform (BERR) is primarily concerned with civil nuclear decommissioning, waste management

and ensuring that the views of relevant energy industries are represented in the decision making process determining radioactive waste management policy.

Links

- www.defra.gov.uk
- www.scotland.gov.uk
- www.wales.gov.uk
- www.doeni.gov.uk
- www.environment-agency.gov.uk
- www.sepa.org.uk
- www.ehnsi.gov.uk/environment/radiation/radiation.shtml
- www.berr.gov.uk/energy/index.html

16. Production and ownership of radioactive waste in UK

Most radioactive waste is produced by the nuclear power station operators (British Nuclear Fuels plc BNFL, British Energy, BE) and the fuel cycle establishments which serve them.

A substantial amount arises from nuclear research and development sites run by United Kingdom Atomic Energy Authority (UKAEA), most of which are now in the decommissioning phase.

Some comes from the defence programme (Ministry of Defence, MoD), and small amounts are produced by medical (GE Healthcare), industrial and educational establishments.

Ownership and arrangements for public sector civil nuclear liabilities

Radioactive wastes from civil nuclear facilities (BNFL and UKAEA) until recently, were owned and managed by the facilities/sites themselves. The Government believed, however, that the scale and nature of the task required a much sharper and stronger strategic focus.

This led to the establishment of the Nuclear Decommissioning Authority (NDA) as a legal entity by the Energy Act 2004. The NDA became fully operational from 1 April 2005.

- Energy Act 2004 - <http://www.opsi.gov.uk/acts/acts2004/20040020.htm>

Ownership of the civil public sector nuclear sites now rests with the NDA. It is responsible for the transfer from BNFL and UKAEA of the UK's public sector civil nuclear liabilities and their subsequent management.

It is a public body acting on behalf of Government and works in partnership with site licensees (at the outset UKAEA and BNFL) and the safety, security

and environmental regulators for the most effective and safe means of discharging the liabilities.

For more information on the NDA see:

- Nuclear Decommissioning Authority - <http://www.nda.gov.uk>
- Decommissioning and cleanup of nuclear sites - See on MRWS Specific Policies

Ownership and arrangements for defence installations

Historically, defence-related radioactive wastes have been generated either by major nuclear operators such as UKAEA, BNFL and their predecessors at their sites or by MoD on MoD-owned and operated sites.

More recently, the contractorisation and privatisation of significant aspects of defence nuclear programmes has meant that much of defence radioactive waste is generated as part of activities undertaken by, and under the day to day control of, private sector operators.

However, where MoD continues to retain ownership of and/or liability for current stocks of radioactive waste and the Secretary of State for Defence is accountable to Parliament for their safe management.

Ownership and arrangements for private sector operators

The Government maintains the view that private sector nuclear sites should be the financial responsibility of the operator concerned.

However, the Government recognises that it bears ultimate responsibility for the safe and secure decommissioning and clean up of sites where a private sector operator is unable to meet its obligations.

The Government therefore believes that the NDA should have the power, in circumstances where Government considers it necessary, to manage the decommissioning and clean up of sites currently operated in the private sector.

The NDA has responsibility for the oversight of British Energy's planning for and decommissioning of its nuclear power stations. The Government is also of the view that private sector operators should meet the full costs of cleaning up the sites they manage.

17. Legislative and regulatory system

Background

Radioactive Substances Act 1993 (RSA 93)

Nuclear licensed sites contain over 99% of the UK's radioactive waste by activity. The main legislation governing radioactive waste management in the UK, except on nuclear licensed sites, is the Radioactive Substances Act 1993 (RSA93).

Under the RSA 93, no person may dispose of radioactive waste except in accordance with an authorisation under the Act, or except where the waste is excluded by the Act or by an Exemption Order. The developer of a disposal facility for radioactive waste will be required to apply to the relevant Agency for authorisation of disposals on or from the site of the facility.

Control under the Act is exercised in England and Wales by the Environment Agency (EA) (<http://www.environment-agency.gov.uk/>) and in Scotland by the Scottish Environment Protection Agency (SEPA) (<http://www.sepa.org.uk/>) and the Chief Radiochemical Inspector within the Environment and Heritage Service (EHS) (<http://www.ehsni.gov.uk/environment/radioactivity/radiation.shtml>), of the Department of the Environment in Northern Ireland.

Where an application is made for disposal of radioactive waste on or from a site licensed under the Nuclear Installations Act 1965, the Agency is required to consult the Food Standards Agency and the Health and Safety Executive before deciding whether to grant an authorisation and, if so, subject to what terms and conditions.

All radioactive waste disposals, including discharges (that is airborne and liquid discharges of radioactive material from any facility, including nuclear licensed sites), in the UK are regulated to standards equivalent to those in the Radioactive Substances Act 1993 (RSA93). This ensures that human health and the environment are protected from the effects of exposure to ionising radiation resulting from these radioactive waste disposals in accordance with internationally agreed standards.

Such regulation is carried out by EA in England and Wales, the SEPA in Scotland, and the EHS, of the Department of the Environment in Northern Ireland.

EA, SEPA, EHS and the Food Standards Agency conduct regular surveys of the UK terrestrial and marine environments which continue to show that the radiological impact of discharges are within the appropriate limits.

The Office for Civil Nuclear Security (OCNS) which is part of the Department for Business, Enterprise and Regulatory Reform (BERR) is responsible for regulating security arrangements at civil nuclear sites. This is primarily in order to protect against the threats of terrorism and nuclear proliferation.

The Radioactive Materials Transport Division (RMTD) of the Department for Transport (DfT), regulates the transport of nuclear waste throughout Great Britain. It is responsible for regulating the packaging, labelling and vehicle marking standards for radioactive material carried by road.

Food safety implications of discharges of radioactive waste are the responsibility of the Food Standards Agency (FSA), which reports to parliament via health ministers and is a non-ministerial government department.

The FSA undertakes a substantial radiological surveillance programme both for aquatic and terrestrial samples in support of this. It has further taken on the role, formerly exercised by the Ministry of Agriculture Fisheries and Food, as statutory consultee to the EA and SEPA in matters relating to radioactive discharge authorisations.

The NII has a similar role as statutory consultee because it regulates the accumulation of radioactive waste on licensed sites and the exposure of the general public to direct radiation from those sites.

- Radioactive Substances Act 1993 (RSA93) (on OPSI website) (http://www.opsi.gov.uk/acts/acts1993/Ukpga_19930012_en_1.htm)

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

The main legislation covering the safety of workers and the general public at nuclear installations, in the UK, is the Health and Safety at Work Act 1974 (HASAWA 74) and its Relevant Statutory Provisions, which include the Nuclear Installations Act 1965 (NIA65).

The Health and Safety Executive (HSE) (<http://www.hse.gov.uk/>) regulates radioactive waste management (but not disposal) and spent fuel management on all the nuclear licensed sites in the UK. The safety of operational nuclear facilities in the UK, including those for waste treatment and storage, is regulated by the HSE using the Nuclear Installations Act 1965 – (as amended) (NI Act) and the general requirements of the HASAWA 1974.

HSE is the licensing authority for nuclear installations and has delegated this responsibility to its Nuclear Installations Inspectorate (NII). The HSE has regulatory responsibility in England, Scotland and Wales. There are no nuclear sites in Northern Ireland.

The NII regulates the nuclear and radiological safety at all licensed sites in the UK, radioactive waste management at those sites and conventional safety at some sites. The NI Act requires organisations to obtain a nuclear site licence from the HSE before using a site for licensable activities. It also enables HSE

to attach conditions to any license in the interests of safety and for handling nuclear matter.

Such conditions include the requirement for licensees to justify the safety of operations, i.e., provide a safety case and make arrangements for the safe management of radioactive waste.

Recent developments

Statement of Intent

The environment agencies and HSE are committed to continuous improvement and to working together to deliver consistent and transparent regulation.

The Statement of Intent published by HSE and EA in August 2001 set out key working principles to underpin this cooperation.

- Statement of Intent (on HSE website) - <http://www.hse.gov.uk/nuclear/sofi.pdf>

Recent initiatives include the sharing of future business plans and strategies; joint regulatory activity such as increased joint investigations and audits on nuclear sites, such as that undertaken at Dounreay by HSE and SEPA, co-ordinated guidance on radioactive waste management; and workshops with the nuclear industry on regulatory interactions.

These developments are designed to improve the operation of the nuclear regulatory system.

Recent changes to the Radioactive Substances Act 1993

The Energy Act 2004 has introduced a new section, 16A, into the Radioactive Substances Act.

