



A Perspective on Radwaste Repositories

Christophe XERRI



Director

Fuel Cycle, Waste Management, Decommissioning and Research Reactors

SOGIN Seminar

7 September 2021

One FACT:

Waste streams ARE managed and solutions EXIST

International Conference on
Radioactive Waste Management
Solutions for a Sustainable Future



1-5 November 2021
IAEA Headquarters, Vienna, Austria

Organized by the
IAEA
International Atomic Energy Agency
Atoms for Peace and Development

QR
code
CN-394

International Conference on Radioactive Waste Management: *Solutions for a Sustainable Future*

1-5 November 2021, Vienna, Austria

<https://www.iaea.org/events/international-conference-on-radioactive-waste-management-2021>



International Conventions & Standards



Joint Convention on the Safety of Spent Fuel Management & on the Safety of Radioactive Waste Management

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

IAEA International Law Series No. 1



Code of Conduct on the Safety & Security of Radioactive Sources

CODE OF CONDUCT ON THE SAFETY AND SECURITY OF RADIOACTIVE SOURCES
放射源安全和保安行为准则
CODE DE CONDUITE SUR LA SÛRETÉ ET LA SÉCURITÉ DES SOURCES RADIOACTIVES
КОДЕКС ПОВЕДЕНИЯ ПО ОБЕСПЕЧЕНИЮ БЕЗОПАСНОСТИ И СОХРАННОСТИ РАДИОАКТИВНЫХ ИСТОЧНИКОВ
CÓDIGO DE CONDUCTA SOBRE SEGURIDAD TECNOLÓGICA Y FÍSICA DE LAS FUENTES RADIATIVAS
مدونة قواعد السلوك بشأن أمن المصادر المشعة وأمنها

Euratom Waste Directive



1. 1994/04 [C] Official Journal of the European Union 2.8.2011

DIRECTIVES

COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste

THE COUNCIL OF THE EUROPEAN UNION, Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Articles 31 and 32 thereof, Having regard to the proposal from the European Commission, drawn up after obtaining the opinion of a group of persons appointed by the Scientific and Technical Committee from among scientific experts in the Member States, Having regard to the opinion of the European Economic and Social Committee (5), Having regard to the opinion of the European Parliament (6), Whereas:

(1) Article 20(1) of the Treaty establishing the European Atomic Energy Community (Euratom Treaty) provides for the establishment of uniform safety standards to protect the health of workers and of the general public.

(2) Article 80 of the Euratom Treaty provides for the establishment of basic standards for the protection of the health of workers and the general public, against the dangers arising from ionising radiation.

(3) Article 37 of the Euratom Treaty requires Member States to provide the Commission with general data relating to any plan for the disposal of radioactive waste.

(4) Council Directive 94/2/Euratom (7) establishes basic safety standards for the protection of the health of workers and the general public, against the dangers arising from ionising radiation. That Directive has been supplemented by more specific legislation.

(5) As envisaged by the Court of Justice of the European Union in its case-law, the provisions of Chapter 3 of the Council Directive 2006/117/Euratom (8) provide for the management of waste from extrinsic industries which may give rise to radioactivity, but excluding such waste as may be produced by radioactivity which are matters dealt with under the Euratom Treaty.

(6) Council Directive 2006/117/Euratom (8) provides for the control of high-activity sealed radioactive sources and orphan sources, including disused sources, in accordance with a common framework for the management of spent fuel and radioactive waste from the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the Joint Convention) and the International Atomic Energy Agency (IAEA) Code of Conduct on the Safety and Security of Radioactive Sources, and current industrial practices, disused sealed sources can be stored, recycled or disposed of in many cases, this needs a return of the source or return of the equipment, including the source, to a supplier or a manufacturer, for requalification or processing.

