NEWSLETTER

IGD-TP Newsletter
Issue #11, October 2021

safe solutions for radioactive waste

Dear reader

Finally, after almost 1.5 years the COVID-19 pandemic is so far under control that international travel becomes possible again. The IGD-TP remained very active in these dark "screen meeting" times with finalisation of Vision 2040 and the development of the Strategic Research Agenda that is now well established. Another development was the further expansion of the project portfolio with new initiatives such as implementer workshops addressing aspects of criticality and retrievability.

But now the time is there to meet in person again. It is with great pleasure that the IGD-TP Symposium on the role of optimisation in radioactive waste geological disposal programmes is announced in this newsletter. The last Exchange Forum

The SIX ConventionPoint in Zurich-West.

in Berlin dates back already to 2018. With EURAD fully established, a part of the role of the exchange forums is logically integrated in the EURAD activities, so the format needed to be renewed. The Symposium is now the new format.

In the IGD-TP community optimisation of the implementation of geological disposal has gained increased attention. In order to build and operate repositories safely, to make consistent progress, and to ensure efficiency, optimisation of all aspects plays a critical role and is a continuous activity throughout its implementation. We were able to identify a wide variety of key speakers that are currently setting the tone in many optimisation aspects. We are also calling for posters on topics that support our strategic research agenda.

All this will take place in central Zürich surrounded by the snow-covered mountains in January 2022. I hope to meet many of you there and pick up where we left before COVID-19 struck.

Irina Gaus, Chair

CONTENT

Editorial team of the Secretariat of IGD-TP (I. Blechschmidt and T. Baldwin) and project co-ordinators

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IGD-TP Symposium and Webinar

The role of optimisation in radioactive waste geological disposal programmes

11-13 January 2022, Zurich, Switzerland
26 January 2022, Online

We are delighted to announce that the IGD-TP will hold an international symposium on the role of optimisation in geological disposal programmes for radioactive waste. Hosted by Nagra in January 2022, the event is open to all IGD-TP members and stakeholders interested in geological disposal of radioactive waste.

Geological disposal projects are first of a kind projects, span several decades, and are multi-billion endeavours. In order to build and operate repositories safely, to make consistent progress, and to ensure efficiency, optimisation of all aspects plays a critical role and is a continuous activity throughout its implementation. While safety optimisation is well established, also through international guidelines, optimisation of the implementation of geological disposal has gained increased attention. This symposium and webinar aim to summarise the status of the main aspects of repository optimisation from a technical-scientific viewpoint and to discuss future directions.

To enable access and involvement of all interested parties, the event will be held in two parts.
The first, physical event, will consist of a two-day meeting in Zurich with sessions on:

- the role of optimisation in selected national geological disposal programmes
- technology and material optimisation
- lessons learned from optimisation in large infrastructure projects
- integrating optimisation for safety and sustainability
- global optimisation approaches – concepts and numerical applications

The third day will provide an opportunity for attendees to tour the Mont Terri underground research laboratory, the ZWILAG storage facility or a Nagra drill site (see overleaf for descriptions). Tour numbers are limited.

Talks and posters presented at the symposium will be recorded and made available online, prior to the webinar. The second part of the event will consist of a live webinar that will include a panel discussion and question and answer session. Questions can be submitted in advance via the IGD-TP website and during the webinar.

Call for Posters

Throughout the symposium the IGD-TP will host a series of themed poster sessions that aim to showcase the cutting-edge radioactive waste management RD&D of our community. The posters will also be displayed on our website. We strongly encourage you to submit poster applications that align to the IGD TP Strategic Research Agenda. Poster abstract submission opened on 1 September 2021.

IGD-TP Symposium and Webinar

Day 3 Tour Options

Interior view of the Mont Terri rock laboratory (mont-terri.ch)

Rock Laboratory Mont Terri (mont-terri.ch)

The Mont Terri rock laboratory is situated to the north of St-Ursanne in the canton of Jura, around 300 m underground. It is accessed via the safety gallery of the Mont Terri motorway tunnel. The rock laboratory comprises 1200 m of galleries and niches. The horse-shoe shaped galleries are 4 to 5 m high and well-lit. The key question being investigated is: can radioactive waste be stored safely in Opalinus Clay? The Mont Terri rock laboratory is engaged solely in research; no deep geological disposal facility will be built at Mont Terri. There are 22 partners from Europe, Japan, Canada, United Kingdom, the USA and Switzerland carrying out research at the Mont Terri rock laboratory. This will be a full-day tour including a small lunch.

ZWILAG Wurenlingen (zwilag.ch)

ZWILAG is a key link between the generation of waste and its disposal in deep geological repositories. In Switzerland, the producers of radioactive waste are responsible for its safe disposal. The Swiss disposal concept sees the final solution as the disposal of radioactive waste in repositories located in suitable rock formations. Until underground repositories are available, radioactive waste must be kept in interim storage for 30 to 40 years as it cools. All categories of radioactive waste generated in Switzerland are processed and temporarily stored in the ZWILAG facility and the neighbouring federal interim storage facility. This will be a half-day tour and will include a small lunch.

