

ESDRED PROJECT

Update



Wolf K. Seidler
Antwerp - July 6th, 2006

ESDRED
=
Engineering **S**tudies and **D**emonstrations
of **R**epository **D**esigns

KEY NUMBERS & DATA

- Start date: February 2004
- Project duration: 5 years
- Total budget: € 18.7 millions of which € 7.3 millions provided by the 6th Euratom Framework Programme for Nuclear Research and Training (2002-2006) of the European Union
- 13 participants

THE PARTICIPANTS

1/2

13 Organisations – 9 Countries

7 Radioactive Waste Management Agencies

Participant Short Name	Country	Participant Full Name
ANDRA	France	Agence Nationale pour la Gestion des déchets Radioactifs
ENRESA	Spain	Empresa Nacional de residuos radioactivos S.A.
NAGRA	Switzerland	National Genossenschaft für die Lagerung radioaktiver Abfälle
NIREX	United Kingdom	United Kingdom Nirex Limited
ONDRAF-NIRAS	Belgium	Organisme National des Déchets Radioactifs et des Matières Fissiles Enrichies/Nationale Instelling Voor Radioactief Afvalen Verrijkte Splijtstoffen
POSIVA	Finland	Posiva Oy
SKB	Sweden	Svensk Kärnbränslehantering AB

THE PARTICIPANTS
2/2

13 Organisations – 9 Countries

6 Technological R&D Organisations

Participant Short Name	Country	Participant Full Name
AITEMIN	Spain	Asociacion para la Investigacion y el Desarrollo Industrial de los Recursos Naturales
CSIC	Spain	Consejo Superior de Investigaciones Cientificas
DBE TEC	Germany	DBE Technology GmbH
ESV-EURIDICE-GIE	Belgium	European Underground Research infrastructure for Disposal of Nuclear Waste in a Clay Environment
GRS	Germany	Gesellschaft für Anlagen-und Reaktorsicherheit mbh
NRG	The Netherlands	Nuclear Research & Consultancy Group v.o.f.

THE OBJECTIVES OF THE PROJECT

Focus is on technology

- To fabricate and test **technological demonstrators**
- To promote a common European vision in terms of radioactive waste disposal **technology** applicable to various concepts
- To **disseminate the knowledge** acquired via technical papers, presentations, training courses, workshops, etc...

THE SCHEDULE

N°	2003	2004	2005	2006	2007	2008	2009
1	Input data and functional requirements						
2		Prototypes Testing and Design					
3		Fabrication of Full scale demonstrators					
4			Demonstrations				
5				Evaluation and Final Report			
6		Training, Communication, Integration and Management Activities					

SOME HIGHLIGHTS OF MAJOR RESULTS TO DATE

MODULE # 1: Buffer Construction Technology

Demonstration Objectives

ANDRA: Design, fabricate & manipulate 4ton, 2.25 m Ø, bentonite rings

GRS: In situ construction & long term testing of bentonite plugs for water resaturation, gas permeability & other parameters

NAGRA: Backfilling of the annular gap between waste canister & mockup disposal drift wall using bentonite pellets and augers

NIREX: Non-intrusive monitoring experiments around a micro tunnel at Mont Terri using seismic technology

O/N: Backfilling of the annular gap between waste canister & mockup disposal drift wall using typical pumpable wet cement grouts and assorted dry materials placed with guns

MODULE #1 : Buffer Construction Technology

Major Results to Date

ANDRA: First bentonite ring pressed at Issoire in France on June 12th using a 65 000 ton press. Second pressing planned for July 3rd.