This allows the Environment Agency to transfer authorisations for the disposal of radioactive waste from one operator to another.

These provisions are necessary to allow restructuring of the nuclear industry to take place, for example, in connection with the preparation for NDA led competitions for management of some sites.

- Recent changes to the Radioactive Substances Act 1993 - http://www.environment-agency.gov.uk/business/444304/945840/1064362/?version=1&lang=_e

Guidance to Inspectors issued by the HSE

In 2001, the HSE issued a guidance for site inspectors, on the management of radioactive materials and wastes on nuclear licensed sites.

- Guidance for inspectors (on HSE website) - <http://www.hse.gov.uk/nuclear/waste1.pdf>

See also:

- Legal and policy bodies of radioactive waste management in the UK - see RWPG National Framework

18. UK advisory bodies

Committee on Radioactive Waste Management (CoRWM)

In November 2003, the UK Government and the Devolved Administrations set up an independent committee (CoRWM) to oversee a review of options for the long term management of high and intermediate level radioactive solid wastes in the UK.

The Committee's aim was to review and recommend the best option, or combination of options, for the long-term management of the UK's higher activity wastes.

The process of review engaged members of the UK public, and provide them with the opportunity to express their views. Other key stakeholder groups with interests in radioactive waste management were also be provided with opportunity to participate.

CoRWM published their report on radioactive waste on 31 July 2006.

- Managing our radioactive waste safely - CoRWM's recommendations to Government - 31 July 2006 - <http://www.corwm.org.uk/content-1092>

The UK Government and the Devolved Administrations responded to CoRWM in October 2006, see the main radioactive waste (<http://www.defra.gov.uk/environment/radioactivity/waste/index.htm>) page for further information. In this response Government announced that it would reconstitute CoRWM with strengthened scientific and technological expertise for the next stage of the of the Managing Radioactive Waste Safely programme.

Reconstituted CoRWM

Reconstituted CoRWM's role will be to provide independent scrutiny and advice to UK Government and Devolved Administration Ministers on the long term management, including storage and disposal, of radioactive waste. CoRWM's primary task is to provide independent scrutiny on the Government's and Nuclear Decommissioning Authority's proposals, plans and programmes to deliver geological disposal, together with robust interim storage, as the long term management option for the UK's higher activity wastes.

CoRWM's sponsoring Ministers will be from Defra, the Department for Business, Enterprise and Regulatory Reform (BERR) and the Devolved Administrations.

The Committee chair and members are currently being appointed and It is planned that the Committee will be in place from Autumn 2007.

Nuclear Safety Advisory Committee (NuSAC)

NuSAC is an independent advisory committee of the Health & Safety Commission (HSC).

NuSAC advises HSC on matters which are referred to it or which it considers require attention regarding nuclear safety policy and its implementation at nuclear installations.

NuSAC also advises HSC on the adequacy and balance of HSC's nuclear safety research programme.

- Nuclear Safety Advisory Committee - <http://www.hse.gov.uk/aboutus/hsc/iacs/nusac/>

Committee on Medical Aspects of Radiation in the Environment (COMARE)

COMARE was established in November 1985 in response to the final recommendation of the report of the Independent Advisory Group chaired by Sir Douglas Black.

Its terms of reference are to "assess and advise Government and the Devolved Administrations on the health effects of natural and man-made radiation in the environment and to assess the adequacy of the available data and the need for further research".

- Committee on Medical Aspects of Radiation in the Environment - <http://www.comare.org.uk/>

Health Protection Agency's Radiation Protection Division (Previously the National Radiological Protection Board)

The National Radiological Protection Board (NRPB) was created by the Radiological Protection Act 1970.

In June 2002, an HPA consultation document proposed that the NRPB and its functions and staff should transfer to the HPA.

On 1 April 2005 the National Radiological Protection Board merged with the HPA forming its new Radiation Protection Division. Together with the Chemical Hazards and Poisons Division of HPA it forms the Agency's Centre for Radiation, Chemical and Environmental Hazards.

The division undertakes research to advance knowledge about protection from the risks of ionising and non-ionising radiations; provides laboratory and technical services; runs training courses; provides expert information and has a significant advisory role in the UK.

HPA-RPD retains the NRPB functions in Scotland.

- Health Protection Agency's Radiation Protection Division - <http://www.hpa.org.uk/radiation/>

Ionising Radiations Health and Safety Forum (IRHSF)

IRHSF replaced the Ionising Radiations Advisory Committee (IRAC).

It provides a liaison mechanism between the Health and Safety Executive and stakeholders on matters concerning protection against exposure to ionising radiations that are relevant to the work of the Health and Safety Commission and the Executive, and to identify significant issues for future action.

- Ionising Radiations Health and Safety Forum - <http://www.hse.gov.uk/aboutus/meetings/irhsf/>

Radioactive Waste Management Advisory Committee (RWMAC)

RWMAC operated up until March 2004. It advised UK Government and the devolved administrations on all aspects of radioactive waste management policy and its implementation.

With the creation of CoRWM, RWMAC was put into abeyance. Following government's announcement that CoRWM will be reconstituted, RWMAC will not be reactivated and the reconstituted CoRWM will be Government's source of independent advice on radioactive waste matters.

RWMAC's advice until March 2004 can be found at:

- Radioactive Waste Management Advisory Committee - <http://www.defra.gov.uk/rwmac/>

19. Monitoring arrangements

Radioactive waste is stored on licensed nuclear sites or special waste storage facilities such as Drigg in Cumbria, all of which have their own monitoring systems.

With the continuing use of radioactive materials in industry, research and medicine, the public's awareness about the potential impact on human health and safety of any enhanced levels of radiation in the environment around any sites handling radioactive materials has heightened.

All those involved recognise this concern and there has developed over the years a network of comprehensive monitoring systems designed to determine the levels of radiation to which members of the public are exposed.

Self monitoring by site owners

All sites discharging radioactivity (liquid and gaseous) into the atmosphere are regulated by the Environment Agency for England and Wales (EA), the

Scottish Environment Protection Agency (SEPA) or the Chief Radiochemical Inspector in Northern Ireland by issuing of discharge authorisations.

For nuclear sites, the regulators place statutory obligations on operators to carry out defined monitoring programmes, both for discharges and for environmental radioactivity. Accounting for radioactive discharges at non-nuclear sites is undertaken on the basis of the amount of radioactivity used.

Discharges are part of the day-to-day operations at nuclear sites or other industries dealing with radioactive substances (such as hospitals) and these discharges are strictly regulated.

Site operators are required to assess regularly all radioactive discharges, ensure that the authorised discharge conditions are met, monitor the local environment and report on the results.

Failure to meet these requirements could result in prosecution of the holder of the authorisation.

Industry monitoring results have been published in separate company reports up until now.

Regulatory monitoring

In support of regulation under the Radioactive Substances Act, the EA, SEPA and the Chief Radiochemical Inspector in Northern Ireland commission independent monitoring of radioactive waste discharges and assess their impact on the environment.

The EA monitors radioactivity in the environment for England and Wales, SEPA monitors radioactivity in the environment for Scotland and the Chief Radiochemical Inspector monitors the impact of nuclear discharges into the Irish Sea on the Northern Ireland coastline.

The Food Standards Agency (FSA) has an aquatic and terrestrial radioactivity surveillance programme around nuclear licensed sites in England and Wales to monitor radioactivity in food. The FSA programme is fully independent of all other government departments, local authorities and industry.

The results of all regulatory monitoring of discharges and environmental radioactivity undertaken in the UK, are published in one report: Radioactivity in Food and the Environment (RIFE). The RIFE monitoring programme is lead by the FSA.

The RIFE report combines the results of all monitoring carried out by the FSA, SEPA, EA and the Environment and Heritage Service of Northern Ireland.

The collaboration shows the commitment of the Agencies to provide a comprehensive report of monitoring and their intention to work closely together to ensure protection of the public.

Monitoring during transportation

Shipments of radioactive wastes and materials have to comply with transport regulations, which entails monitoring before departure and on arrival (receipt).

The Radioactive Materials Transport Division (RMTD) of the Department for Transport (DfT) is responsible for the regulatory process. The consignor and recipient of the wastes are responsible for the goods and their safe carriage.