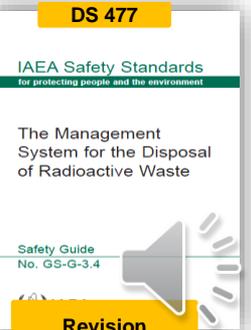
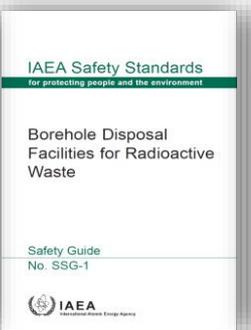
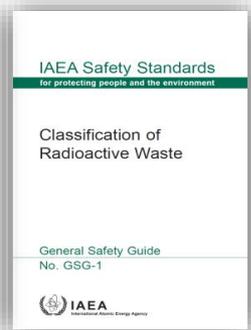
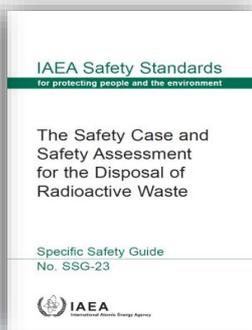
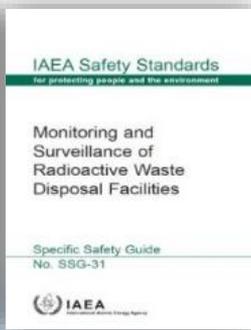
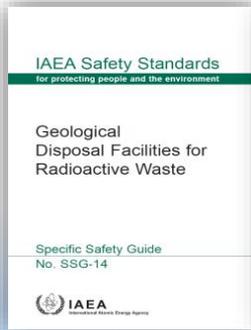
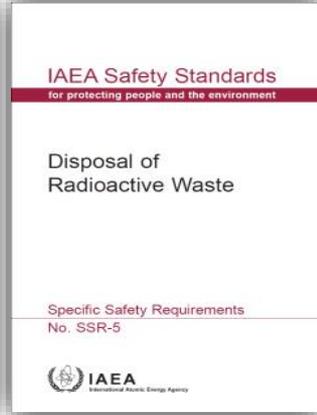
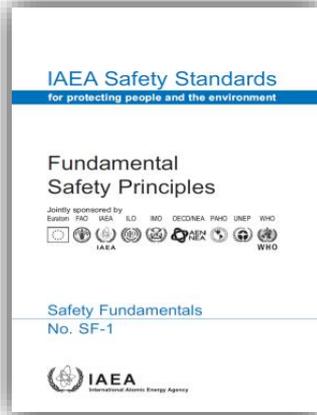
(7) Council Directive 2006/117/Euratom (8) provides for the control of high-activity sealed radioactive sources and orphan sources, including disused sources, in accordance with a common framework for the management of spent fuel and radioactive waste from the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the Joint Convention) and the International Atomic Energy Agency (IAEA) Code of Conduct on the Safety and Security of Radioactive Sources, and current industrial practices, disused sealed sources can be stored, recycled or disposed of in many cases, this needs a return of the source or return of the equipment, including the source, to a supplier or a manufacturer, for requalification or processing.

(8) Directive 2006/117/Euratom (8) provides for the management of waste from extrinsic industries which may give rise to radioactivity, but excluding such waste as may be produced by radioactivity which are matters dealt with under the Euratom Treaty.

(9) Council Directive 2006/117/Euratom (8) and Council Directive 2006/117/Euratom (8) provide for the management of waste from extrinsic industries which may give rise to radioactivity, but excluding such waste as may be produced by radioactivity which are matters dealt with under the Euratom Treaty.

(10) Council Directive 2006/117/Euratom (8) and Council Directive 2006/117/Euratom (8) provide for the management of waste from extrinsic industries which may give rise to radioactivity, but excluding such waste as may be produced by radioactivity which are matters dealt with under the Euratom Treaty.