ZWILAG (zwilag.ch)

Drone photo of the drilling site in Bülach after setting up the drilling rig (nagra.ch)

Nagra Borehole site Bachs or Rheinau (nagra.ch)

In earlier investigations, Nagra identified deep underground faults with a vertical trend in the eastern part of the Rheinau community. The aim now is to clarify how these faults develop in the Opalinus Clay and whether they impact its properties. The knowledge gained in Rheinau is important for understanding the properties of the Opalinus Clay, which is of relevance for all three potential siting regions (Jura Ost, Nördlich Lägern and Zürich Nordost). In addition, Nagra is planning another borehole in the community of Bachs in the Nördlich Lägern siting region. In the previously completed borehole in Bülach, Nagra drilled through a fossilised coral reef above the Opalinus Clay. This reef divides the region into two sections. The drill site in Bachs is being prepared so that, if necessary, the section without the reef can be investigated in greater detail. This will be a half-day tour and will include a small lunch.

IGD-TP Symposium and Webinar

Practical Details

Registration

The registration for the Symposium, Webinar or both, opens on the 1 September 2021 on the IGD-TP website igdtp.eu

Registration fee
The costs for both events are subsidised by the IGD-TP. However, a small fee is required to support the Symposium:

- **Option 1:** Registration fee (€200). Includes participation on both days, refreshments and lunch.
- **Option 2:** Registration fee and dinner (€250). Includes Option 1 plus a 3-course dinner at the Sheraton Zurich on day 1.
- **Option 3:** Registration fee and day 3 excursion (€250). Includes Option 1 plus the day 3 excursion (transport, refreshments, lunch, site).
- **Option 4:** Full package (€300). Includes all options (meeting attendance, dinner and excursion).

The Webinar is free to attend for all.

Given the Covid-19 pandemic, a final decision on whether the Symposium will proceed as a physical event will be taken in November upon review of the latest information. All registrations would be refunded in full if the physical event were to be cancelled.

Symposium venue

The Symposium will be held at SIX ConventionPoint, Pfingstweidstrasse 110, 8005 Zurich, Switzerland conventionpoint.ch. Travel directions and advice are provided on the IGD-TP website.

Accessibility

We would like to make this event as accessible as possible. We strongly encourage you to contact us if you need further information or have any queries.

- The conference rooms and toilets are on the same floor and are wheelchair accessible. A hearing loop is available. Service animals are not allowed.
- The conference dinner venue is wheelchair accessible and has accessible toilets. Service animals are allowed.
- For the optional tours on day 3, participants should be in good physical condition as there are some steps to take and a certain distance to walk.

Accomodation

The cost of accommodation in Zurich is not included in the registration fee and must be booked and paid directly by the participant. We recommend the following two hotels, which are both within walking distance to SIX Convention Point:

- Sheraton Zurich - marriott.com/hotels/travel/zrhzs-sheraton-zurich-hotel
- 25hours-Hotel Zurich West - 25hours-hotels.com/en/hotels/zurich.
  Note that there are two 25hours-Hotel's in Zurich – *please make sure that you book the **Zurich West***.

You will find more hotels via Zurich tourism: zuerich.com/en
Webinar: The access link will be provided directly to registered participants.