Links

- Food Standard Agency's radioactivity in food monitoring and RIFE reports <http://www.food.gov.uk/aboutus/ourboard/boardmeetoccasionalpapers/radiologicalenvreport2004>
- Department of Transport - <http://www.dft.gov.uk/pgr/freight/dgt1/>
- Environment Agency - <http://www.environment-agency.gov.uk/>
- Scottish Environment Protection Agency - <http://www.sepa.org.uk/>
- Environment and Heritage Service: radioactivity - <http://www.ehsni.gov.uk/environment/radiation/radioactive.shtml>

Local Authority Radiation Monitoring Arrangements

Following Chernobyl, many local authorities co-ordinated their monitoring programmes through the Local Authority Radiation and Radioactivity Monitoring Advice and Collation Centre (LARRMACC).

The prime objective was to collate, co-ordinate and assure the quality of the monitoring results of local authorities (LAs) and to demonstrate scientific credibility to other external agencies.

LARRMACC has since disbanded, but local authorities (which continue to have programmes for continuous measurement of radiation levels, sampling of environmental materials, sampling of foodstuffs etc) have regrouped as members of LARNET (Local Authority Radiation Network).

20. Energy policy and the nuclear industry

Background

Energy is essential in almost every aspect of our lives and for the success of our economy. We face two long-term energy challenges:

- tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and
- ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel.

The strategy the Government has adopted for meeting the twin challenges of tackling climate change and ensuring energy security focuses on:

- saving energy;
- developing cleaner energy supplies; and
- securing reliable energy supplies at prices set in competitive markets.

Our strategy is set out in more detail in the 2007 Energy White Paper (www.berr.gov.uk/energy/index.html)

Alongside this White Paper, published on 23 May 2007, the Government launched a consultation on 'The Future of Nuclear Power: The role of nuclear power in a low carbon UK economy'. This consultation seeks views on the information and arguments set out on whether the private sector should be allowed to build new nuclear power stations.

Views obtained through this consultation will contribute to the shaping of the policy on the future of civil nuclear power in the UK and will help Government assess the arguments before it reaches its final decision on the future of new nuclear build later in the year.

The Government's preliminary view, which is the basis of this consultation is set out below.

We face a great deal of uncertainty about our energy supplies over the next couple of decades, most obviously the pace of climate change and geopolitical developments. But there are also uncertainties relating to future fossil fuel and carbon prices; the speed at which we can achieve greater energy efficiency and therefore likely levels of energy demand here and globally; the speed, direction and future economics of development in the renewable sector; and the technical feasibility and costs associated with applying carbon capture and storage technologies to electricity generation on a commercial scale.

Faced with these uncertainties the Government believes we need diversity and flexibility in the energy mix and a policy framework that opens up the full range of low carbon options. As well as renewable energy, those options should include the use of gas and coal with carbon capture and storage along with nuclear power. We agree with the recently published fourth report of the Intergovernmental Panel on Climate Change (IPCC) that nuclear power could have a role to play alongside other low carbon energy sources in reducing carbon emissions.

Tackling climate change and ensuring energy security will require action on many fronts including supply and demand, and engaging individuals and business. Unnecessarily ruling out any of the options available is likely to increase the risks of not achieving these objectives.

The Government believes that, given the many uncertainties in the energy market over the coming decades, not allowing energy companies the option of investing in new nuclear power stations would increase the risks of not achieving our long-term climate change and energy security goals, and if we were to achieve them, it would be at higher costs.

Apart from large-scale hydropower – the opportunities for which have been largely exhausted in the UK – nuclear power is the only low-carbon form of

base-load generation, which is proven on a commercial scale. Without nuclear power as an option, the alternative would be for energy companies to invest in significant fossil fuel capacity, whether of the conventional kind or fitted with carbon capture and storage technology, and to build renewable capacity over and above our existing targets, particularly as we will need to replace existing nuclear stations as they retire.

The Government is not itself proposing to build nuclear power stations. We have, however, reached the preliminary view that private sector energy companies should have the option of investing in new nuclear power stations, subject to the following conditions:

- the developer preparing an environmental Impact Assessment and securing development consent;
- the developer securing the necessary permissions from the independent regulators to ensure that the nuclear power station could be operated safely, securely and without detriment to public health;
- a decision by the Secretary of State, that the proposed design is Justified (in accordance with the Justification of Practices Involving Ionising Radiation Regulations 2004);
- the proposal being in a site that meets the suitability criteria as identified through a Strategic Siting Assessment. This Assessment would also meet the requirements for a Strategic Environmental Assessment (in accordance with EC Directive 2001/42);
- the establishment, in legislation, of arrangements to protect the taxpayer and ensure that energy companies meet their full decommissioning costs and full share of waste management costs. These would need to be agreed before proposals for new nuclear power stations could proceed. As with the existing nuclear power stations, there is a potential Government liability in accordance with international Conventions to cover third party damages in the unlikely event of a major accident;
- a decision that the management of waste arising from new nuclear power stations would be explored through the Managing Radioactive Waste Safely (MRWS) process.

Within this framework, we think it is likely that energy companies will come forward with proposals for new nuclear power stations, although we cannot predict this with certainty. Their decisions will be affected by their view on the underlying costs of new investments, their expectations of future electricity, fuel and carbon prices, expected closures of existing power stations and the development time for new power stations. We cannot know all of these things today and believe we should reflect this uncertainty by having a diversified approach in our energy policy. This will reduce the risks associated with this uncertainty, for example, by preventing over-reliance on a limited number of technologies.

Specific policies

21. Introduction

There are a number of specific policies designed to help with the management of radioactivity.

22. Spent fuel management and reprocessing

Spent (irradiated) fuel

Spent fuel is irradiated fuel which is removed from a nuclear reactor after final use.

The main UK spent fuels are those arising from Magnox, Advanced Gas Cooled Reactor (AGR) and Pressurised Water Reactor (PWR). Smaller amounts of spent nuclear fuel arise from research reactors and nuclear submarines.

Typically spent fuel is made up of approximately 97.5% unreacted uranium, 0.5% plutonium and 2% waste products.

Some spent fuel elements are stored for long periods prior to long term management being decided whilst some spent fuel is reprocessed.

Historically, spent fuel was not viewed as nuclear waste in the UK. Previously, UK policy had been that it was up to the owners of these materials to decide whether they should be declared as wastes or not.

On 26 September 2002, however, the UK Minister of the Environment, in his written answer to a parliamentary question on UK radioactive waste management, recognised that the Government:

"intends, in assessing management options, to include not only materials currently classified as waste but also to consider the consequences of providing for other materials which may have to be managed as waste during the period, such as some separated plutonium, and uranium, as well as certain quantities of spent nuclear fuel".

Further, with the creation of the Committee on Radioactive Waste Management CoRWM, (formed to oversee the review of options for the long term management of higher activity radioactive wastes in the UK and to recommend the options that can provide a long term solution), it has been realised that some of these items may in the future be categorised as radioactive wastes.

Reprocessing

Reprocessing of spent fuel involves the separation of uranium and plutonium from nuclear waste products (i.e. fission products and activation products) by

dissolving the fuel in nitric acid. The resulting materials are then potentially reusable and leads to only 2% of the waste volume.

Two consequences of reprocessing of UK spent fuel are the stockpiles of separated plutonium and reprocessed uranium that it generates and the radioactive discharges that it gives rise to.

Reprocessing is carried out in the UK by British Nuclear Fuels (BNFL) at its Sellafield site in Cumbria.

Reprocessing of fast reactor and materials testing, and research reactor fuels, was undertaken on a smaller scale by the United Kingdom Atomic Energy Authority (UKAEA) at its Dounreay site in Scotland.

An end to reprocessing at Dounreay was announced on July 2001.

Two distinct types of spent nuclear fuel reprocessing are undertaken at BNFL Sellafield. There is reprocessing of uranium metal fuel from the UK's older Magnox nuclear power plants and also reprocessing of uranium oxide fuel from more modern Advanced Gas-Cooled and Light Water Reactors (AGRs and LWRs) in the THORP facility (BNFL's thermal oxide reprocessing plant).

THORP undertakes reprocessing of both UK and overseas spent nuclear fuel.

Spent fuel management - current practices

Magnox fuel (uranium metal/magnesium alloy cladding) is reprocessed since the Magnox cladding is susceptible to corrosion in the water used to store it in.

All Magnox fuel will continue to be despatched to BNFL's Magnox reprocessing facility at Sellafield.

BNFL has contracted British Energy (BE) to reprocess or store all AGR lifetime fuel arisings. BE has contracted to reprocess in BNFL's THORP facility, some 4700 tU, the arising from its AGR stations up to about the year 2006/2007.

