RADIOACTIVE WASTE MANAGEMENT PROGRAMMES IN OECD/NEA MEMBER COUNTRIES

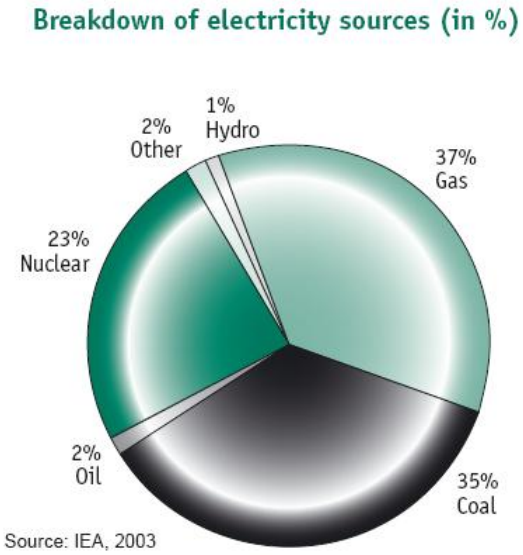
UNITED KINGDOM

NATIONAL NUCLEAR ENERGY CONTEXT

Commercial utilisation of nuclear power in the United Kingdom started in 1956 and as of 2009 there are 23 nuclear power units supply electricity to the electricity grid.

The UK Government published its Energy White Paper "**Meeting the energy challenge: a white paper on nuclear power**" in January 2008. This stated that nuclear should be part of the UK's low-carbon energy mix, that companies should have the option of building new nuclear power stations, and that the UK Government should take facilitative actions to enable this to happen.

Against the challenges of climate change and security of supply the UK Government believes that nuclear is an important part of our energy policy, alongside reducing our energy use, increasing renewables, and investing in new technologies.



SOURCES, TYPES AND QUANTITIES OF WASTE

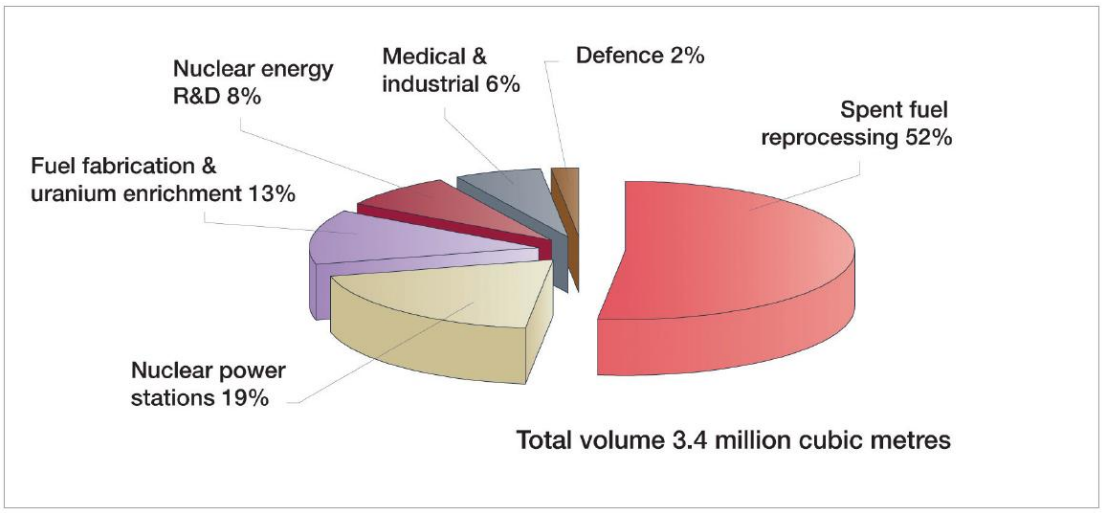
Radioactive wastes arise from the generation of electricity in nuclear power stations and from the associated fuel cycle, from the use of radioactive materials in industry, medicine and research, and from military nuclear programmes. There is a wide range of wastes, from those that contain high concentrations of radioactive materials, to general industry and laboratory wastes which are only lightly contaminated with activity. They can arise in solid, liquid or gaseous form. Some wastes, mainly gases and liquids containing very low concentrations of activity, may be routinely discharged to the environment in accordance with regulatory arrangements in the UK. Discharges are made within authorised limits, usually after some form of treatment. Radioactive wastes with higher contents of activity, which could lead to these limits being exceeded, cannot be discharged. In accordance with Government policy, these non-dischargeable wastes are either disposed of as solid wastes at authorised sites for low-level waste, or where suitable sites are not yet available, held in storage until such sites are developed for the long-term management of intermediate- and high-level waste.