IAEA Safety Standards for Disposal



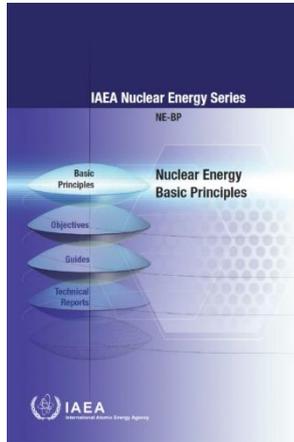
DS 477

Revision

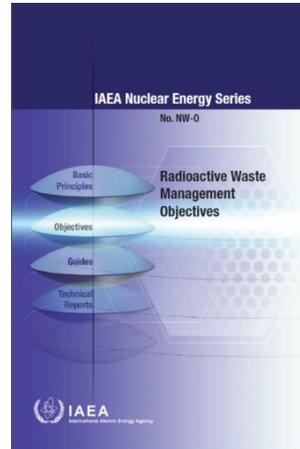


Publications - Nuclear Energy Series

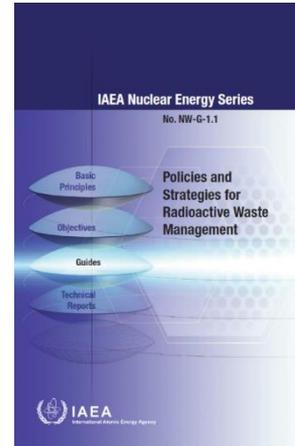
Principles



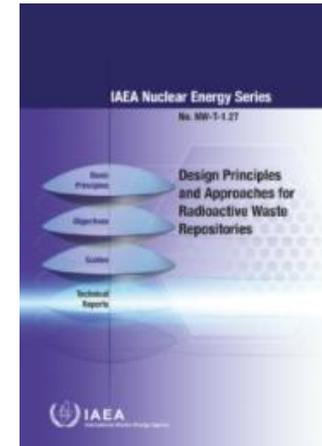
Objectives



Guides



Technical Reports



Reflect and build upon international experiences and good practices



Surface Disposal of LLW and VLLW in operation worldwide

L'Aube (CSA), France



Southwest Repository
China



LLWR, UK

El Cabril, Spain



Rokkasho, Japan



Dukovany, Czech



Vaalputs, South Africa

There are a large number of repositories for low-level waste in operation worldwide.



Near surface disposal

- Near surface disposal is defined as disposal in a facility constructed on the ground surface or up to a few tens of metres below ground level
- Safety is met by a combination of:
 - Features of the disposal facility
 - Features of the site
 - Limitations placed on the radiological inventory
 - Measures for surveillance and control

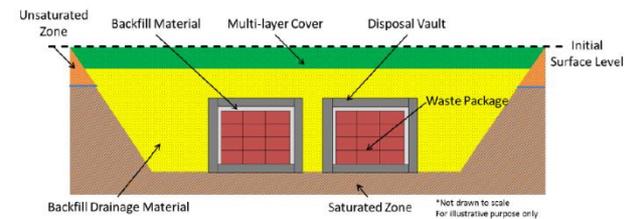
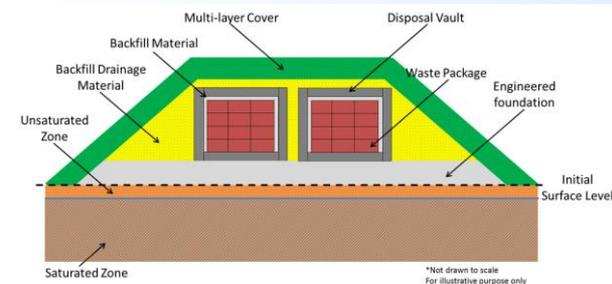
L'Aube (CSA), France



At *Centre de l'Aube* in France, site geology, facility design and waste limits are in place to meet safety requirements.