BE retains the option of early reprocessing or of storing subsequent arisings of fuel from these stations. The remaining lifetime arisings of BE AGR spent fuel will be sent for storage at Sellafield with the option to reprocess or condition for direct disposal.

No decisions have yet been taken on the long term management of spent fuel from the Sizewell B PWR station and the spent fuel from nuclear submarines.

UK's position on spent fuel management and reprocessing

The Government's policy on reprocessing, remains as set out in the White Paper "Review of Radioactive Waste Management Policy" published in July 1995 (Cm 2919). Namely, that the question of whether to reprocess or hold the spent fuel in long term storage is a matter for the commercial judgement of the owner of the spent fuel subject to meeting the necessary regulatory requirements.

Implications of creating the Nuclear Decommissioning Authority (NDA) on BNFL and UKAEA reprocessing activities

The White Paper "Managing the Nuclear Legacy - a strategy for action" (Cm 5552), states that:

"Existing THORP contracts will remain with BNFL plc as site licensee and operator of the plant and will be honoured. THORP will therefore continue to operate until existing contracts have been completed or the plant is no longer economic".

Any proposals for new THORP contracts require Ministerial agreement in light of criteria set out in Cm 5552.

With regards to Magnox fuel reprocessing, the White paper states that "the (Magnox) stations should continue to operate until their planned shut-down dates with reprocessing of Magnox fuel being completed by around 2012".

- Managing the Nuclear Legacy - a strategy for action (Cm 5552) (on BERR website) - <http://www.dti.gov.uk/files/file29300.pdf?pubpdfload=02%2F1075>

23. High level waste (HLW) management

Background

The storage and treatment of radioactive wastes in the UK is strictly regulated and controlled by the Health and Safety Executive (<http://www.hse.gov.uk/>) (Nuclear Installations Inspectorate) on nuclear sites and by the environment agencies at all other sites.

Solid wastes containing high levels of radioactivity are stored after conditioning by processes such as supercompaction, cementation or turning into glass.

Such wastes cover a wide range of materials and can be classified, according to the nature and quantity of radioactivity associated with them, as high level wastes (HLW) or intermediate level wastes (ILW).

HLW results from the reprocessing of spent nuclear fuel, (this is the residue from the primary stages of the separation of uranium and plutonium from irradiated nuclear fuel) and is highly radioactive.

Although small in volume, it contains over 95 per cent of all the radioactivity in wastes from nuclear establishments. HLW can generate heat, which has to be taken into account in the design of processing, storage and disposal facilities.

HLW in the UK

There is negligible public exposure from HLW and ILW since all stocks are stored on nuclear sites subject to independent regulation by HSE and authorising departments.

In the UK, all HLW is currently stored at British Nuclear Group's (BNG's) Sellafield site.

At UKAEA's Dounreay site, smaller volumes of liquid product from reprocessing are stored in shielded underground stainless steel tanks. The activity of the liquid depends on the reactor from which the fuel originated.

This waste is now classified as ILW and will be cemented as solid ILW for long-term storage.

At Sellafield, liquid HLW is concentrated by evaporation and stored in double-walled stainless steel tanks inside thick concrete walls. Because the waste is still generating heat, the tanks are continuously cooled.

It is the intention that all of the liquid HLW is conditioned using a process called vitrification, which immobilises the waste by converting the liquid waste into borosilicate glass; by 2015 all of it should be in this form.

Vitrification produces a solid stable product suitable for long-term management. A vitrification plant is operational at Sellafield and is producing glass blocks of HLW which are sealed in stainless steel canisters and then placed in a dry store.

Plant equipment from the vitrification process that has been contaminated with the HLW is also categorised as HLW.

In November 2003 the UK Government and the devolved administrations set up an independent committee (the Committee on Radioactive Waste Management or CoRWM) to oversee a review of options for the long term management of high and intermediate level radioactive wastes in the UK and to recommend the option or combination of options that can provide a long term solution.

CoRWM announced an integrated package of recommendations for the long-term management of the UK's radioactive waste on 31 July 2006. –

- Managing our radioactive waste safely - CoRWM's recommendations to Government (on CoRWM's website) - 31 July 2006
<http://www.corwm.org.uk/content-1092>

Government responded to CoRWM's recommendations on 25 October 2006, accepting CoRWM's primary recommendation on geological disposal of higher activity radioactive waste, and its recommendations for safe and secure interim storage. Government committed to consult further on how implementation of geological disposal could be taken forward.

On 25 June 2007, the UK Government and the Welsh and Northern Irish devolved administrations published the consultation document on managing higher activity radioactive waste in the long-term, entitled "Managing Radioactive Waste Safely: a Framework for Implementing Geological Disposal".

- “Managing Radioactive Waste Safely: a Framework for Implementing Geological Disposal” www.defra.gov.uk/corporate/consult/radwaste-framework/index.htm

National inventory

A national inventory of radioactive waste (HLW, ILW and low level waste (LLW)) has been compiled regularly since the early 1980s and is produced about every three years.

It is compiled by Defra and the NDA (Nirex until it was incorporated into the NDA) to provide up-to-date information essential for waste management policy, regulation and planning of waste treatment, packaging, storage and long-term management.

The latest edition of the Inventory, the 2004 Inventory, shows a snapshot on 1 April 2004. It describes all stocks of radioactive waste held in the UK at that date, together with predictions of wastes arising into the future. The next inventory, the 2007 Inventory, will be published in 2008.

- UK radioactive waste inventory (on NDAwebsite) - <http://www.nda.gov.uk/documents/upload/N090-The-2004-UK-Radioactive-Wastes-Inventory-main-report.pdf>

See also:

- General Principles - UK radioactive waste categories
- Spent fuel management and reprocessing
- Intermediate level waste (ILW) management
- Low level wastes (LLW) management

24. Partitioning and transmutation

What is partitioning and transmutation (P&T)?

Partitioning is a series of physical and chemical separation processes which separate different radionuclides from a mixture, in order to permit their segregated treatment.

Transmutation, on the other hand, is the process applied to the separated components. It is the destruction of radionuclides by converting them to different nuclides which are likely to have shorter half-lives and eventually generally low toxicity.

Transmutation is achieved by subjecting the "partitioned" (separated) radionuclides to intense radiation in either a nuclear reactor or a particle accelerator.

Partitioning and transmutation in the UK

The UK already carries out large scale partitioning at the two nuclear fuel reprocessing plants (i.e. dissolving spent fuel in acid then separating out uranium and plutonium sequentially) at Sellafield.

Some of the separated plutonium in the UK has been transmuted by placing new fast reactor or mixed oxide fuel elements into nuclear reactors and irradiating them.

However the main thrust of P&T overseas relates to fission products like caesium-137 and to minor actinides like americium.

The Government undertook to maintain a watching brief on the development of partitioning and transmutation in its 1995 White Paper "Review of Radioactive Waste Management Policy: Final Conclusions" (Cm2919).

It has subsequently done so through a series of research contracts let by the Department for Environment, Food and Rural Affairs and its predecessor departments.

A particular emphasis of the work has been to assess the ability of partitioning and transmutation to contribute to radioactive waste management in the UK context.

A study was undertaken by the Government's Radioactive Waste Management Advisory Committee (RWMAC) in 2003 in response to request for advice from Ministers in the UK Government and Devolved Administrations for Scotland and Wales on the potential application of P&T to radioactive waste management. The study concluded that P&T cannot realistically be considered to offer a long-term management solution for the UK's current stocks of radioactive waste, and those likely to arise in the future.

- RWMAC study and news release on the application of partitioning and transmutation in the UK - <http://www.defra.gov.uk/rwmac/reports/part-trans/index.htm>

The Committee on Radioactive Waste Management (CoRWM) has recently found P&T has no role to play in the long-term management of the UK's higher activity wastes.

25. Intermediate level waste (ILW) management

Definition

Intermediate level waste is radioactive material which falls between low level waste (LLW) and high level waste (HLW). It is sufficiently radioactive to require shielding and containment and special arrangements for its handling.

ILW consists mainly of metals, with smaller quantities of organic materials, inorganic sludges, cement, graphite, glass and ceramics.

ILW mainly arises from the dismantling and reprocessing of spent fuel and is defined by the amount of radioactivity it contains per unit weight.

Background of ILW management

Prior to the termination of the Nirex ILW underground repository programme in 1997, most licensees' radioactive waste management strategies were based on raw waste storage followed by waste conditioning and assumed direct disposal to avoid the need for additional surface stores.