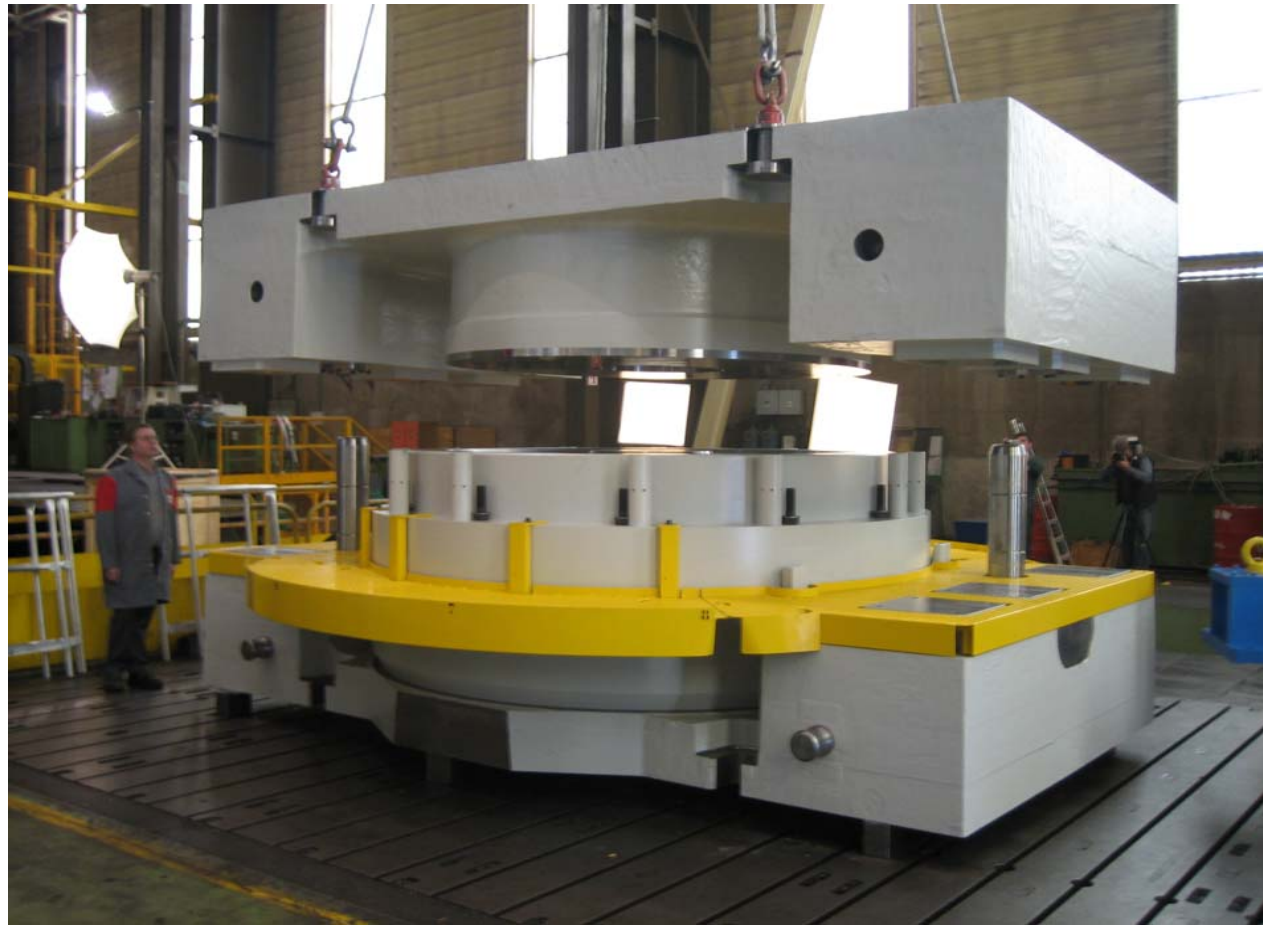
GRS: First lab test completed; 2nd test running to end of year. First gas sealing experiment running at Mt Terri- three others to start soon

NAGRA: Computer modeling of buffer completed and steel mockup of disposal drift constructed

NIREX: First of 4 monitoring experiments at Mont Terri completed; evaluation in progress

O/N: Mockups for wet and dry backfilling tests constructed at MOL; testing is underway

MODULE # 1 : Photos of ANDRA Results – Mold for the Fabrication of Bentonite Rings