Designs for near surface disposal of LLW and VLLW



Trench

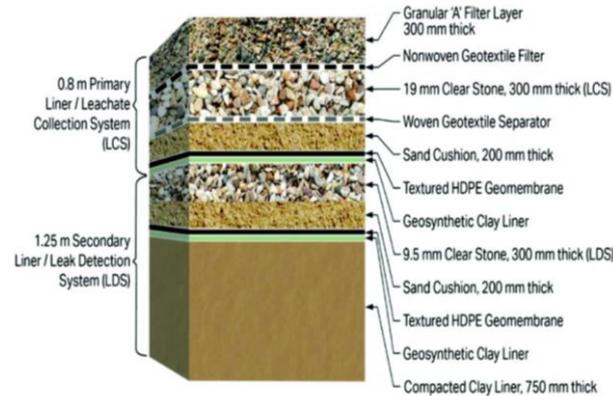
Near surface engineered facilities

There are a large number of repositories for low-level waste in operation worldwide



Near surface disposal, long-term performance

- Passive and engineered barriers
- Integration with natural landscape and post closure considerations



Proposed liner design for near surface disposal facility in Canada (Rowe et al., Canadian Geotechnical (2019))



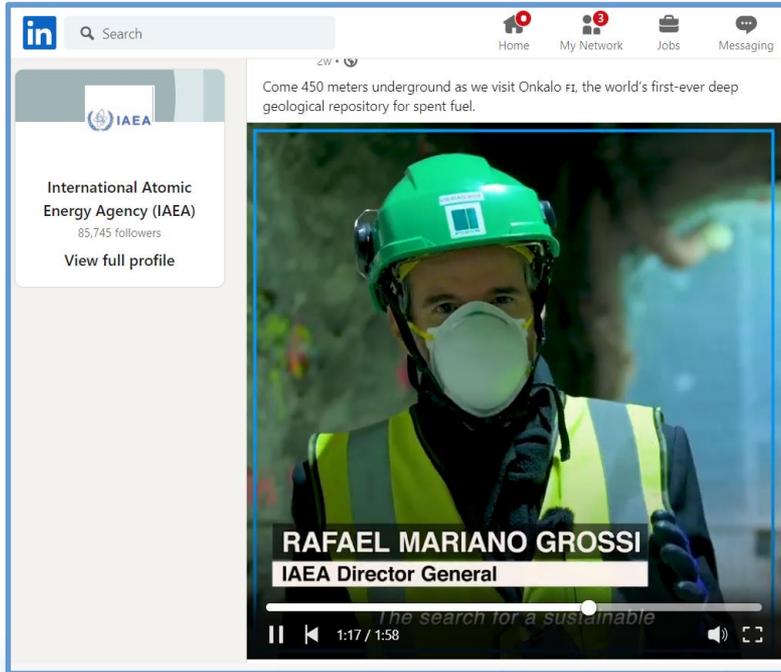
The final cover layer at El Cabril will integrate into the surrounding environment. Site surveillance phase will last 300 years (Courtesy of Enresa)

HLW Disposal High in the International Agenda

DG of the IAEA visited Onkalo / Finland in December 2020



IAEA



One of the most-viewed IAEA LinkedIn posts of 2020 – Over 30,000 views (plus lively discussion) – Launched at the quietest time of the year . . .