Because government policy prior to 1995 was that ILW should remain untreated for as long as it was safe to do so (so as not to foreclose any disposal options), as of April 2004 (the time of the most recent official figures), only a small proportion (20%) of existing ILW had been conditioned.

Most of the remainder, which has arisen from nuclear industry operations over many decades, was stored in untreated form on nuclear sites.

The past policy (up to 1995) of not foreclosing options has meant that large quantities of ILW have been stored in a raw (unconditioned) form.

Such storage conditions of some ILW led to the Nuclear Installations Inspectorate (NII) increasing the emphasis on the need for potentially mobile wastes to be conditioned.

Particular concern has focused on "historic" wastes. These historic wastes may be poorly characterised, physically and chemically degraded, and held in old facilities subject to deterioration.

Considerable effort is often needed to find suitable means of retrieving, conditioning and storing these wastes.

Current situation of ILW management

After the termination of the Nirex ILW underground repository programme in 1997, it has been realised that the interim storage period (i.e. temporary storage of ILW prior to development of a final management solution) for ILW has substantially lengthened.

Because these wastes will remain hazardous for thousands of years, their conditioning must take account of various factors such as safety, environmental issues, minimal human intervention, etc.

In March 2005, the Environment Agency, Scottish Environment Protection Agency and the Health and Safety Executive issued a joint guidance to explain the regulatory process and provisions associated with conditioning of ILW on nuclear licensed sites in the UK.

- Conditioning of intermediate level waste on nuclear licensed sites (on Environment Agency website) - http://www.environment-agency.gov.uk/commondata/acrobat/intlevelradiowaste_1010898.pdf

The NII has also published a guidance document (for HSE inspectors) on radioactive waste management:

- Management of radioactive materials and radioactive waste on nuclear licensed sites March 2001 (on HSE website) - <http://www.hse.gov.uk/nuclear/waste1.pdf>

By making its guidance to inspectors on radioactive waste management freely available, NII has made clear to nuclear operators its expectations for the long-term storage of ILW in the UK.

The Committee on Radioactive Waste Management's (CoRWM) report on the long-term management of higher activity wastes included ILW on 31 July 2006.

- Managing our radioactive waste safely - CoRWMS's recommendations to Government (on CoRWM's website) - 31 July 2006 - <http://www.corwm.org.uk/content-1092>

Government responded to CoRWM's recommendations on 25 October 2006, accepting CoRWM's primary recommendation on geological disposal of higher activity radioactive waste, and its recommendations for safe and secure interim storage. Government committed to consult further on how implementation of geological disposal could be taken forward.

On 25 June 2007, the UK Government and the Welsh and Northern Irish devolved administrations published the consultation document on managing higher activity radioactive waste in the long-term, entitled "Managing Radioactive Waste Safely: a Framework for Implementing Geological Disposal".

- "Managing Radioactive Waste Safely: a Framework for Implementing Geological Disposal"- www.defra.gov.uk/corporate/consult/radwaste-framework/index.htm

Current storage of ILW

At present there is no facility in the UK for the long-term management of ILW.

Specially designed interim surface or sub-surface storage waste facilities are currently used to ensure the safe storage of radioactive waste pending the availability of a long-term management/disposal option.

Most ILW is stored at the site where it is produced. ILW is stored in water filled concrete tanks, or in a variety of steel containers or immobilised in standard packages and kept within dry, above-ground concrete stores.

For most ILW currently arising, packaging consists of conditioning in cement based materials within 500 litre stainless steel drums.

Larger items are conditioned in higher capacity stainless steel or concrete boxes. There are a number of ILW plants operating at Sellafield, Dounreay, Windscale and Trawsfynydd.

Limited facilities for storing ILW from hospitals and industrial, educational and research establishments are also in operation.

See also:

- General Principles - UK radioactive waste categories
- Spent fuel management and reprocessing

- High level waste (HLW) management
- Low level waste (LLW) management

26. Low level waste (LLW) management

Background

Low level waste (LLW) is defined as radioactive waste having a radioactive content not exceeding 4 GBq (Giga Becquerel) per tonne of alpha or 12 GBq per tonne of beta/gamma activity. (1 GBq = 1000 million Becquerels; 1 Bq = 1 disintegration/second).

Low level waste represents about 90% by volume of radioactive waste from UK nuclear facilities.

The major components of LLW before conditioning are: soil, metals and building materials (concrete, cement and rubble). Organic materials (laboratory equipment, clothing and paper towels) and graphite from gas-cooled reactors are also present. There are smaller quantities of glass and ceramics and other miscellaneous inorganic materials.

Unlike high level wastes (HLW) and intermediate level wastes (ILW), LLW do not normally require shielding during handling or transport.

Disposal of LLW

After incineration or compaction to reduce its volume, LLW can be sent to the shallow national repository operated by for British Nuclear Group near Drigg in Cumbria where most of the UK's LLW is disposed.

Some LLW is not suitable for disposal at the repository near Drigg - for example, because of the kinds of radioactivity it contains - so it is kept in storage on site until the policy has been decided for other long-lived waste.

The United Kingdom Atomic Energy Authority (UKAEA) also had a disposal facility for low level waste at Dounreay. In the past, solid LLW arisings at Dounreay were disposed of to this facility known as the "LLW pits". This is now effectively full and no further wastes are being consigned there.

Following a Best Practicable Environmental Option (BPEO) study, UKAEA is considering building a new LLW disposal facility at Dounreay.

Low Level Waste Repository (LLWR) near Drigg

In the past, the LLWR near Drigg was owned and operated by BNFL as a national LLW facility. Ownership of the site transferred to the Nuclear Decommissioning Authority (NDA) on 1 April 2005, and it is currently managed and operated under contract by British Nuclear Group Sellafield Ltd.

Waste disposed at the LLWR arises not only from nuclear sites but also from hospitals, research and other facilities using radioactivity.

The disposal unit at the LLWR is designed as a large concrete vault at ground level. Prior to deposition in the vault, the waste is converted into solid form. Little by little the vault will be filled with containers and when it is full, the plan is to finally cement it in and place soil on top.

Standards of disposal have been steadily raised. When it first opened in 1959, the disposal trenches were similar to an ordinary council tip.

Since 1988, disposal has been into the concrete-lined vault and LLW for disposal has usually been packed in high force compacted form into special metal ISO freight containers.

The original trenches have been capped with soil and both trenches and the vault area will be mounded over at the end of the site use.

The Environment Agency has consulted on its future regulation of Drigg. Cumbrian residents were invited to find out more and give their comments on how the Environment Agency proposes to regulate the disposal of radioactive waste at the national low-level waste repository at Drigg. Further information can be obtained from:

- Drigg review decision document March 2006 -

<http://www.defra.gov.uk/environment/radioactivity/government/decisions/pdf/driggreviewdecision.pdf>

LLW management policy

A review by Government (the UK Government and the devolved administrations) of the long term management of the UK's solid low level radioactive waste (LLW), was completed and a revised policy statement was published on 26 March 2007.

The new policy puts providing public safety at the forefront of dealing with LLW. It sets out a more flexible and pragmatic approach to its management, stressing the need to minimise the amount of waste created and recognising the need to involve the public in developing and authorising LLW management plans.

Unlike higher-activity wastes, the methods for managing and disposing of LLW in the long term already exist. The new policy announcement will ensure that we have safe and appropriate disposal routes for low level radioactive waste in the future. It will ensure that they are flexible enough to accommodate the wide range of types and radioactivity of wastes that result from both nuclear and non-nuclear activity.

Further information, including the revised policy statement is available at –

<http://www.defra.gov.uk/environment/radioactivity/waste/llw/index.htm>

27. Plutonium management

Background

Exposure of uranium fuel to the flux of neutrons in a nuclear reactor results in plutonium as a by-product.

Spent fuel can either be stored pending a decision on its long term management or reprocessed. Reprocessing results in separated plutonium, among other products.

Reprocessing of spent fuel is a process which separates the plutonium and uranium from other fissile and fission products in the fuel.

Plutonium in storage is subject to national and international safety and security requirements. It can be used as feedstock, together with uranium to manufacture mixed oxide (MOX) fuel. The UK stockpile of separated plutonium, derives from military, Magnox and THORP reprocessing activities.

Historically, plutonium from reprocessing has not been viewed as nuclear waste in the UK. But is currently regarded by the Nuclear Decommissioning Authority (NDA), which is now responsible for the stockpile, as a zero-rated asset. NDA will advise and the Government will decide whether civil owned plutonium will be retained as strategic stock or regarded as waste.

