

CEG Workshop on
**DISPOSAL OF RADIOACTIVE WASTE AND SPENT NUCLEAR FUEL –
EXPERIENCE AND PLANS**
Sweden, 24-25 February 2009

IAEA NETWORKING ACTIVITIES IN RADIOACTIVE WASTE DISPOSAL

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IAEA Project on Disposal 2008/2009

Major Programme 3: Nuclear Safety and Security
Sub-programme L: Management of Radioactive Waste
L.2: Management and Disposal of all Types of Radioactive Waste

Project L.2.04: *Strengthening capabilities for the disposal of radioactive waste*

OBJECTIVES

- To achieve more familiarity of Member States with approaches and technologies for geological disposal of high level waste developed in countries with most advanced repository programmes.
- To enhance Member States' capabilities to develop and implement safe and cost effective approaches and technologies for the near surface disposal of low- and intermediate level radioactive waste.



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Introduction to “Networking”

- IAEA assists to build and sustain **know-how** and **training**
- Emphasis on **innovative** approaches to **optimize resources**
- Since **2001**, the *IAEA Network for Training in Disposal Technologies in Underground Research Facilities (URF Network)* for HLW/SNF
- This “networking” is showing to be a very **effective** and **efficient** vehicle for training of professionals
- Similar Networks in other activity areas: **decommissioning, disposal of LLW, environmental remediation**



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Why develop a Network approach?

- Create a forum for
 - *sharing information and lessons learned*
 - *transferring knowledge*
 - *comparing approaches* valued by all MS
- **Coordinate support** to organizations or Member States with less advanced programmes from Member States with more experience;
- Complement existing Agency activities with more **demonstration projects** giving practical **hands-on and user-oriented** experience



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NETWORKS – “Centres of Excellence”

Organizations that possess a demonstrated breadth of radioactive waste management (disposal, D&D or ER) experience, a record of excellence in a wide range of areas, facilities suitable for demonstration or training and a willingness to share their experience through the NETWORK, are identified as **“Members”** and acknowledged as **“Centres of Excellence”**.



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NETWORKS - Partnership

- **“Member”** organizations, who will provide expertise and training capabilities
- Activities/operations centred around a real demonstration project, offer a venue for **“Participant”** training and other forms of co-operation, while receiving assistance from **“Members”**



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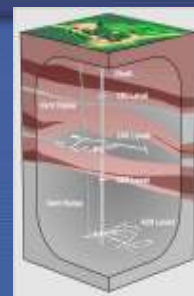
“URF Network” ...

An IAEA Network of “Centres of Excellence”
for training in and demonstration of waste disposal technologies in underground research facilities

- Established in 2001

Contact: b.neerdael@iaea.org

Website: http://www.iaea.org/OurWork/ST/NE/NEFW/wts_network.html



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“DISPONET” ...

An International Network
of “Centres of Excellence”
for the disposal of
low-level radioactive waste

- Being established in 2008-09

Contact: I.nachmilner@iaea.org



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“IDN” ...

An International Network
of “Centres of Excellence”
for the decommissioning
of installations

- Established in 2007

Contact: p.dinner@iaea.org

Website: <http://goto.iaea.org/decommissioning>



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URF Network – Background

- Geological disposal the **preferred option** for the HLW/SNF
- Technologies required are **available**
- Countries are at **various** stages
- Construction of a geological repository for HLW/SNF **not within a decade**
- The URFs contributing to moving from **theory to practice**
- In 2001, several Member States with URFs came together in an *IAEA Network* and offered their facilities for **sharing** training and R&D activities



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Objectives

- Encourage the **transfer, sharing and preservation** of knowledge and technologies
- Work on **solutions** for Member States currently without URFs
- **Supplement national efforts** and promote **public confidence** in waste disposal schemes
- Contribute to the **resolution** of key technical issues

A mechanism to ensure
Member States' **awareness** of
the **latest state-of-the-art** technology
in geological disposal