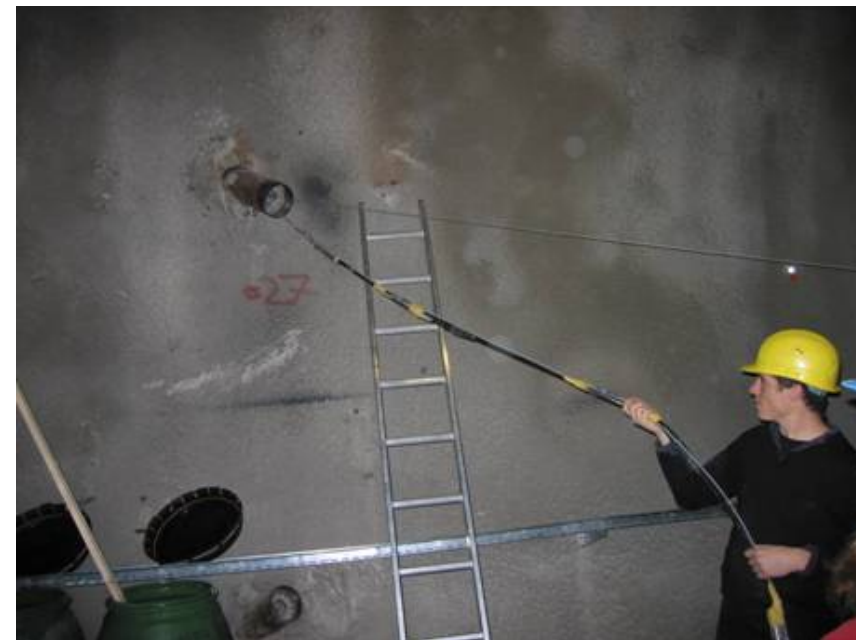
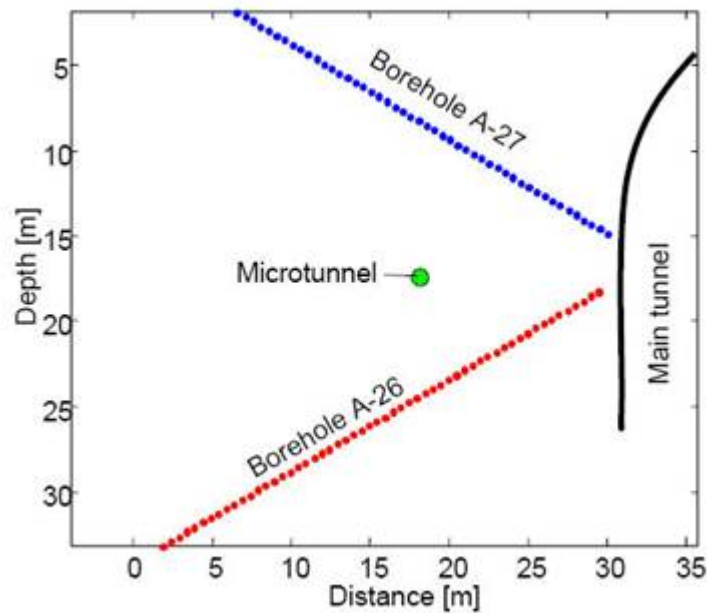
MODULE # 1 : Photo of ANDRA Results – Fabrication of First Bentonite Ring



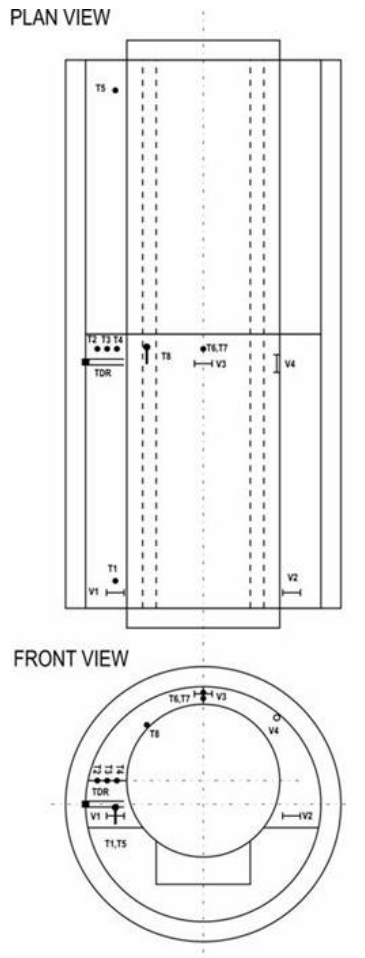
MODULE # 1 : Photos of GRS Results – Operations of Borehole Sealing in Mont Terri



MODULE #1 : Photos of NIREX Results – Logging Operations in Mont Terri



MODULE # 1 : Photos of ONDRAF/NIRAS Results – Construction of Mock-up for Back-filling Operations