In the UK, radioactive waste is classified under the following broad categories, according to its heat-generating capacity and activity content: as high-level, or heat-generating waste (HLW); intermediate-level waste (ILW); low-level waste (LLW); and very low-level waste (VLLW). Two sub-categories are recognized: low volume VLLW arising from, for example, hospitals and universities, that can be safely disposed of with ordinary refuse and high volume VLLW arising from, for example, nuclear decommissioning, which requires controlled disposal.

Stocks and forecast future arisings of radioactive wastes are recorded in the UK Radioactive Waste Inventory, compiled periodically by the Department Energy and Climate Change (DECC) and the Nuclear Decommissioning Authority. The 2007 UK Radioactive Waste Inventory recorded that approximately 3.84 million m^3 of radioactive waste existed as at 1 April 2007 or was predicted to arise from the future operation of existing facilities. Of this 3.47 million m^3 was LLW, 364,000 m^3 was ILW and 1420 m^3 as HLW.

Over 95% (over 3.2 million cubic metres) of the radioactive waste total has already been produced. Some has been processed, and is being held in stores, but most of it is contained within existing nuclear reactors and other nuclear facilities and will not be processed until these are shut down and dismantled. This waste is the legacy of past and current civil and military nuclear programmes.

Waste volumes from each activity from existing facilities (as of 1 April 2007) below:



More information on the UK's radioactive waste inventory is available from http://www.nda.gov.uk/ukinventory/

RADIOACTIVE WASTE MANAGEMENT POLICIES AND PROGRAMMES

WASTE management policies

The UK is a Contracting Party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and its Convention on Nuclear Safety. As a Member State, it is also legally bound to adhere to the laws and standards of the European Union in the way its radioactive wastes are managed. The key principles are as follows:

- Radioactive wastes are not unnecessarily created.
- Wastes are safely and appropriately managed and treated.
- These wastes are safely disposed of at appropriate times and in appropriate ways.
- The policy for the management of radioactive waste is devolved in the UK to the Scottish, Welsh and Northern Ireland governments. The UK Government is responsible for policy in England. The term "the Government" is used where statements apply to all four governments.

Managing Radioactive Waste Safely

In October 2006 the Government accepted the recommendations of the independent Committee on Radioactive Waste Management (CoRWM) on geological disposal, coupled with safe and secure interim storage for legacy wastes. It also supported the recommendation to explore how a site selection approach based on voluntarism (an expression of interest by local communities in hosting a facility) and partnership with local communities could work in practice.

In June 2008 the UK Government and devolved administrations for Wales and Northern Ireland published the Managing Radioactive Waste Safely (MRWS) White Paper setting out a framework for implementing geological disposal for higher activity wastes. The White Paper explains that the Nuclear Decommissioning Agency (NDA) is the implementing organisation, responsible for planning and delivering the geological disposal facility and, as part of this process, will engage with communities and other stakeholders. The NDA already provides interim storage of waste on its sites and will continue to do so for as long as it takes to site and construct a geological disposal facility. The NDA will also undertake a programme of research and development to support optimised delivery of geological disposal and interim storage.

Local Authorities in England were invited to enter into discussions with Government, without commitment, about hosting a geological disposal facility. Welsh authorities were informed, and may choose to enter into discussions, though the Welsh Assembly Government has currently reserved its position on geological disposal. The Scottish Government is not a sponsor of the geological disposal element of the MRWS programme but continues to support long-term interim storage for higher activity radioactive waste and an on-going programme of research and development.