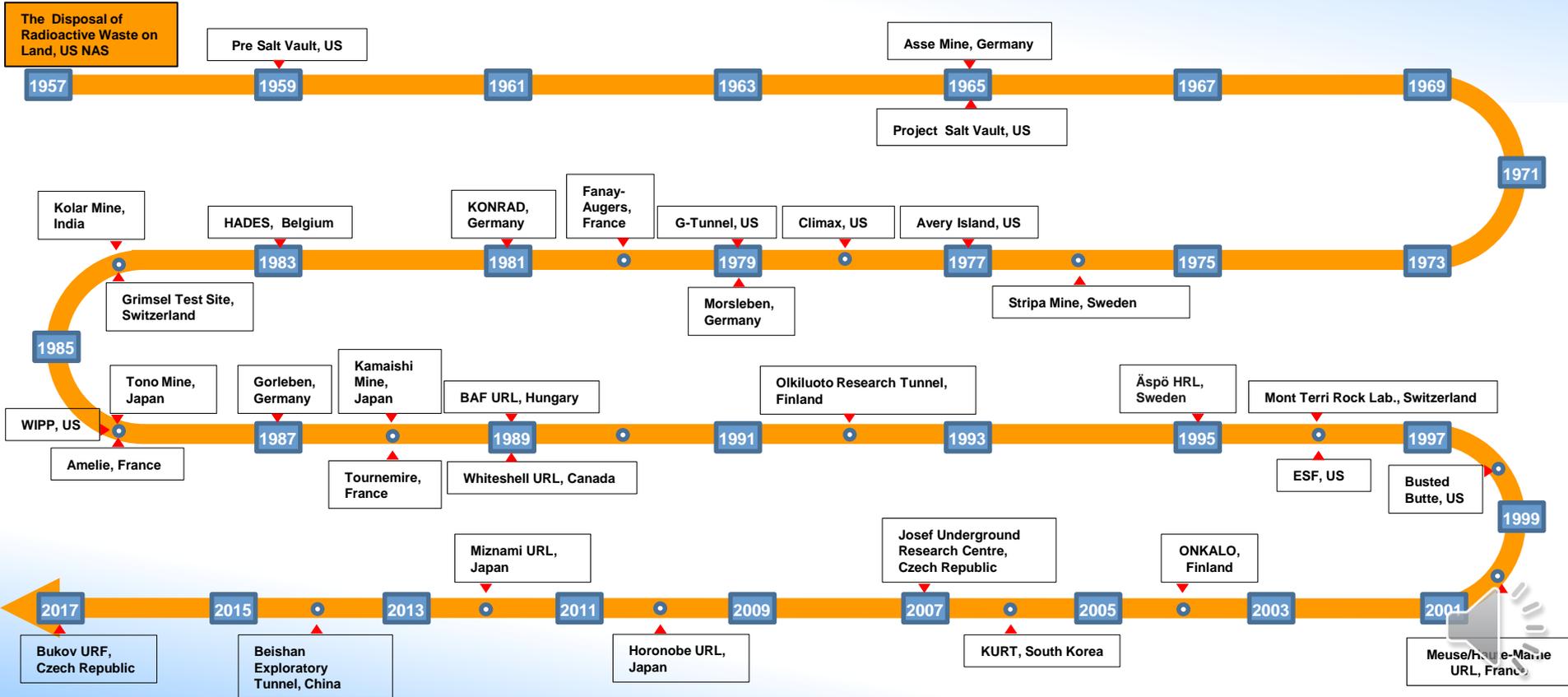
https://www.linkedin.com/posts/iaea_come-450-meters-underground-as-we-visit-onkalo-activity-6746428501844348928-8LBN

