



Introduction

The Submarine Dismantling Project (SDP) is the MOD's programme to deliver a safe, secure and environmentally responsible solution for dismantling 27 defuelled submarines. This involves recycling the bulk of the submarine and safely disposing of the remainder. The submarine's Reactor Pressure Vessel (RPV) contains Intermediate Level radioactive Waste (ILW) and must be stored for an interim period until it can be processed and sent to a proposed Geological Disposal Facility (GDF) sometime after 2040.

Radioactive materials must be carefully managed to minimise the risk they pose to people and the environment. This factsheet describes the radioactive waste that will be created by submarine dismantling. It explains how the waste that cannot be disposed of immediately will be stored until disposal is possible.

Types of Radioactive Waste

Solid radioactive waste is categorised according to its radioactive content and the heat it produces. Each of these categories is managed in a different way.

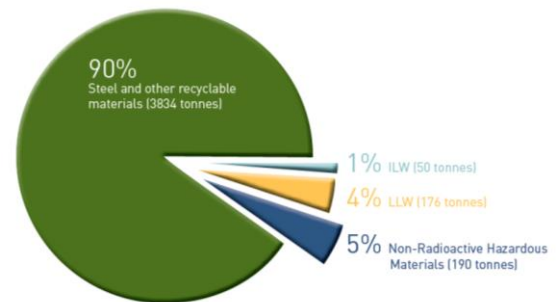
- High Level Waste (HLW) is waste in which the temperature may rise significantly as a result of its radioactivity. Most HLW is currently stored at Sellafield in Cumbria. SDP will not generate any HLW.
- Intermediate Level Waste (ILW) has lower levels of radioactivity than HLW and does not generate sufficient heat for this to have to be taken into account in the design of storage or disposal facilities. There is no disposal route currently available for ILW so it must be stored until a proposed UK Geological Disposal Facility (GDF)¹ is available.
- Low Level Waste (LLW) has lower levels of radioactivity than ILW. There are existing facilities for the disposal of LLW, such as the LLW Repository in Cumbria.

¹ Scottish Government policy for ILW differs from the policy in England and Wales and is for long-term management in near-surface, near-site facilities. This policy is not, however, applicable to waste arising from the decommissioning of out-of-service nuclear submarines.

Waste from Defuelled Submarines

Around 90% of the materials on the submarines, such as steel and other metals, can be recycled. There will also be some non-radioactive hazardous waste (such as asbestos), which will be disposed of through existing routes, and some other waste materials that cannot be recycled.

The radioactive waste on the defuelled submarines includes LLW, such as contaminated pipework, and ILW, most of which is steel in the RPV that has become radioactive as a result of its exposure to radiation. There is no HLW in the defuelled submarines. The pie chart below shows the estimated amount of each material or waste resulting from dismantling a Trafalgar Class submarine.



Interim ILW storage

Submarines weigh between 5000 and 16000 tonnes, of which up to 50 tonnes will be ILW (for comparison, a fully-loaded articulated lorry weighs up to 44 tonnes). The total volume of ILW produced from all 27 submarines is expected to be about 0.2% of the UK's total ILW inventory from all sources. For comparison, this is less than 10% of the volume of ILW generated by a single civil nuclear power station over its lifetime².

ILW must be stored safely and securely until a GDF is available for its disposal, as such SDP must provide interim storage for the ILW from the submarines.

² Based on packaged waste at the point of disposal in a GDF



ILW storage for SDP

Interim storage facilities are required to be located on secure nuclear licensed or authorised sites, regulated by the appropriate government agencies. The store and its contained packages will be continuously monitored throughout the store's life (up to 100 years) to ensure that they are safe.

Geological Disposal Facility

A Geological Disposal Facility (GDF) is a highly-engineered facility capable of isolating radioactive waste within multiple protective barriers, deep underground, to ensure that no harmful quantities of radioactivity ever reach the surface environment. The UK Government's policy for the long-term management of higher activity radioactive waste was developed following a thorough review by the independent Committee on Radioactive Waste Management (CoRWM). CoRWM took the view that geological disposal, coupled with safe and secure interim storage, was the best available long-term approach.

Radioactive Waste Management Ltd (RWM) are responsible for implementing Government policy on geological disposal. As the developer of a GDF, RWM carry out generic preparatory work to plan for geological disposal. This work is described as "generic" because no sites have been identified yet. RWM is a wholly owned subsidiary of the Nuclear Decommissioning Authority, which is an Executive Non-Departmental Public Body of the Department of Energy and Climate Change.

Please see the UK Government's recent Implementing Geological Disposal White Paper³ for further information.

Glossary

Radionuclide - A radionuclide (or radioisotope) is any chemical element that has an unstable nucleus. This causes the radioactive material to decay and emit radiation.

Half-life - The time taken for a particular type of radioactive element to decay away by half. Can be a fraction of a second or many thousands

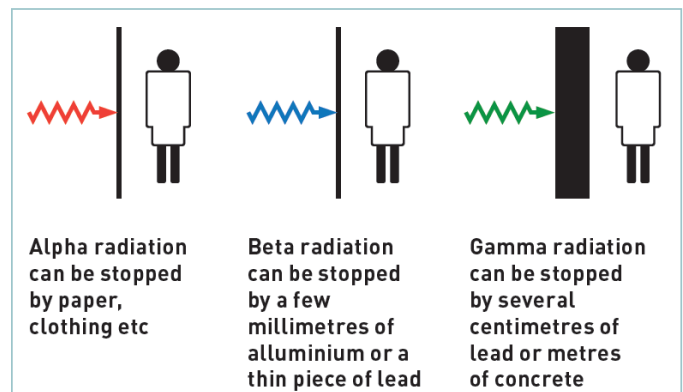
³ www.gov.uk/government/publications/implementing-geological-disposal.

Impact of Radioactive Decay

The rate and type of decay varies depending on the different radioactive elements present (called radionuclides). The three main radionuclides of interest in the ILW removed from submarines will be Cobalt 60, Nickel 59 and Nickel 63.

Cobalt 60 is a Gamma radiation emitter and it is relatively short-lived, losing half its radioactive energy every 5.27 years (this is called its 'half-life'). This means that it decays relatively quickly so, after a period of interim storage, the gamma radiation, which requires heavy shielding, will have significantly reduced.

Nickel 59 and Nickel 63 are Beta radiation emitters but have much longer half-lives of 76,000 years and 100 years respectively. This means that Beta radiation would take many thousands of years to reduce significantly so, for all practical purposes, a quantity of ILW will always remain but, because beta is less penetrating, it will require progressively less shielding over time.



More Information

Further information and all SDP consultation documents are available at:

<https://www.gov.uk/government/publications/submarine-dismantling-project-interim-storage-of-intermediate-level-radioactive-waste>