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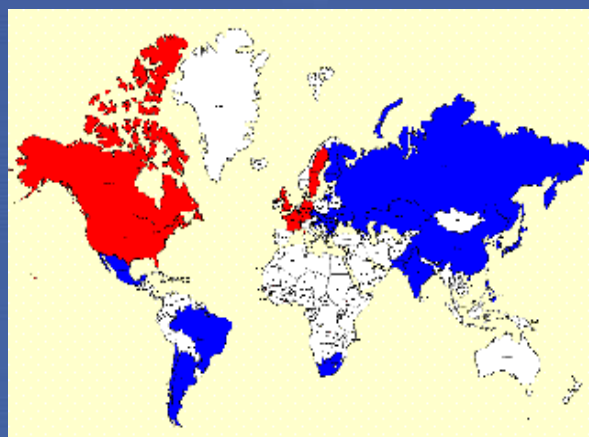
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IAEA Role



Network Members and Participants



■ Network Members ■ Network Participants



Current Member Organizations



Network Members, owners of **unique facilities**, with demonstrated **high quality research** and offered to be part of the Network:



- **Belgium** (HADES URF at Mol; SCK-CEN),
- **Canada** (URL, *Lac-du-Bonnet*; AECL),
- **France** (Underground Test Facility, Tournemire; IRSN),
- **Germany** (Deep Disposal in mined structures; DBE Tech),
- **Sweden** (Äspö Hard Rock Laboratory; SKB),
- **Switzerland** (Grimsel Test Site in Granite and Mon-Terri URL in Clay-stones; NAGRA),
- **UK** (Geoenvironmental Research Centre; Cardiff University) and
- **USA** (Yucca Mountain Project, WIPP facility and LBNL; USDOE).



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Membership growth

Country	Organization	Request for Membership received
Canada	AECL	2000
Belgium	SCK-CEN	2000
UK	GRC, Cardiff University	2001
USA	DOE-WIPP	2001
USA	DOE-LBNL	2002
USA	DOE-UMSCO	2002
Switzerland	NAGRA	2003
Sweden	SKB	2004
France	IRSN	2007
Germany	DBE Technology	2008
France	ANDRA	?
Japan	JAEA	?
USA	SNL	?
Germany	TU Clausthal	?
Finland	POSIVA	?
	ITC	?



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Training Course Themes

1. Fundamentals of Geological Disposal
2. Special Technical Issues
3. Decision Making and Stakeholder Involvement
4. Numerical Modelling



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Training Courses 2003 – 2008 (TC INT/9/173)

No.	Host	Topic	Date	IAEA Participants	
1	USA/CAN	Fundamentals	11 - 22 Aug 2003	8	
2	SWI/BEL *	Fundamentals	20 Oct - 7 Nov 2003	13	
3	USA	Fundamentals	18 - 26 Oct 2004	11	
4	CZE/SWI *	Siting/Fundamentals	16 - 26 Nov 2004	12	
5	HUN *	Decision Making & Stakeholder Involvement	30 May - 3 Jun 2005	14	
6	SWI *	Repository Design, Construction & Operation	19 - 30 Sep 2005	15	
7	USA	Fundamentals	12 - 30 Dec 2005	13	
8	SWE/(UK)	Numerical Simulation with Data Available	29 May - 9 June 2006	12	
9	USA	Numerical Simulation of Subsurface Processes	7 - 17 Aug 2006	8	
10	SWI *	Fundamentals	23 Oct - 1 Nov 2006	16	
11	GER *	DG Repositories in Sedimentary Formations	24 - 28 Sep 2007	15	
12	SWI *	Transport & Retardation Processes in Fractured Rocks	15 - 24 Oct 2007	16	
13	USA	Fundamentals	3 - 14 Nov 2008	9	
14	JAP *	Fundamentals (<i>Postponed indefinitely!!!</i>)	20 - 25 Oct 2008		
15	CAN	Decision Making & Stakeholder Involvement	1 - 10 Oct 2008	12	
16	UK	Numerical Simulations with Experimental Data	14 - 21 Jul 2008	10	
17	SWI *	Cement and Cementitious Materials in Geological Disposal	15 - 19 Dec 2008	10	
* facilitated by ITC, Switzerland				Σ	194