In June 2007 the Scottish Government announced its policy for higher activity radioactive wastes is to support "near surface, near site long-term storage facilities where the waste is monitorable and retrievable and the need for transporting it over long distances is minimal." The Scottish Government is developing a Detailed Statement of its policy on which it will consult in Autumn 2009.

Low-level waste policy review

In 2007 the Government issued a policy for managing solid low level radioactive waste in the UK setting out priorities for managing existing and future wastes from the nuclear energy industry and other sources.

The NDA published its draft UK Nuclear Industry LLW Strategy in June 2009 for consultation in line with the 2007 Policy Statement. Also in line with the policy, Government is planning to publish a non-nuclear industry strategy. The NDA will also develop and publish a plan for the optimal use of the existing LLW repository near Drigg, Cumbria

The revised UK Radioactive Discharges Strategy was published in July 2009. This is an updated and expanded version of the 2002 Strategy and demonstrates how the UK is complying with the Oslo and Paris (OSPAR) Strategy for radioactive substances .

PROGRAMMES and projects

Low-level waste (LLW)

Most LLW is routinely disposed of at the LLW Repository Ltd near Drigg in Cumbria. Authorisations are also issued for the disposal of some LLW, mainly from outside the nuclear industry, by means of burial at suitable landfill sites. Planning consent was granted on 21 April 2009 for the construction of a new LLW disposal facility adjacent to the decommissioning reactor research site at Dounreay.

Intermediate-level waste (ILW)

Most ILW is stored at the site where it has been produced. About two-thirds of the ILW has arisen at the Sellafield site. Much of the rest is held at nuclear power stations of the Magnox design, the nuclear research sites at Dounreay, Harwell and Winfrith, and the Atomic Weapons Establishment at Aldermaston. Waste treatment and packaging programmes are underway and, up to April 2008, about 21% had been conditioned. There is an emphasis on putting the waste into a passively safe form that will be placed in interim storage until final long-term management options have been identified and implemented under the "Managing Radioactive Waste Safely" programme.

High-level waste (HLW)

HLW arises from the reprocessing of spent nuclear fuel. In 2009, all the existing UK stock is held at Sellafield. The HLW from reprocessing arises in liquid form and thereafter undergoes conditioning for long-term management by conversion into a glass, by a process called vitrification. The mass of conditioned HLW at 1 April 2007 was 1,700 tonnes. A further 1,600 tonnes of liquid waste remained to be conditioned by being converted into a glass form. Once all waste at 1 April 2007 and projected future arisings of liquid waste and contaminated scrap items are conditioned the total mass will be 2,900 tonnes. This does not include HLW that will be returned to reprocessing customers in line with Government Policy. Current Government policy is that the vitrified waste should be stored for at least 50 years to allow the heat to decline so as to make long-term management less complex. This should provide sufficient time for a final management solution for the waste to be implemented under the "Managing Radioactive Waste Safely" programme.

Other potential wastes

It is for the Government to decide on a strategy for long term plutonium management and as part of the process is planning to consult publicly. No decision has been taken on a strategy but for technical reasons at least a small percentage of the UK's plutonium stock is unlikely to be suitable for recycling and will therefore need to be disposed of.

RESEARCH and development

FUNCTIONS and responsibilities

Within the UK, each of the component parts of industry, the regulatory bodies and the Government have responsibility for commissioning and funding the research and development necessary to support their respective functions in relation to radioactive waste management.

The NDA also has supplemental functions in this area under the Energy Act 2004 of "carrying out research into matters relating to the decommissioning of nuclear installations, the cleaning up of nuclear sites and the other activities in relation to which it has functions." To help with this role a Research Board on Decommissioning and Clean-up in the UK is being established.

The UK Government recognises that, in addition to research to support the day-to-day work of the industry, the regulators and Government, there is a need for basic research of a more strategic and long-term nature. Such work is funded by various

Research Councils, whose role is to sponsor such work within a range of academic, educational and training organisations.

