

Generic Design Concepts - How they will evolve

Information to West Cumbria Managing Radioactive Waste Safely Partnership

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1. Introduction

This note briefly summarises how we (the Nuclear Decommissioning Authority Radioactive Waste Management Directorate, NDA RWMD) have addressed the development of generic designs for geological disposal; how different designs could be applied to different geological environments; and how a site specific design would evolve. It is based on a presentation given by Alun Ellis at the September 2009 meeting of the West Cumbria Managing Radioactive Waste Safely Partnership.

2. Generic designs

Designs for geological disposal in the UK are currently developed by us as generic designs. Generic designs are based upon specific assumptions on the typical characteristics of the geological environment that is available in the UK. These generic designs have been developed drawing on work done in the UK and in international programmes in different geological environments. Different rock types have different physical properties and therefore require different technical solutions for disposal. Developing generic designs allows a typical representation of appropriate sizes of excavation; designs of rock support; designs of disposal vaults or cells in a particular rock. The use of generic designs and safety and environmental assessments of these designs allows us to challenge and improve these designs. The generic designs also address appropriate disposal solutions for different waste types.

Developing these designs, in turn, helps to enhance the understanding of how waste disposal could be carried out in particular generic environments; how safety can be addressed in all phases of development; how long it might take to develop and what it is likely to cost. The generic designs provide us with a basis for developing waste package specifications. We are then able to check that current waste packaging proposals from waste producers are consistent with transport, operational and long-term safety requirements using the Letter of Compliance Process.

3. Site-specific designs

Generic designs show layouts and arrangements which are indicative of how a disposal facility might look for a particular host rock type, whereas site-specific designs would take account of specific features both on the surface and underground. At this early stage in the process it is not possible to specify exactly what a geological disposal facility will look like. The detailed layout and design of the basic geological disposal facility features both above and below ground will depend on its location, as the actual design will be tailored to the geography and specific geological structure at the site in question.

Potential surface features of a geological disposal facility might include for example construction support facilities, workshops, an encapsulation plant, services, management and administration buildings, buffer waste storage, visitor centre, etc.

Planning controls will ensure that these are appropriately structured and landscaped and are architecturally designed to fit in with the local environment. Consequently, layouts for both surface and underground are likely to differ from generic layouts.

Typically, surface and underground layouts depend on:

- Local topography, features, access routes, drainage and other facilities
- The geological characteristics of both the overlying rocks and the host geological environment, typically this would include factors such as the depth of the host environment; the thickness; the arrangement of fault zones; and localised variations in rock properties.
- The type and volume of waste for disposal would also influence the provisions both on the surface and underground.

Surface facilities

In the construction stage at the beginning of the programme, the surface facilities would be focused around underground construction (shaft and drift excavation) and preparation activities associated with development of surface facilities (e.g. soil stripping, services and landscaping). This would be followed on the surface by the construction of surface facilities. The surface facilities would include:

- Facilities to support construction activities;
- Waste handling, maintenance and services;
- Transport and other infrastructure (railway sidings and/or roads);
- Offices, control rooms and visitors' centre;
- Underground accesses (shafts/ drifts).

The visual impact of surface facilities will be a key consideration and where shafts are used these would be the highest structures at c. 30m high. Layout of the surface site would be dictated by site specific factors (topography, available space, drainage, roads and other local features). Layouts could be organised to take advantage of local features and/or screening to reduce visual impact. The NDA will work with the potential host community to develop the designs of the surface facilities to ensure they are sympathetic to the local environment.

Underground Facilities

Once initial underground access routes (shafts or drifts) are constructed, excavated rock would be brought to the surface and either used for site screening/landscaping or removed from site. Underground construction materials that will be brought to the site would include, rock support materials, blasting materials and steel and concrete for underground installations.

The underground site could either directly underlie the surface facilities or could (where drift access is used) be located anything from directly underneath the surface (spiral drift) to a few kilometres away (typically about 4km distance). It would be feasible to locate the underground facilities up to about 8km away with some performance penalties on waste transport distances but any distance beyond 8km would become difficult. Shafts would necessarily overlie the surface facilities otherwise connecting underground tunnels would be required.