Radioactive Waste Management – The critical enabler of sustainability

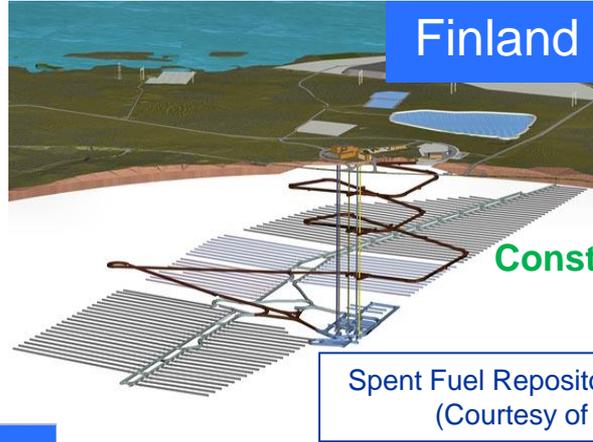


HLW/SNF Disposal – Decades of RD&D

Global historical overview of all RD&D in URFs

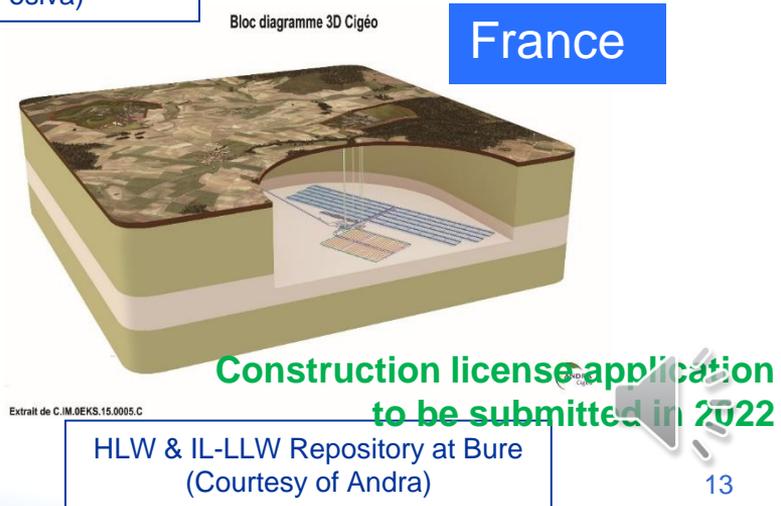


Implementing Geological Disposal: getting to licensing



Spent Fuel Repository at Forsmark
(Courtesy of SKB)

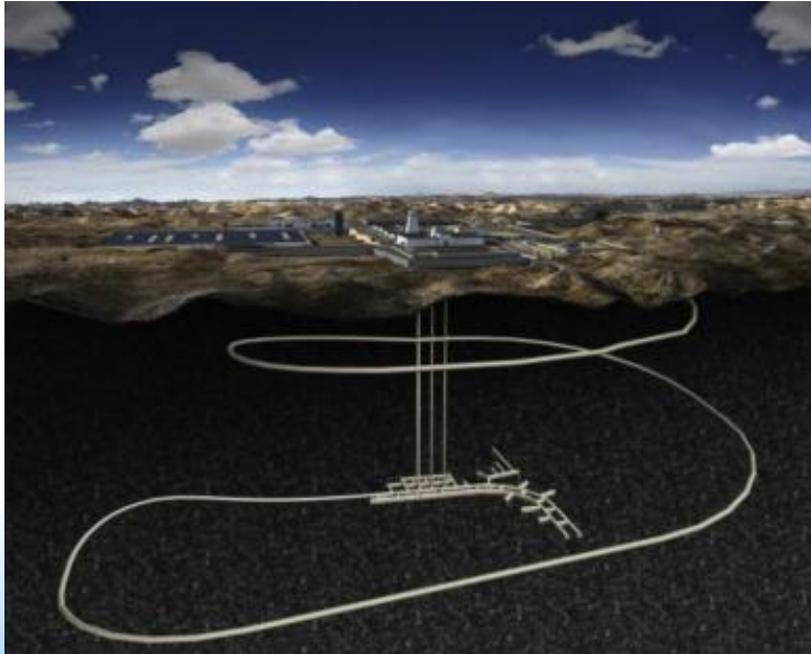
Construction license submitted, cleared by nuclear regulator



Developing Geological Disposal: in motion



- China underground laboratory: construction starting



- In Russia plans are moving forward for construction of a URF for HLW
- Switzerland is moving into the final stage of their 3 steps siting program
- Canada has narrowed their list of candidate sites down to two
- Germany, Japan and the United Kingdom have all successfully relaunched scientifically/technically sound repository siting programmes with strong public engagement commitments



Multinational Approaches and National Programmes



- Joint Convention
 - Reference is a national repository, but no door is closed on a multi national repository as long as safety, security and an ethical approach are ensured
 - Cooperation and agreement between willing countries can be considered
- IAEA publications provide the clear message that:
 - Participation in collaborative repository project does **not** remove the requirement for a national policy
 - Regardless of the national or multi-national approach a national policy and strategy/national programme for RWM is needed
- Engaging with other countries can bring efficiencies to respective national programs, even if it does not lead to a Multi National Repository
 - Pool competencies to the first phases of a roadmap for a geological repository project
 - Save time and money



Thank you!

And Stay Connected !

Professional Networks – [link](#)

eLearning – [link](#)