MODULE # 2: Waste Canister Transfer & Emplacement

Demonstration Objectives

ANDRA:

- Design, fabricate and test 1:1 scale prototype pushing robot for placing 2 ton vitrified waste canisters in horizontal disposal cells
- Design, fabricate and test industrial scale pushing robot based on results obtained with the prototype

DBE-TEC:

- Design, fabricate and test industrial scale emplacement equipment for placing 5 ton spent fuel canisters into vertical boreholes in salt
- Demonstrate the equipment including transport cart, transfer cask, emplacement device & a borehole lock at a surface facility

MODULE # 2: Waste Canister Transfer & Emplacement

Major Results to Date

ANDRA:

- First of its kind prototype pushing robot designed, fabricated, tested and demonstrated
- Equipment moved to an exhibition hall for future demonstrations

DBE-TEC:

- Basic design of vertical emplacement equipment completed
- Tenders being issued for final design & fabrication

MODULE # 2: Video of ANDRA Results

Musthane Prototype Pushing Robot



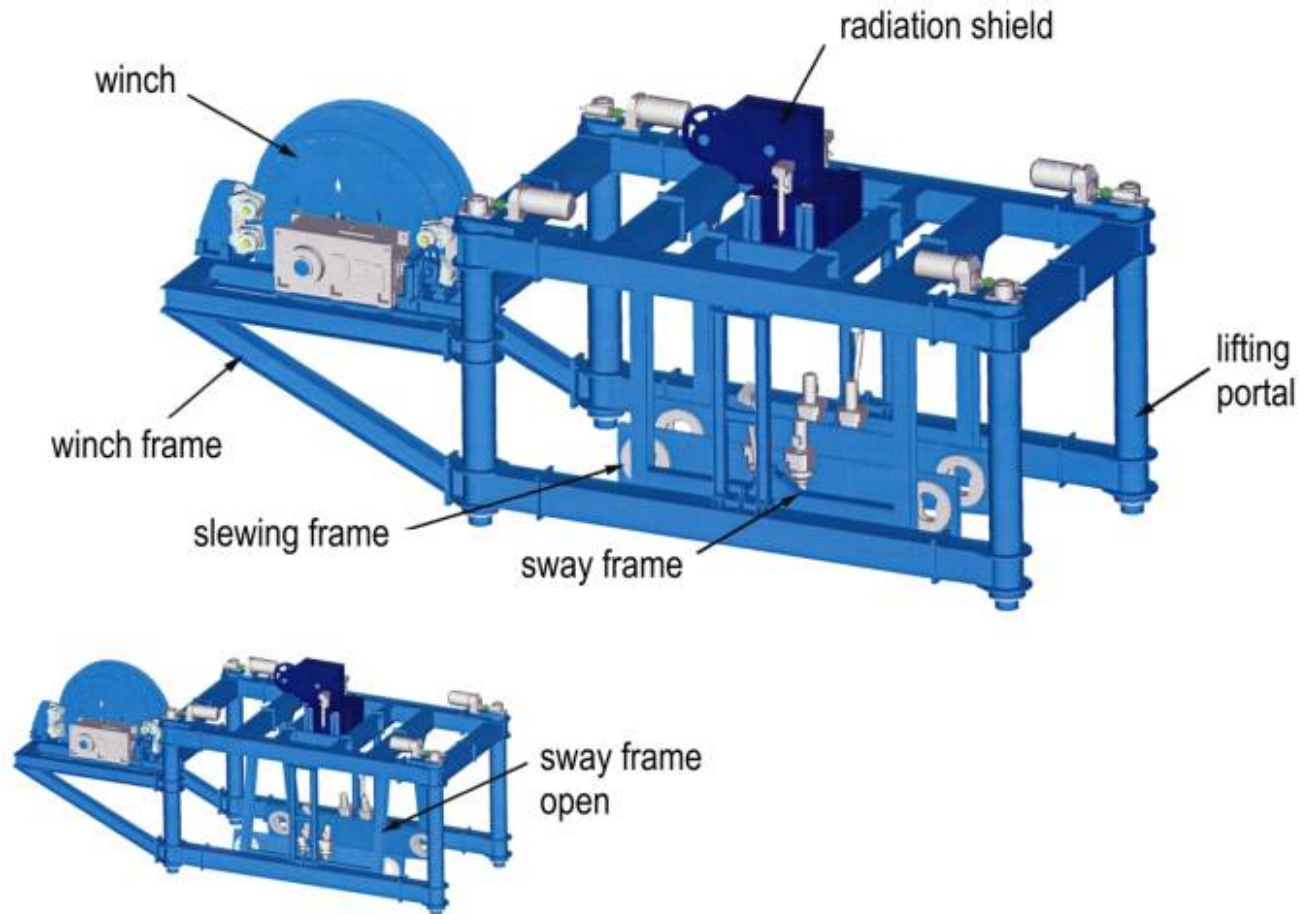
MODULE #2: Photos of ANDRA Results / Layout of Test Bench



