

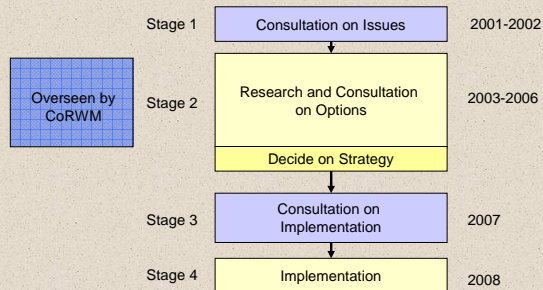
Geological aspects of radioactive waste management

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Contents

- Current UK Policy
- Geological disposal of wastes
- Geoscientific challenges
- Conclusions

Managing Radioactive Waste Safely



Government Policy

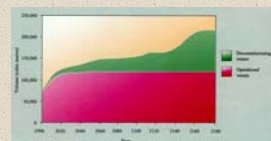
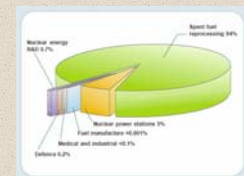
- Announced on 25 October 2006;
- Higher active wastes to be managed in long-term through geological disposal;
- Until geological disposal facilities available, continuing need for safe and secure interim storage;
- NDA will be implementing organisation;
- NDA will be augmented by transfer of Nirex into NDA. Nirex will be wound up;
- Independent scrutiny and advice to Government by a successor body to CoRWM; and
- Open and transparent partnerships with potential host communities seen as important to implementation.

Timescales for implementation

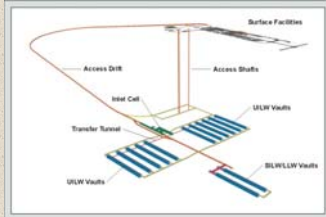
- Intermediate Level Waste
 - Baseline date for first waste emplacement is 2040
 - Sooner or later dates can be envisaged
- High Level Waste
 - Opportunity for co-located repository with ILW
 - Baseline data for first waste emplacement is 2070

The Wastes

- Legacy wastes
 - Primarily from civil nuclear power
- Decommissioning wastes
- Possible wastes
 - Wastes from new nuclear power stations
 - Spent fuel
 - Civil stocks of plutonium
 - Civil stocks of uranium



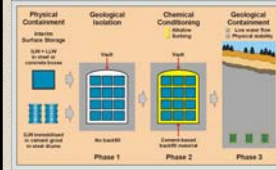
Geological Repository



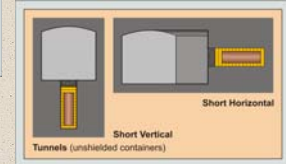
- Waste receipt at surface
- Access to underground;
- Waste handling; and
- Disposal vaults

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Geological Disposal



Intermediate-level waste concept



KBS-3 High-level waste concept

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Differences in concepts

- High level waste and spent fuel
 - Higher reliance on engineered barriers
 - Heat generating wastes
 - Lower importance of gas
 - Engineered barriers sensitive to:
 - high pH
 - fresh and very high salinity groundwater
- Intermediate level waste
 - Higher reliance on geological barriers
 - Lower heat generation
 - Importance of gas generation
 - High pH generated
 - Engineered barriers less sensitive to variations in salinity

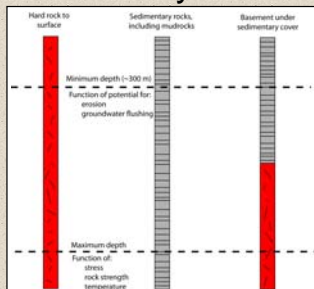
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Geoscientific challenges

- Establish characteristics of potentially suitable sites
- Limit construction impacts
- Long timescales
- Site characterisation

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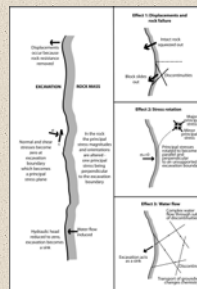
Potentially Suitable Geology



- Range of suitable geologies available
- Suitability influenced by repository concept
- Technical requirements:
 - Deliver radiological performance
 - Constructability
- Many other social, environmental and political issues need to be considered
- UK policy is to seek to identify volunteer communities

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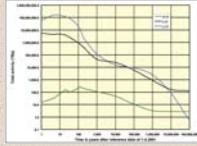
Construction impacts



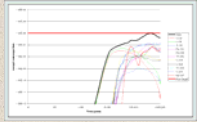
- Radiological performance depends on geology
- Potential to damage rocks by construction activities
- Requirement to:
 - Understand how geology contributes to radiological performance
 - How construction activities affect the ground
 - Design construction operations to limit impacts to within acceptable limits

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Long timescales



- Wastes remain radioactive for very long periods
- As engineered barriers degrade, greater reliance placed on geological barriers
- Timescales likely to embrace geological changes, e.g. glaciations



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Site Characterisation -issues

- Understand scope of multidisciplinary project
- Determine information requirements:
 - Rational basis for planning
 - Recognise likely need for change
- Identify appropriate investigation techniques:
 - Generate required information
 - Appropriately mitigate environmental impacts
 - Provide cost-effective investigations
- Develop implementable programmes to establish resource requirements (finance, time, people, equipment, etc)

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Site characterisation - scope



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Information Requirements

- Rational basis for planning investigations based on clear understanding of:
 - Information that is required;
 - How the information will be obtained; and
 - How the information will be used.

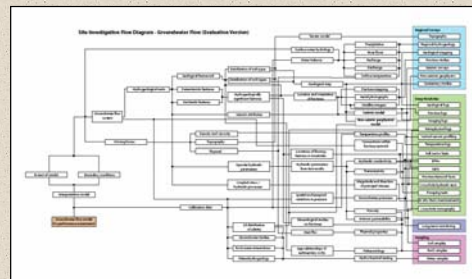
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Site Investigation Flow Diagrams

- Studies progressing in Switzerland, Japan and UK to develop concept
- Describes information flow from data acquisition through interpretation and modelling to end use.
- Provides explanation of why information is needed.
- Directs attention to interpretation and modelling.

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Site Investigation Flow Diagrams



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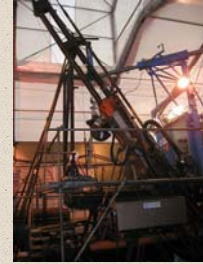
Stages of Investigation

0	Desk Study		
1.1	Initial Site Investigations	Regional Surveys	Sites selected for investigation
1.2		Initial Boreholes	
2.1	Detailed Site Investigations	Drilling and regional surveys	Confirm suitability of site, obtain authorisations, commence construction of repository
2.2			
2.3		Post-completion testing	
2.4		Establish baseline	
3	Man-access Underground Investigations		

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Key Techniques

- Deep Drilling
- Geophysical Logging
- Instrumentation
- Others



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Implementable Programmes

- Definition of scope of works for investigations;
- Identification of interfaces between activities;
- Duration of activities;
- Development of programmes;
- Identification of resource requirements; and
- Identification of risks.

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Conclusions

- Government policy is to manage higher activity wastes in the long-term through geological disposal
- Implementation will be subject to consultation in 2007
- Implementation will demand significant inputs from the geoscientific community
- We must be ready to rise to these challenges

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