Plutonium management

Stocks of plutonium, whether separated or not, civil or military, all need to be safely and securely stored and used, subject to arrangements designed to ensure that the material would only be available for a proper purpose.

The producers and users of plutonium for civil purposes; the UK, Belgium, China, France, Germany, Japan, Russia, Switzerland, and the United States of America agreed in November 1997 to provide an internationally-accepted framework for the management of plutonium.

Their agreement was published in the document:

- International Guidelines for the Management of Civil Plutonium - <http://www.dti.gov.uk/energy/sources/nuclear/technology/fuel-cycle/plutonium-management/page26707.html>

The nine countries concerned meet annually to see that the information envisaged in the guidelines is published in a timely and efficient manner and to exchange experiences with the workings of the guidelines. The guidelines include a standard format for provision of information.

Individual countries take responsibility for supplying information. The International Atomic Energy Agency (IAEA) publishes the information through regular Information Circulars. These appear in the INFCIRC/549 series:

- IAEA Information Circulars - <http://www.iaea.org/Publications/Documents/Infcircs/>

UK's approach to plutonium management

In accordance with its international obligations on non-proliferation, the UK Government applies stringent measures to all grades of civil reprocessed plutonium.

These measures are designed to prevent the two potential risks which could apply to plutonium, namely attempts by an outside group to steal and/or misuse the material (theft or sabotage) or attempted misuse of the material by the authorities in a non-nuclear weapon state holding it (diversion).

Subject to meeting the appropriate safety, security and international safeguards requirements, the NDA will advise the UK Government their preferred management option, including what portion of civil plutonium should be held as a strategic stock which could be used as a future energy source and what should be declared as waste.

With regard to UK stocks held on behalf of foreign reprocessing customers, this is material owned by British Nuclear Group's (BNG's) customers and held by BNG to their order. The NDA will also advise the UK Government on the repatriation of foreign-owned plutonium.

All reprocessing customers are contractually required to demonstrate an acceptable end use before delivery of plutonium. The customers may opt to store the plutonium for a period of time or to convert it to MOX fuel.

However, the plutonium remains the property of BNG's customers and so the UK Government considers that these customers (or in the last resort, their Governments) bear ultimate responsibility for the plutonium.

Plutonium Working Group

As part of the British Nuclear Fuel (BNFL) National Stakeholder Dialogue, the Plutonium Working Group (PuWG) was set up in November 1999.

The Group brought together a diverse group of people and range of opinions to work constructively towards identifying plutonium management options.

The PuWG published its fourth and Final Report in March 2003. The main objective of the PuWG was to develop and recommend principles for BNFL's management and reduction of separated plutonium stocks.

See also:

- General Principles - UK radioactive waste categories
- Spent fuel management and reprocessing
- Uranium management
- The Nuclear Decommissioning Authority (NDA)

28. Uranium management

Background

Uranium is a slightly radioactive metal that occurs in minerals throughout the earth's crust. It is used mainly as fuel for nuclear reactors, mostly for electricity generation and also for propulsion of submarines, for defence purposes and for radiation shielding, etc.

Uranium naturally occurs in three different forms known as isotopes. These isotopes are uranium 238, uranium 235 and uranium 234.

Uranium 235 is the main fissile isotope and only 0.7% of natural uranium is "fissile" (i.e. capable of supporting a self-sustaining fission chain reaction).

Uranium 238 makes up the remainder of the mass with uranium 234 being present in very small amounts.

The majority of nuclear fuel is made from enriched uranium although UK Magnox stations mainly use natural un-enriched uranium.

Enriched uranium is uranium with a higher than natural concentration of the fissile U-235 isotope.

The enrichment process produces this higher concentration, typically between 3.5% and 5% U-235. Enrichment is only undertaken at only one location: Capenhurst near Cheshire.

- World Nuclear Association: background on uranium and depleted uranium - <http://www.world-nuclear.org/info/inf14.html>

Depleted uranium

Depleted uranium (DU) is the main by-product of the uranium enrichment process and is also produced from the reprocessing of Magnox reactor fuel in the UK.

The UK holdings of civil DU at the end of 2003, now owned by the Nuclear Decommissioning Authority (NDA), were some 85,000 tonnes.

Uses of depleted uranium

The main uses for DU outside nuclear applications arise from either its high density and/or its excellent radiation shielding characteristics.

DU has both civil and military applications. The high density of DU makes it useful as a counterbalance in some aircraft. It is also sometimes used to shield radiation in hospital radiotherapy units, for containers for radioactive sources, and in heavy industrial drilling equipment.

Uranium recovered from spent fuel by reprocessing

When spent nuclear fuel is reprocessed, both plutonium and uranium are recovered separately. Uranium comprises about 96% of that spent fuel from modern reactors.

The uranium from oxide fuel reprocessing, which typically contains a slightly higher concentration of U-235 than occurs in nature, can be reused as fuel after conversion and enrichment, if necessary.

However, in the UK several tens of thousands of tonnes of uranium recovered from reprocessing are currently stockpiled.

Historically, uranium from reprocessing has not been viewed as nuclear waste in the UK. The NDA will advise the UK Government on the long-term strategy for the management of these materials on their reuse or their disposal.

See also:

- Spent fuel management and reprocessing
- Plutonium management
- The Nuclear Decommissioning Authority (NDA)

29. Decommissioning and cleanup of nuclear sites

Background

In the UK, radioactive waste management and decommissioning on all 40 licensed nuclear sites is regulated by the Health and Safety Executive's Nuclear Installations Inspectorate (NII) and by the Environment Agency in England and Wales and the Scottish Environment Protection Agency (SEPA) in Scotland. This legislative framework also applies to nuclear site operations.

Decommissioning is the process whereby a nuclear facility, at the end of its economic life, is taken permanently out of service and its site made available for other purposes.

Views on the Government's approach to decommissioning policy were sought during the 2001 Managing Radioactive Waste Safely (MRWS) consultation process.

The Nuclear Decommissioning Authority (NDA)

In November 2001, the Government announced radical changes to the arrangements for the clean-up of Britain's nuclear legacy. The Government's detailed intentions were subsequently set out in a White Paper, "Managing the Nuclear Legacy - a strategy for action" (Cm 5552) published on 4 July 2002: http://www.nda.gov.uk/documents/upload/white_paper_managing_the_nuclear_legacy_a_strategy_for_action.pdf

The NDA was established as an executive non-departmental public body by the Energy Act 2004 and became fully operational on 1 April 2005. Its remit is to ensure the safe, secure and environmentally responsible decommissioning and clean-up of the UK's civil public sector nuclear sites. In addition, the NDA is responsible for certain commercial operations, including: the two generating Magnox nuclear power stations (Oldbury and Wylfa) pending their closure; the Thermal Oxide Reprocessing Plant (THORP) at Sellafield and the Sellafield Mixed Oxide fuel Plant (SMP); and the Springfields site, which manufactures nuclear fuel for British Energy's Advanced Gas-cooled Reactors and for overseas' customers. Ownership of these assets was transferred to the NDA on 1 April 2005.

Initial contracts for the management and operation of the NDA's sites were signed with the incumbent site contractors on 1 April 2005: British Nuclear Group Sellafield Ltd; Magnox Electric Ltd; Springfields Fuels Ltd; and the United Kingdom Atomic Energy Authority (UKAEA). These site licensees are responsible for the day-to-day management of the NDA's sites, as well as site safety, security and environmental performance.

Detailed work plans for the life-cycle of each site are submitted to the NDA for approval. Work is funded by the NDA and performed by the NDA's contractors in line with agreed contracts.

The NDA published its Strategy on 30 March 2006, following public consultation and Government approval. Copies are available on the NDA's website:

http://www.nda.gov.uk/documents/upload/NDA_Final_Strategy_published_7_April_2006.pdf.

To deliver better value for money, a programme of competitions is underway for new Parent Body Organisations (PBOs) to manage and operate the NDA's sites. Details of the NDA's competition schedule are also available on the NDA's website - <http://www.nda.gov.uk/contracts/competition/restructuring-and-competition-overview.cfm>.

Current policy

The Government felt that the decommissioning policy found in Cm 2919 needed updating to reflect developments in decommissioning theory and practice since Cm 2919 was published.