MODULE #2 : Photos of ANDRA Results – Canister mock-up (left) and Pushing Robot (right)



MODULE # 2 : View of DBE-TEC Results – Design of Frame for Tilting the Canister from a horizontal to a vertical position



MODULE #3: Heavy Load Emplacement Technology

Demonstration Objectives

ANDRA:

- Design, fabricate & test basic 1/3 scale transporter using air cushions
- Design, fabricate & test 1:1 scale emplacement equipment including mockup of horizontal disposal cell, gamma gates, 43 ton spent fuel canister, sliding plate and AIR cushion cradle
- Ditto for emplacement of 17 ton packages of bentonite rings

SKB:

- Design, fabricate & test 1:1 scale emplacement equipment including mockup of horizontal disposal cell, gamma gates, 43 ton spent fuel canister, sliding plate and WATER cushion cradle
- Demonstrate this equipment underground at Äspö

MODULE # 3: Heavy Load Emplacement Technology

Major Results to Date

ANDRA:

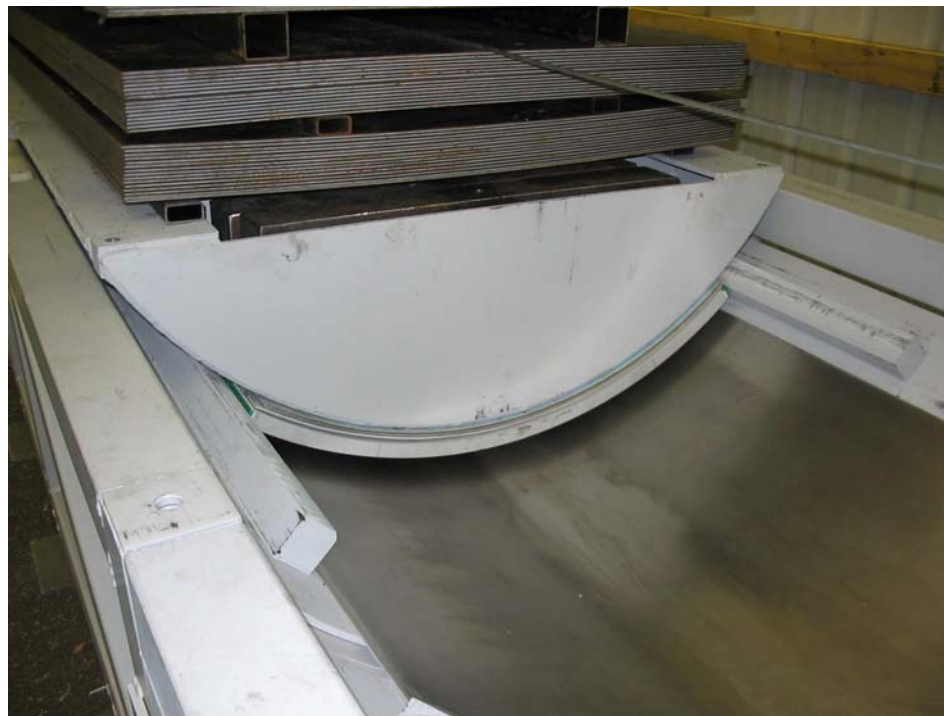
- 1/3 scale air cushion transporter built, tested & demonstrated
- Full scale spent fuel emplacement demonstrator built and demonstrated; testing is ongoing
- Full scale bentonite ring emplacement demonstrator designed; fabrication in progress