DECOMMISSIONING AND DISMANTLING POLICIES AND PROJECTS

The Government believes that, in general, the process of decommissioning nuclear plants should be undertaken as soon as reasonably practicable, taking account of all relevant factors. Such factors include the potential hazards posed to the public, workers and the environment, and the benefits obtainable from radioactive decay in this regard, the availability of disposal routes for the wastes and, subject to ensuring public safety, the financial implications of proceeding on different timescales.

Each operator is expected to produce and maintain a decommissioning strategy and plans for its sites. The Government expects that those strategies and plans will take into account the views of stakeholders (including relevant local authorities, public and stakeholder groups). Strategies should include a comprehensive site decommissioning plan for safely carrying out the decommissioning process with due regard to security and protection of the environment. Each plan should take into account any proposed future use of the site in question.

Decommissioning activities at many of the UK's older nuclear sites are now well underway. Some examples are:

- The identification of preferred end states for each of the NDA's sites following engagement with local communities.
- Successful demolition of the former plutonium criticality facility at Dounreay, the completion of the isolation of the Dounreay shaft and the disposal of bulk sodium coolant from the Prototype Fast Reactor.
- Demolition of the former uranium purification facility at Sellafield and the commencement of construction of the sludge packaging plant which will enable safer storage of legacy wastes.
- The first movement of sludge from the Windscale Pile fuel Storage Pond to interim buffer storage, starting the process of desludging one of the highest hazard facilities at Sellafield.
- The completion of the post operational clean out of the Magnox fuel Fabrication Plant and Springfields and the commencement of its decommissioning.
- Demolition of redundant diffusion plant structures at Capenhurst completing all demolition projects on the site.
- Completion of the decommissioning of the Active Handling facility at Winfrith and the release of land for the development of a Science and Innovation Campus at Harwell. .
- Removal of all remaining fuel skips at Hunterston and Hinkley Point A and the emptying of all the residual reactor waste form the vaults at Trawsfynydd.
- The commissioning of the Intermediate Level Waste Store at Hunterston.
- The explosive demolition of the cooling towers at Chapelcross and Calder Hall decommissioning power stations.
- Planning permission has been secured for the LLW facility at Dounreay and

the construction of Vault 9 has begun at the LLW Repository near Drigg in Cumbria.

Responsibility for decommissioning the UK's publicly-owned civil nuclear sites resides with the NDA.

TRANSPORT

Transport of radioactive material, including waste and spent fuel, is controlled by a comprehensive set of regulations covering transport by road, rail, air and sea, for which the Department for Transport is responsible. The basis for these regulations is the International Atomic Energy Agency Regulations for the Safe Transport of Radioactive Materials.

At present, radioactive waste is transported for storage at suitable facilities, for disposal at the LLW disposal facility near Drigg or at landfill sites, or by incineration. Waste is generated by a large number of organisations ranging from nuclear installations to hospital radio-pharmacies.

At present, with the exception of small amounts of ILW, only low-level radioactive waste is transported. Such movements are not notifiable to the UK competent authority under UK law. The majority of waste is transported by road, and only small amounts are transported by rail.

COMPETENT AUTHORITIES

The **Nuclear Installations Inspectorate (NII)**, part of the **Nuclear Directorate** in the **Health and Safety Executive (HSE)**, regulates the management of radioactive waste on nuclear sites, including disposal facilities. The NII issues nuclear site licences under the *Nuclear Installations Act 1965 (NIA65)*. Before being licensed, the operators must show that the site will be run safely and that they will be able to deal with the liabilities when the site is finally shut down. The HSE must consult the **Environment Agency**, for England and Wales, and the **Scottish Environment Protection Agency**, for Scotland, before granting a licence.

The environment agencies (The Environment Agency, for England and Wales, the Scottish Environment Protection Agency for Scotland and the Northern Ireland Environment Agency) are also responsible for regulation under RSA93 of non-nuclear facilities such as hospitals, universities and manufacturing industries. Such facilities must have an authorisation for the keeping and use of radioactive materials and the accumulation and disposal of radioactive waste to be authorised. The environment agencies also require users of mobile radioactive apparatus to be registered. Registration and authorisation certificates granted by the environment agencies set out limitations and conditions relating to the control of radioactive materials and waste.