On 30 November 2003, the Government published a revised policy for decommissioning the UK's nuclear facilities for public consultation to reflect developments in decommissioning theory and practice since the decommissioning policy in Cm 2919 was first published. Having taken into account the points made, the Government announced its revised policy statement in a statement to Parliament on 9 September 2004. Copies of the revised policy statement are available on the Department for Business, Enterprise and Regulatory Reform website - <http://www.dti.gov.uk/consultations/page30232.html>

30. Radioactively contaminated land

In the early 1990s, the UK Government undertook a policy review and consultation exercise on contaminated land. The outcome of the review, "A Framework for Contaminated Land", was published in November 1994 and it was concluded that there was a need for a modern, specific contaminated land power.

This statutory regime was introduced by the Environment Act 1995.

Part IIA of the Environmental Protection Act 1990 (EPA 90) as inserted by section 57 of the Environment Act 1995 was introduced to address the historical legacy of land contamination.

It provides a regime for the control of threats to health or the environment from [non-radioactive] land contamination and provides a framework for the identification and remediation of such land in circumstances where there has not been any identifiable breach of a pollution prevention regime.

Part IIA, its accompanying regulations and Statutory Guidance came into force in England on 1 April 2000. Similar regimes have been introduced in Scotland and Wales.

Regulations extending this to harm to persons attributable to radioactivity (other than that arising from nuclear incidents) came into force on 4 August 2006.

- Contaminated land pages on the Defra website - <http://www.defra.gov.uk/environment/land/contaminated/index.htm>

31. Waste substitution policy

What is waste substitution?

A number of nuclear operators in Japan and Europe, have contracts with British Nuclear Group (BNG) to reprocess their spent nuclear fuel at Sellafield, Cumbria.

Fuel is reprocessed to separate uranium and plutonium (which can potentially be reused), from waste products in the spent fuel.

Government policy remains that the wastes resulting from the reprocessing of overseas spent fuel should be returned to the country of origin, and the high level waste (HLW) should be returned as soon as practicable after vitrification.

The concept of substitution has been approved by the UK Government to accelerate the return of overseas waste and to reduce the number of waste shipments.

In December 2004, the UK Government announced its policy of intermediate level waste (ILW) substitution, which provides for the return of HLW and to compensate for the ILW being retained in the UK and additional amount of HLW.

- Updated statement on policy for intermediate level radioactive waste (on BERR website) - <http://www.dti.gov.uk/files/file30058.pdf>

UK policy in respect of Low Level Waste Substitution can be found in "Review of Radioactive Waste Management Policy" (Cm2919) published in July 1995.

This policy statement provides for substitution of HLW for LLW because of the availability of the LLW disposal facility at Drigg in Cumbria.

See also:

- General Principles - UK radioactive waste categories

32. Import and export of radioactive wastes and materials

Current policy

The current policy on imports and exports of radioactive waste is set out in the 1995 White Paper "Review of Radioactive Waste Management Policy: Final Conclusions" (Cm 2919) states:

The Government's policy is that (other than the wastes resulting from the reprocessing of overseas spent fuel which should be returned to the country of origin) radioactive waste should not be imported or exported from the UK, except:

- For the recovery of reusable materials, provided that this is the genuine prime purpose;
- For treatment that will make its subsequent storage and disposal more manageable, in cases:
 - Where the processes are at a developmental stage; or
 - Which involve quantities which are too small for the processes to be practicable in the country of origin.


Where such processes would add materially to the wastes needing to be disposed of in the UK, the presumption should be that they will be returned to the country of origin.

In addition, waste may be imported for treatment and disposal in the UK:

- If it is in the form of spent sources which were manufactured in the UK; or
- If it is waste from small users, such as hospitals, situated in:
 - EU Member States which produce such small quantities of waste that the provision of their own specialised installations would be impractical;
 - Developing countries which cannot reasonably be expected to acquire suitable disposal facilities

A consultation document on the Control of Exports of Radioactive Sources was published on 10 February 2006, with responses closing on 5 May 2006.

See:

- Consultation: Introduction of an order under the Export Control Act 2002 to control the export of certain high activity radioactive sources  (on BERR website) - <http://www.dti.gov.uk/files/file23925.pdf>

A review by Government (the UK Government and the devolved administrations) of the long term management of the UK's solid low level radioactive waste (LLW), has been completed and a revised policy statement was published on 26 March 2007. This includes import and export issues.

- Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom, 26 March 2007-
<http://www.defra.gov.uk/environment/radioactivity/waste/pdf/llw-policystatement070326.pdf>

Regulations

Transfrontier shipment of radioactive wastes

Shipments of radioactive waste into, out of, or through the EU are regulated under the 1993 Transfrontier Shipment of Radioactive Waste Regulations (TFSRW), which implement the provisions of Directive 92/3 Euratom.

- Council Directive 92/3/Euratom (on Europa website) -
http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/923_en.pdf
- The Transfrontier Shipment of Radioactive Waste Regulations 1993 -
http://www.opsi.gov.uk/si/si1993/Uksi_19933031_en_1.htm

Prior permission of the relevant competent authority is required in respect of shipments of radioactive waste into, out of, or through the UK.

The TFSRW apply to shipments of radioactive wastes to or from anywhere in the world, i.e. they are not confined solely to EU Member States.

The Environment Agency (EA) is the competent authority for shipments to or from sites in England and Wales; the Scottish Environment Protection Agency (SEPA) deal with this legislation in Scotland and the Industrial Pollution and Radiochemical Inspectorate (IPRI) within the Environment and Heritage Service in Northern Ireland.

Transfrontier shipment of radioactive substances

European Council Regulation 1493/93/EURATOM applies to the transfrontier shipment of radioactive substances between EU Member States.

Being an EU Regulation it has direct effect in the UK and no specific implementing legislation is required.

For shipments of sealed sources, the holder has to obtain a prior written declaration from the consignee in the state of destination that the consignee has complied with all applicable legal provisions. The declaration must be approved by the competent authority of the Member State to which the shipment is being made.

For other types of sources (open/unsealed sources) the holder who has carried out the shipment is required to provide the competent authorities of Member States of destination with a quarterly summary of deliveries.

The EA is the competent authority for shipments to non-nuclear sites in England and Wales, SEPA is the competent authority for those sites in Scotland and IPRI is the competent authority for Northern Ireland.

The Health and Safety Executive is the competent authority for shipments involving nuclear licensed sites.

- Transfrontier shipment of waste pages on the NetRegs website - http://www.netregs.gov.uk/netregs/275207/275512/?version=1&lang=_e

33. Small users of radioactivity

Background

The term "small users" is used to describe organisations that use radioactive materials, but do not belong to the civil or the defence nuclear sectors.

They include hospitals, universities, research laboratories and some non-nuclear industries employing radioactive materials for diagnostic, therapeutic, industrial, teaching and research purposes.

The radioactive materials held by small users are of two types: "open sources" and "sealed (or closed) sources".

Open sources are dispersible, such as solutions or powders; sealed sources are designed to be non-dispersible, often by permanent encapsulation.

Some closed sources are defined in law as "mobile sources" when they are moved from one premises to another in day-to-day usage, e.g. industrial radiography equipment.

Regulation

The management of radioactive wastes by small users is regulated under the Radioactive Substances Act 1993 (RSA93).

- Radioactive Substances Act 1993 - http://www.opsi.gov.uk/acts/acts1993/Ukpga_19930012_en_1.htm

This is enforced by the Environment Agency (EA) for England and Wales, the Scottish Environment Protection Agency (SEPA) and the Industrial Pollution and Radiochemical Inspectorate (IPRI) of the Environment and Heritage Service for Northern Ireland.

To keep or hold radioactive materials, a user is subject to registration under RSA93.

The accumulation and storage of radioactive waste resulting from work with these materials, and the subsequent disposal of the waste, are subject to authorisation under RSA93.

Failure to have one of these permissions from the regulator, or to comply with their limits or conditions, is an offence under RSA93. The range of potential penalties includes fines and imprisonment.

In some cases, the nature and small-scale of radioactivity used by small users means that they may be exempted under RSA93 from the need to obtain a specific registration or authorisation.

This is done under the limits and conditions of one or more Exemption Orders. These are Statutory Instruments made as secondary legislation to RSA93. Schools, smaller hospital laboratories and retail outlets selling smoke alarms commonly use this approach.

Generation of wastes by small users

Small users are involved in the handling of a diverse range of radioactive materials, and hence their wastes are also diverse.

Hospitals generate wastes in an especially wide range of forms, including biological wastes from patients.

The quantities of radioactive waste that small users generate are very much smaller in both activity and volume terms than, for example, even a small nuclear power plant.

In addition, the half-lives of the materials that small users employ are often much shorter than those used in the nuclear industries. When this is the case, the radioactivity decays away typically in weeks or months.

