Scotland’s Higher Activity Radioactive Waste Policy

RETRIEVABILITY AND REVERSIBILITY
Introduction

1. The purpose of this document is to provide an outline of the issues of retrievability and reversibility.

Scottish Government Policy

2. The Scottish Government Policy for Higher Activity Waste (Ref 1) is that the long-term management of higher activity radioactive waste should be in near-surface facilities. Facilities should be located as near to the site where the waste is produced as possible. Developers will need to demonstrate how the facilities will be monitored and how waste packages, or waste, could be retrieved. All long-term waste management options will be subject to robust regulatory requirements.

3. When waste is managed in a storage facility it is always on the basis that it will have to be retrieved. This means that the waste is regulated on the basis that its retrievability, whilst in storage, can be demonstrated to the satisfaction of the regulators.

4. When waste is managed in a disposal facility it is on the basis that there is no intention to retrieve it. It is not that the waste cannot be retrieved, if that proved necessary, rather that there is no intention to retrieve it.

5. The Scottish Government Policy does not specify how retrievability will be demonstrated. It will be for operators to demonstrate how this is to be done in the design and management plan for any storage or disposal facility to the satisfaction of the regulators.
Terminology

6. The terms “retrievability” and “reversibility” vary in meaning in different countries and organisations. This document uses the terms as currently defined by the OECD/NEA Retrievability and Reversibility (R&R) project (see paragraphs 11 – 13 below).

Retrievability, in waste disposal, is the ability in principle to recover waste or entire waste packages once they have been emplaced.

Retrieval is the actual action of recovery of the waste, whereas, retrievability is the potential for such retrieval.

Reversibility describes the ability in principle to change or reverse decisions taken during the progressive implementation of a disposal system.

Reversal is the action of going back on a previous decision either by changing direction or perhaps even by restoring the situation that existed prior to that decision.

Retrievability

7. Retrievability and reversibility are not new issues. The concept of retrievability has been discussed widely in the national radioactive waste management programmes of many countries. An EC Concerted Action study in 2000 (Ref 2) involving waste management organisations from nine European countries reported that retrievability was being investigated in virtually all national programmes for disposal facilities as part of their concept development.
8. There have been national studies on the subjects of reversibility and retrievability. Some countries have taken direct or indirect steps towards requiring retrievability in disposal facilities as a matter either of legislation (e.g. France) or national policy (e.g. Canada).

9. Some countries require retrievability to be an option post disposal, for example even if it regarded as a waste in this generation, future ones may regard it as a resource.

10. A table showing the current status of disposal programmes in a number of countries with respect to the roles of reversibility and retrievability in those programmes can be found at:


12. The Nuclear Energy Agency (NEA) produced the initial report in 2001 to provide an overview of the relevant issues based on the understanding and views of experts from the waste management community in NEA Member Countries. It is accepted that national programmes would benefit from a shared understanding of the reversibility and retrievability concepts at the international level. The OECD/NEA project, which the Scottish Government is directly involved with, involves a review, begun in 2008, of the 2001 document.

13. There are two main working documents which have been under construction – the draft report, which would essentially be an update of NEA-3140, and a 4-page leaflet explaining the concepts of reversibility and retrievability. Both documents have been extensively revised in the course of the work and a modified draft report was placed on the
OECD/NEA web in late 2010 and formed the source material for a conference on R&R in Reims which was held in December 2010. Following the conference a review of the draft report is to take place before finalisation of the Report by mid 2011.

14. It is clear that the concept of retrievability is an important issue for stakeholders and international experience demonstrates that it is now being considered in designing disposal facilities around the world.

15. Whilst much of the work on retrievability is in relation to a deep geological disposal facilities the main principles and concepts are applicable to all types of disposal facilities, including near surface facilities.

**The R-Scale**

16. Retrievability relates to storage of waste and also disposal, with increasing levels of difficulty arising from retrieval as the scale progresses from storage to disposal.

17. The NEA R&R project has developed a “R-scale” to illustrate qualitatively the degree and type of effort that is needed to retrieve the waste before and after its emplacement in a facility (Ref 4). The R-scale was developed in relation to a deep geological disposal facility but the main principles are applicable to all types of disposal facilities.

18. The scale demonstrates that, as time passes the process of retrieval becomes more difficult, but the level of passive safety grows and the need for active management declines.

19. This growth and decline may be viewed as less marked in a near surface facility, compared with a deep geological facility, as in the former case the waste is potentially more vulnerable to disturbance and
therefore continues to require management for the period during which it represents a hazard.

20. Although the concept of retrievability is built into the Policy as a requirement, as demonstrated by the scale, this could mean that disposal facilities can still be backfilled and sealed. However, following closure of the disposal facility, waste retrieval would become significantly more difficult. Some form of excavation would be required to retrieve waste containers or recover wastes in the event containers have lost their mechanical integrity.

21. SEPA requires, within the “Near-Surface Disposal Facilities on land for Solid radioactive Wastes – Guidance on requirements for Authorisation” (GRA) (Ref 5) that if a developer/operator in Scotland makes provisions for retrievability, these should not unacceptably affect the environmental safety case. For example, a developer/operator might propose to keep a facility open that would otherwise be ready for closure, solely to maintain the option to retrieve waste emplaced in the facility. In such circumstances, the environmental safety case would need to demonstrate that processes such as degradation of waste packages would not unacceptably affect the safety of people or the environment.

22. Such a demonstration would need to consider the effect of remaining open on the environmental safety case both for the period before the delayed closure and for the post-closure period

Reversibility

23. In long-term radioactive waste management, consideration is increasingly being given to concepts such as “stepwise decision making” and “adaptive staging” in which stakeholders are to be meaningfully involved in the review and planning of developments. The key feature of
these concepts is development by steps or stages that are reversible, within the limits of practicability (Ref 6).

24. Reversibility denotes the possibility of reconsideration of one or a series of steps at various stages of a programme. This is designed to provide reassurance that decisions can be reversed if experience shows them to have adverse or unwanted effects. A stepwise approach to decision making has thus come to the fore as being of value in advancing long-term radioactive waste management solutions in a societally acceptable manner.

Implementation Strategy

25. There will be a Strategy to implement the Scottish Government’s Policy on higher activity waste which will be subject to a Strategic Environmental Assessment (SEA). The Implementation Strategy (IS) and the SEA will be led by the Scottish Government and will be based on a stepwise approach engaging with stakeholders in the development of the IS and the SEA.

26. The key issues which will be addressed in the initial work on the next stage are:

- Knowledge and Information Management
- Legislation, Regulation and Guidance
- Waste identification, Treatment and Packaging
- Location, Design and Construction of Treatment or storage or Disposal facilities
- Social and Economic Costs and Benefits
- Best Practice and Experience in the UK and Internationally
27. The design of treatment or storage or disposal facilities will need to clearly demonstrate how waste packages and waste can be retrieved from storage or disposal facilities.

28. The Policy Statement has taken account of experience elsewhere, notably the Scottish Government’s direct involvement in the OECD work on retrievability and stakeholder engagement for the long-term management of radioactive waste. This will continue into the next stage of the IS where further work will be undertaken to establish and make use of international experiences, particularly with regard to retrievability, in planning and developing near-surface facilities.
Bibliography

A selected international bibliography on reversibility and retrievability to support the current NEA R&R project can be found at:

References

http://www.scotland.gov.uk/Publications/2011/01/20114928/0


6. Stepwise Approach to Decision Making for Long-term Radioactive Waste Management OECD/NEA -