The **Nuclear Decommissioning Authority (NDA)** was established in 2005 to take responsibility for the sites operated by BNFL and UK Atomic Energy Authority. These sites are now managed under contracts with the NDA and both the LLW Repository near Drigg and Sellafield have been subject to open competition. An open competition to award the contract in respect of the Dounreay site has begun and will be followed by a competition for the Magnox North and South sites and the Reactor Research Sites in England.

FINANCING

General policy in the UK is that producers and owners of radioactive waste are responsible for bearing the costs of managing and disposing of their waste, including the costs of regulation and of any regulatory-related research undertaken by themselves or by the regulatory bodies. They should calculate the cost of radioactive waste management and disposal liabilities before these are incurred and make appropriate financial provisions for meeting them. They should also regularly review the adequacy of these provisions. Producers and owners of radioactive waste are also responsible for developing their own waste management strategies, and for consulting the Government, regulatory bodies and disposal organisations as appropriate.

The costs of reprocessing and storage of spent nuclear fuel, and the long-term storage, treatment and eventual disposal of radioactive waste from reprocessing fuel, are to be met by the utilities that own it. The UK policy for funding research and development is that each of the component parts of the nuclear industry, the regulatory bodies and the Government itself should continue to be responsible for commissioning and funding the research and development necessary to support their own respective functions in relation to radioactive waste management.

The NDA has responsibility for contracting the operation of commercial and waste management operations on designated sites and for the eventual decommissioning of those sites. The current estimate for the cost of the clean-up programme for these sites is around £70 billion and the programme is likely to take over 100 years to complete. NDA is exploring ways in which the cost can be reduced and the timescales shortened, whilst still maintaining safety, security and environmental standards.

The NDA is funded directly by the UK Government and from income from commercial operations such as electricity generation, fuel fabrication and spent fuel management on its sites. Initially it is revenue from commercial operations made up approximately half of the NDA's total budget although this proportion will reduce over time as operational facilities enter decommissioning.

At £8.44 billion over the three years from 2008/09 to 2010/11, the NDA budget includes the highest ever level of Government spending on nuclear decommissioning.

PUBLIC INFORMATION

For more information, the websites of the relevant authorities and organisations are listed below.

Government

Department of Energy and Climate Change
London
Website: http://www.decc.gov.uk/
E-mail: enquiries@decc.gsi.gov.uk
Department for Environment, Food and Rural Affairs
Radioactive Substances Division London
Website: www.defra.gov.uk
E-mail: helpline@defra.gsi.gov.uk
Department for Transport

Radioactive Material Transport Division
London
Website: http://www.dft.gov.uk/

Scottish Government
Environmental Quality Directorate
Edinburgh
Website: http://www.scotland.gov.uk/
E-mail: radioactivewasteteam@scotland.gsi.gov.uk

National Assembly for Wales
Environment Protection Division
Cardiff
Website: http://www.wales.gov.uk/
E-mail: webmaster@wales.gsi.gov.uk

Health and Safety Executive
Nuclear Safety Directorate
Bootle
Website: www.hse.gov.uk/nuclear

Environment Agency
Radioactive Substances Regulation,
Bristol
Website: www.environment-agency.gov.uk
E-mail: enquiries@environment-agency.gov.uk

Scottish Environment Protection Agency
Radioactive Substances Regulation
Stirling
Website: www.sepa.org.uk
E-mail: public.relations@sepa.org.uk

Nuclear Decommissioning Authority
Cumbria
Website: www.nda.gov.uk
E-mail: enquiries@nda.gov.uk

Food Standards Agency
Radioactivity in Food
London
Website: http://www.foodstandards.gov.uk/
E-mail: helpline@foodstandards.gsi.gov.uk

Industry

United Kingdom Atomic Energy Authority
Didcot,
Oxfordshire
Website: www.ukaea.org.uk

British Energy plc
Gloucester
Website: www.british-energy.com

British Nuclear Fuels
Seascale,
Cumbria
Website: www.bnfl.com