Small Users Liaison Group (SULG)

The SULG was set up following problems highlighted in the twelfth annual report of the Radioactive Waste Management Advisory Committee (RWMAC) in its chapter on "Small Users, Big Problems".

The SULG provides a forum for effective liaison, communication and consultation between non-nuclear users of radioactive substances and the EA and an improved understanding of the EA's and users' objectives, priorities and constraints in respect of the management of radioactive waste.

The EA chairs and provides the Secretariat for the SULG:

- Small Users Liaison Group - <http://www.srp-uk.org/sulg.html>

As part of its work programme for 1999-2000, RWMAC was asked by the then Minister for the Environment, Michael Meacher, to undertake "an analysis of the current problems of Small Users."

In September 2000, RWMAC issued its advice to Ministers:

- Advice to Ministers on The Problems of "Small Users" of Radioactive Materials - <http://www.defra.gov.uk/rwmac/reports/smallusers/index.htm>

Scottish Non-Nuclear Industries Liaison Group

The Scottish Non-Nuclear Industries Liaison Group (formerly known as the Scottish Small Users Liaison Group) has been established to provide a forum for the discussion of issues relating to the regulation of the keeping and use of radioactive substances.

It also deals with the accumulation and disposal of radioactive waste by non-nuclear users including the oil industry (referred to in some documents as "small users") in Scotland.

- Scottish Non-Nuclear Industries Liaison Group - <http://www.sepa.org.uk/radioactivity/snnilg/>

See also:

- Control of radioactive sources (HASS Regulations 2005)

34. Research

Background

In 1995, in the Government White Paper "Review of Radioactive Waste Management Policy - Final Conclusions" (Cm 2919) stated:

"Each of the component parts of the industry, regulatory bodies and the Government itself should continue to be responsible for research and development necessary to support their respective functions.

Improvements are being considered to the co-ordination of research through the RADREM Committee. The Government will continue to issue information and advice about the EU programmes to those commissioning and undertaking research."

Since 1995 the RADREM Committee has been disbanded and a new research co-ordination scheme is evolving.

The nuclear industry has changed markedly since 1995 and much less research is undertaken today.

Similarly, with the closure of a number of nuclear power reactors and the restructuring of the nuclear power industry, the emphasis on research by the regulators has changed.

Additionally, the Committee on Radioactive Waste Management (CoRWM) undertook a major programme of public discussion with some research to examine the different waste management options for the long term management of higher activity radioactive wastes in the UK. CoRWM published its report on 31 July 2006.

- Managing our radioactive waste safely - CoRWM's recommendations to Government (on CoRWM's website) - 31 July 2006 - <http://www.corwm.org.uk/content-1092>

- Defra news release - 31 July 2006 - <http://www.defra.gov.uk/news/2006/060731e.htm>

The UK Government and the Devolved Administrations responded to CoRWM in October 2006, see the main radioactive waste page for further information - <http://www.defra.gov.uk/environment/radioactivity/waste/index.htm>

Other research activities in the UK

Health and Safety Commission Research

The Health and Safety Commission (HSC) has accountability to Government for ensuring that adequate and balanced levels of nuclear safety research are undertaken in the UK.

It implements these responsibilities through its executive arm the Health and Safety Executive (HSE) by coordinating a research programme under guidelines issued by the Secretary of State for Business, Enterprise and Regulatory Reform funded mainly by the nuclear generators and the licensees who operate the Nuclear Decommissioning Authority (NDA) owned sites.

HSE Nuclear Safety Directorate's remit includes ensuring that the industry properly manages its radioactive waste, and this is reflected in its oversight of the industry research programme.

- Health and Safety Commission nuclear research - <http://www.hse.gov.uk/research/nuclear/index.htm>

The Nuclear Safety Advisory Committee (NuSAC) Sub-Committee on Research

The Sub-Committee on Research provides independent advice, on behalf of NuSAC, to the HSC on all aspects of research related to subjects within NuSAC's remit.

- Nuclear Safety Advisory Committee and the sub-committee - <http://www.hse.gov.uk/aboutus/hsc/iacs/nusac/>

Nuclear Decommissioning Authority future research

Command 5552 and the Energy Act 2004 commit the NDA to play a role in R&D related to cleanup and decommissioning programmes.

NDA will facilitate the formation of a Research Board to oversee R&D in waste management and decommissioning.

Environment Departments and Environment Agencies Research

The Radioactive Substances Division of Defra has a small research programme relating to policy formulation covering control, handling and disposal of UK radioactive wastes; radioactivity in the general UK

environment, and identification and remediation of radioactively contaminated land.

The objectives of Defra's research programme for radioactive substances are to support the development of policies which relate to the safe management and disposal of radioactive wastes; to maintain an overview of environmental radioactivity, policies related to it and the processes governing its movement.

- Radioactivity pages - <http://www.defra.gov.uk/environment/radioactivity/index.htm>
- Radioactive substances research - <http://www.defra.gov.uk/environment/radioactivity/publications/index.htm>

Scientific research by the Environment Agency (EA) relating to radioactive substances is a small part of the total research undertaken by the EA and has a correspondingly small budget.

The EA's research programme over the five-year period from 2006-2011 has two main themes, namely:

1. Improved understanding of the consequences of radioactive waste management options; and
2. Further development of risk assessment frameworks for humans and non-human species.

The EA is concerned, wherever possible, to collaborate, both domestically and overseas, in relevant research programmes and to influence the research as appropriate.

The Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) was formed in 1994 as a company limited by guarantee and a registered charity

It aims to improve the environment of Scotland and Northern Ireland through research and forum activities.

SNIFFER identifies and manages environmental research on behalf of its members - the Scottish Environment Protection Agency, Environment and Heritage Service, the Scottish Executive, Scottish Natural Heritage and the Forestry Commission - and stakeholders.

- Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) - <http://www.sniffer.org.uk/>

Each of the above organisations has a remit which includes the protection and enhancement of the environment of Scotland or Northern Ireland

35. Control of radioactive sources

High activity sealed sources (HASS)

The control of high activity sealed sources is currently the focus of considerable international activity.

Both IAEA and the European Commission are involved in the development of enhanced controls over radioactive sources.

The principal concern of both organisations is to prevent the serious health effects, some fatal, that can occur when sources are lost from regulatory and management controls ("orphan sources").

A "high activity sealed source" is defined in EU legislation as any sealed source containing a radionuclide whose activity at the time of fabrication, or at first placing on the market, is equal to or exceeds one hundredth of the A1 value in the International Atomic Energy Authority (IAEA) Regulations for the Safe Transport of Radioactive Material (ST-1, Revised).

- Safe transport of radioactive material safety standards (on International Atomic Energy Agency website) - <http://www-ns.iaea.org/standards/documents/default.asp?sub=200>

A1 value is the maximum amount of activity for a particular special form radionuclide that is allowed in a Type A package. A1 value for a particular radionuclide is defined as the quantity of that radionuclide resulting in a dose rate of 0.1 Sievert/hr at a distance of 1 meter from the package.

The term "orphan source" generally refers to a source of radioactive material that has been lost from regulatory and management controls either because it has never been under regulatory control, or because it has been abandoned, lost, misplaced, stolen or transferred without proper authorisation.

Highly Active Sealed Sources (HASS) Regulations 2005

The HASS Regulations which came into force on 20 October 2005, are intended to implement Council Directive 2003/122/Euratom on the control of high activity sealed radioactive sources and orphan sources (the HASS Directive).

The Directive aims to enhance the controls on high activity sealed radioactive sources and orphan sources, beyond those established under the Basic Safety Standards Directive 1996, in order to prevent exposure of workers and public to radiation arising from inadequate control of these sources.

- The High-activity Sealed Radioactive Sources and Orphan Sources Regulations 2005 - <http://www.opsi.gov.uk/si/si2005/20052686.htm>

Only some of the UK's inventory of sealed sources will be classified as HASS.

In England and Wales there are some 450 HASS users, and approximately 2000 high activity sealed sources in use at any time.

Subsidised collection of surplus radioactive sources in the UK

A UK-wide project is being funded by the Government to collect and safely store or recycle surplus sources from publicly funded bodies such as hospitals, universities, schools and museums. This project is managed by the Environment Agency on Government's behalf.

This project aims to assist organisations to safely manage their surplus sources and thus keep in line with the HASS Directive (which imposes greater management duties on source holders).

For the purposes of this project, a surplus source is a radioactive source which is no longer used or intended to be used for the purpose for which registration under the Radioactive Substances Act 1993 was granted.