

Managing radioactive waste

What is the Nirex
Phased Disposal Concept?

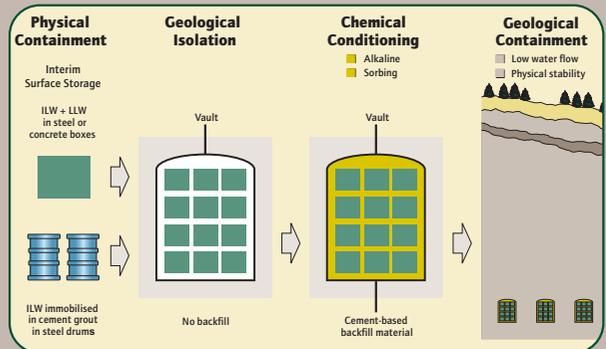
nirex

What is the Nirex Phased Disposal Concept?

Radioactive waste exists and one of the most important ethical, environmental and safety issues facing the UK is how to deal with it in the long term. The objective of responsible long-term management of such waste is to isolate it from both unwarranted human intervention and natural occurrences, so as to protect both the environment and those who live in it from the radioactivity. For some kinds of radioactivity this requires long-term plans spanning hundreds of thousands of years.

The Phased Disposal Concept is a multi-barrier, multi-phased approach, based on storing wastes deep underground, beyond disruption by man-made or natural events. It is so called because we have worked over the last few years to incorporate extended **monitoring** and the option of **retrievability** into our concept. These ideas have been incorporated as a result of extensive consultation with a range of interested groups and individuals.

The Nirex Phased Disposal Concept is one of the options on which Nirex conducts research for the long-term management of radioactive waste. It is our, and many others', currently preferred solution. Similar deep disposal routes are being actively implemented in Finland, Sweden and USA. It provides a vision as to how radioactive waste could be managed in the long term and so allows us to set the standards against which waste is packaged and conditioned today.



Phased disposal concept

One of the important features is that choices on how, and if, to proceed, are left in the hands of future generations without placing an undue burden upon them. This is achieved by dividing the plan into a number of phases.

Phase 1 – Packaging the waste

For enhanced safety in storage, Government policy is to package and immobilise intermediate-level waste (ILW) as soon as possible. This phase is already under way, at the sites where the waste is generated. Packaging standards adopted in the UK are set by Nirex based on the Nirex Phased Disposal Concept. Waste packages provide the first of several safety barriers - physical containment.

Phase 2 – Interim surface storage

Continued storage of packaged wastes, generally at its site of origin or site of packaging. Together with the above packaging phase, this represents the present situation, while Government long-term policy is still under review, (see www.corwm.org.uk). This phase lasts only until some other facility is able to receive the waste packages for longer-term management.

Phase 3 – Transport

The waste packages will be transported to a single national waste management facility. During transport, extra containment and radiation shielding will be used where necessary.



ILW packaged and conditioned in a 500l drum



ILW interim surface store



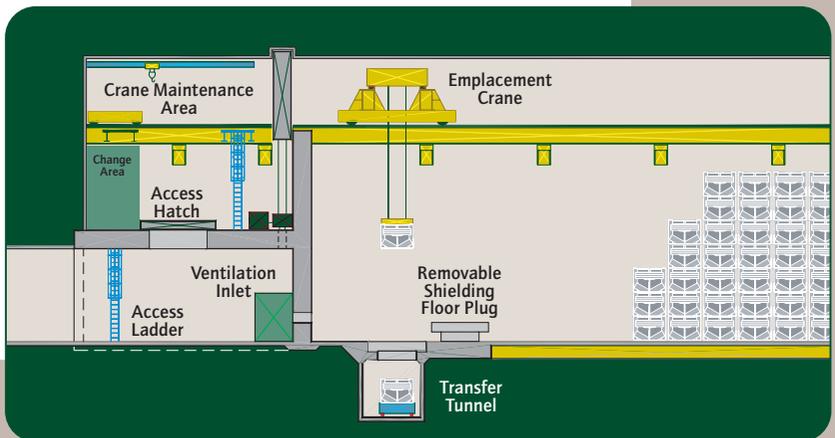
Transporting the waste

Phase 4 – Waste emplacement

Our plan for this phase is to stack the waste packages in large purpose built vaults excavated at depth (300–1,000m deep) within a suitable rock formation. This effectively removes them from man's environment, and from many of the risks associated with surface or near-surface storage. This emplacement phase would provide another barrier, geological isolation, but would not yet provide long-term geological containment.

Phase 5 – Monitored underground storage

In the carefully controlled and monitored environment of an underground store, the waste packages could remain with no need for intervention for as long as desired by future generations. This gives future generations a wide range of options. They could proceed to the next phase of the plan when desired, or they could even retrieve the packages for some other type of long-term management.



Longitudinal section through ILW vault emplacement

Phase 6 – Backfilling

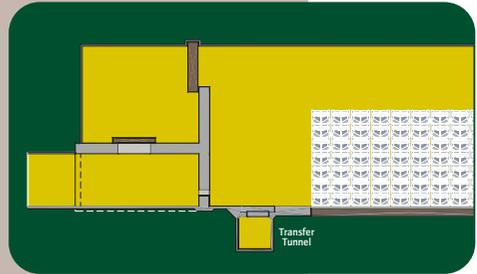
When sufficient confidence is obtained, or society desires it, the spaces between the stacked waste packages can be 'backfilled' by pumping in a specially developed cement mix, which then sets into a huge solid block. This cement is a very effective barrier against the movement of potentially mobile radioactive materials into the groundwater that is present in rocks deep underground. Not all of the vaults have to be backfilled at once – monitoring of backfill performance can continue alongside phase 5. Waste packages could still be retrieved, (albeit with increased difficulty) if necessary or desired, after this backfill has been added.

Phase 7 – Repository closure

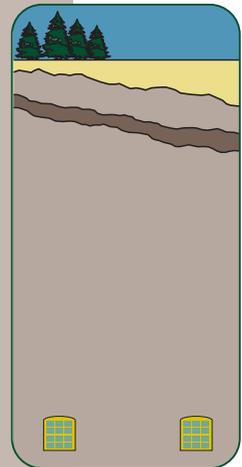
When backfilling has been completed, the repository can be closed and sealed, at an appropriate time. The final barrier against movement of radioactivity is the geological environment in which the repository was built. When society decides to seal the repository, its behaviour will have been confirmed by a monitoring programme and conditions could continue to be monitored indefinitely.

Phase 8 – After closure

The multiple barriers mentioned above would provide the long term containment of radioactivity in the repository, without the need for continued maintenance and would thus protect human health and the environment. This does not mean that the repository would be forgotten about, as it is envisaged that it would continue to be monitored from the surface.



Longitudinal section through backfilled ILW vault



Closed repository

A plan with options

We have developed this long-term plan that progresses towards permanent disposal, but in a series of phases. Future generations could follow this plan all the way to closure, but we leave their options open. In the light of their future knowledge, they can decide to move on to the next phase, or whether to change the plan. Up to a very late stage, they can even retrieve the waste packages and manage them some other way if they wish. In this way we take as much responsibility as we can for managing the waste we have created, but we do not tie the hands of future generations.

Further information

For further information, other leaflets and links to other related websites, visit us at www.nirex.co.uk.

If you have any questions or comments, please contact us by e-mail on info@nirex.co.uk, or write to the Corporate Communication Department at the address below.

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