SKB:

- Full scale spent fuel emplacement demonstrator built and erected underground at Äspö
- Testing is ongoing; demonstration planned for this fall

MODULE #3: Video of ANDRA Results

Bertin Air Cushion Prototype Demonstration



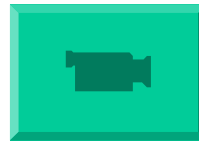
MODULE # 3 : Photos of ANDRA Results / Industrial Demonstrator / General View of Test Bench



MODULE # 3 : Photos of ANDRA Results/Industrial Demonstrator Test Bench - Gamma Gates & Cart



MODULE # 3 : Video of SKB Results



MODULE # 3 : Photos of SKB Results – General Layout



MODULE # 3 : Photos of SKB Results – Emplacement Machine



MODULE # 4: Temporary Sealing Technology (low pH cement & shotcrete)

Demonstration Objectives

- Develop a cement formulation which will produce a concrete with a pH of less than 11
- Use this concrete to develop a shotcrete formulation which can be used to construct low pH concrete plugs for restraining bentonite plugs as they expand
- Develop a low pH shotcrete formulation for rock support
- Construct a low pH plug underground and load it to failure
- Apply a skin of rock support shotcrete underground and monitor results

MODULE # 4: Temporary Sealing Technology (low pH cement & shotcrete)

Major Results to Date

- One metre long low pH plug constructed using shotcrete technique at Äspö
- Plug has been loaded to failure (sliding) and evaluation of results underway
- Skin of rock support shotcrete has been installed underground at Äspö and observation/monitoring is underway

MODULE # 4: Photos of Temporary Sealing Technology Shotcreting Operations for Construction of Plug



Module 5: Training & Communication

Major Results to Date

- Fully functional Web site www.esdred.info is in place
- First 17 Lecture Training Course “*Technology Related to Geological Disposal of High Level Long Lived Radioactive Waste*” has been developed and will be presented to the UNIVERSITY POLITEHNICA OF BUCHAREST on 7 & 8 November 2006
- An International Technical Conference on Practical Aspects of Deep Radioactive Waste Disposal is now confirmed for June 16 -18, 2008 at the Czech Technical University in Prague

Module 5: Training in Bucharest



UNIVERSITY POLITEHNICA OF BUCHAREST

Course Title:
Technology Related to Deep Geological Disposal
Of High Level Long Lived Radioactive Waste

Lecture # 5

TITLE
An Example of Reversible Co-disposal in Clay (French Concept)

Date: 8 November 2006

by

Louis LONDE
ANDRA



UNIVERSITY POLITEHNICA OF BUCHAREST
FACULTY OF POWER ENGINEERING
DEPARTMENT OF NUCLEAR ENGINEERING
Bucharest
8-9 November2006

Module 5: Communication in Prague



The poster features the European Commission logo and 'Community Research' text at the top left. A green curved line separates the header from the main content. The text 'Call for Papers' is centered, with the ESDRED logo below it. To the right is a photograph of a cityscape with a bridge. Below the ESDRED logo, the text reads: 'First Circular & Pre-registration', 'International Technical Conference on', and 'Practical Aspects of Deep Radioactive Waste Disposal'. A horizontal line follows, with the word 'THEME' centered. Below this, the theme is detailed: 'Underground Disposal Unit Design & Emplacement Processes For a Deep Geological Repository "Operational & Safety Considerations"'. Two 3D cutaway diagrams of a disposal unit are shown. Another horizontal line follows, with the host organization information: 'Czech Technical University – Faculty of Civil Engineering', 'Centre of Experimental Geotechnics', 'Prague', and 'June 16-18, 2008'. At the bottom, logos for ANDRA, SURAO, and GRS are displayed.

EUROPEAN COMMISSION
Community Research

Call for Papers

ESDRED

First Circular & Pre-registration
International Technical Conference on
Practical Aspects of Deep Radioactive Waste Disposal

THEME

Underground Disposal Unit Design & Emplacement Processes
For a Deep Geological Repository
"Operational & Safety Considerations"

Czech Technical University – Faculty of Civil Engineering
Centre of Experimental Geotechnics
Prague
June 16-18, 2008

ANDRA SURAO GRS

22 September 2006