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Training Courses in 2008

- **TC16: 14 – 21 July 2008, GRC, Cardiff University, UK (GRC)**
 - Topic: Numerical simulation with experimental data
- **TC15: 1 – 10 October 2008, Toronto, Port Hope, Kincardine, Chalk River, Canada (AECL, NWMO, OPG, NRC)**
 - Topic: Decision making and stakeholder involvement
- **TC13: 3 – 14 November 2008, WIPP, Carlsbad, NM, and YMP, Las Vegas, NV, USA (USDOE, SNL, YMP)**
 - Topic: Radioactive waste disposal technologies in URFs
- **TC17: 15 – 19 December 2008, Flums, Hagerbach and Mont Terri, Switzerland (ITC)**
 - Topic: Cement and cementitious material in the geological disposal of RW



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Training Courses Planned for 2009

- The IRSN experimental platform: testing in hard clays, Tournemire/Milliau; Host: IRSN, FRA (15 – 19 June)
- From surface-based to underground site characterisation – with ITC, Host: NAGRA, SWI and RAWRA, CZE (15 – 24 Sept)
- Fundamentals of GD – with ITC; Host: DBE Tech, GER (28 Oct – 4 Nov)



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Fellowship Offers 2008 – (1)

BEL

- Fellowship at the HADES URF focusing on the PRACLAY experiment (SCK-CEN), 2009+

CAN

- Surface based diamond drilling and core logging (AECL), 2008 or 2009

FRA

- Circulation of an alkaline fluid in a packed-off section of a vertical borehole drilled from a large scale cylindrical core, 3-4 months, Q3/4 (IRSN), 2008
- Hydro-mechanical behaviour of indurate clay and swelling clay in the sealing system (3-year Ph.D. proposal of IRSN in cooperation with GRC, Cardiff University, UK)



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Fellowship Offers 2008 – (2)

ROK

- Hydrogeological characterization of groundwater flow system (KAERI in KURT), 2008
- Migration of colloids through rock fractures (KAERI in KURT), 2009
- Measurement and modelling: in situ heater test and rock properties (KAERI in KURT), 2008

SWI

- Investigations of magmatic and tectonic structures in the crystalline formations where the Grimsel Test Site is located (NAGRA at GTS), Flexible
- Cyclic deformations in a claystone, shrinkage and swelling measurements (SWISSTOPO at Mont Terri), 2008
- Evaporation logging (SWISSTOPO at Mont Terri), 2008



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Fellowship Offers 2008 – (3)

SWE

- Geoscience (to be specified later) at Äspö (SKB), 2010/2011?
- Communication Aspects at Äspö (SKB), 2010/2011?

UK

- Modelling aspects of coupled thermo/hydro/chemical/ mechanical (THCM) behaviour of an Engineered Barrier System (GRC)
- Modelling of cement/bentonite interaction with radionuclides (GRC), 2008
- 3D modelling of a fully coupled thermo/hydro/chemical/ mechanical behaviour of an Engineered Barrier System (GRC), Flexible
- *Thermo/hydro/chemical/mechanical modelling of engineered barrier system at IRSN URL Tournemire (3-year Ph.D. proposal of GRC in cooperation with IRSN, FRA)??*

USA

- Geoscience (to be specified later) at WIPP (USDOE), 2008/2009?
- Communication aspect (USDOE), 2009?



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New TC Project RER9103

- Budget cycle: 2009 – 2011
- Europe regional TC project with almost the same objective and scope
- Special arrangement for participation in training courses from countries outside of Europe
- Also special arrangement for hosting courses outside of Europe



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Future Outlook

- The Projects are providing **important benefits** that are not available through other avenues
- Given the **renewed interest in nuclear power** – to reduce the Green House effects, and to meet the rising international demand for energy – interest in the Network Project is growing
- Continuation of the Networks consistent with the IAEA mandate to **ensure the safe and sustainable application of Nuclear Energy**
- Network Projects can contribute to the recognized requirement for **nuclear knowledge maintenance and management**
- **Promotion of public confidence goal** should be clearly defined



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