IGD-TP Symposium and Webinar

The SIX ConventionPoint Pfingstweidstrasse 110 8005 Zürich

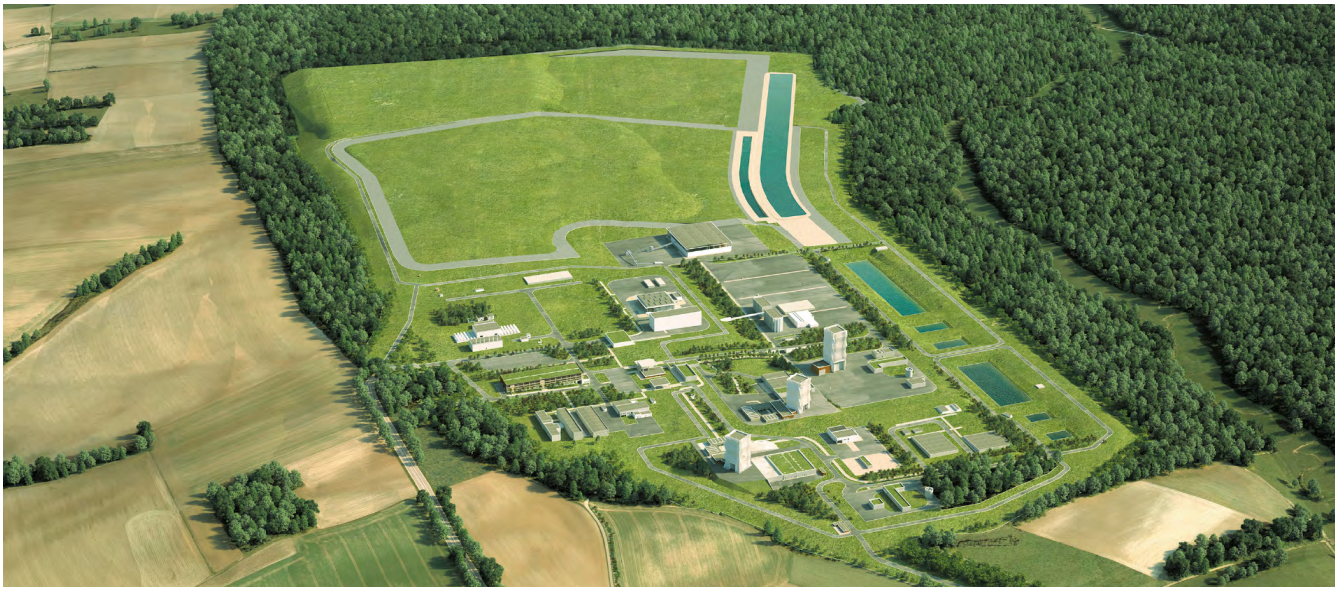
Dates

27 April 2021	First announcement
1 September 2021	Registration opens
1 September 2021	Second announcement and call for posters
15 November 2021	Poster abstract submission deadline
30 November 2021	Symposium registration closes and selected poster presenters informed
30 November 2021	Covid-19 review and final decision to proceed with the Symposium
20 December 2021	Final programme published
7 January 2022	Deadline to supply presentation and poster files
11-13 January 2022	IGD-TP Symposium
20 January 2022	Symposium presentations and posters published on igdtp.eu
25 January 2022	Webinar registration and advance question submission closes
26 January 2022	IGD-TP Webinar

Further information will be added to the IGD-TP website as it becomes available on igdtp.eu/event/igd-tp-symposium.
For any other questions please contact secretariat@igdtp.eu

Update from the Members – Andra

Status of licence application for a DGR programme in France



andra.fr/cigeo

Prior to the licensing application for the deep geological disposal project (Cigéo project) that is scheduled to be submitted in 2022, Andra submitted a public utility application (DUP) in August 2020, in particular to reaffirm the general interest of the Cigéo project.

The DUP is made up of 19 documents dealing with economic, environmental, legal, technical aspects, etc. of the project. In particular, it includes an impact study which takes stock of the impacts, advantages and disadvantages of the overall Cigéo project on the environment (including the disposal center as well as the operations carried out by other contracting bodies for its water and electricity supply, its connection to the rail network...), in all its dimensions (population, health, biodiversity, soil, air, water, landscapes...), according to the different phases of the project. The impact study reports the negative impacts of the project on the environment, and the measures taken to avoid, reduce or compensate for them. It also presents the main opportunities and expected benefits for the territory, in terms of employment, demographic development, taxation and even territorial attractiveness. (andra.fr/cigeo-le-dossier-denquete-publique-prealable-la-declaration-DUP).

The DUP was the subject of an evaluation by the Environmental Authority, which submitted its evaluation report in January 2021. The DUP was also examined by the French state services (under the coordination of the prefect of the Meuse department).

The opinion of the Environmental Authority firstly makes an overall judgment on the quality of the impact study. It notes that „this is a file of an unusual magnitude, for which the impact study is already very important" and that „the environmental assessment is very detailed and takes care to explain in a didactic manner the technical questions addressed". The opinion does not contain any elements calling into question the structuring choices for the implementation of the Cigéo project. However, it makes around forty recommendations, calling for the study of additional measures or justifications. (meuse-hautemarne.andra.fr/cigeo-le-regard-de-landra-sur-lavis-de-lautorite-environnementale-sur-la-dup).

Andra wrote a response report to the recommendations of the Environmental Authority. This response was attached to the DUP for a public inquiry. The DUP has been made available to the public for information and advice as part of the public inquiry that began in mid-September and is scheduled to end in late October. At the end of this public inquiry, the DUP can then be issued by a decree of the Prime Minister, after consulting the French State Council.

Many other authorisations will still have to be obtained to allow the creation of the Cigéo project, and in particular the licensing application decree. This decree, associated with town planning authorisations, will allow the start of construction of the first installations of the DGR.

The ERDO Association for Multinational Radioactive Waste Solutions

There is a wide consensus that every country has a responsibility for ensuring safe, environmentally acceptable disposal of its radioactive wastes. The only recognised practicable solution for final disposal of highly active and long-lived radioactive wastes is emplacement in a Geological Disposal Facility (GDF). Thus, every country that produces such wastes should have access to a GDF.

Implementation of a GDF is expensive; national cost estimates range from a few to many billions of euros. For a nuclear-power programme of significant size, the disposal costs are still a relatively minor part (a few percent) of the full nuclear fuel cycle costs – but for small nuclear power programmes with only one or a few nuclear reactors, and for countries with only medicine, industry or research (MIR) radioactive wastes, meeting the costs can be a serious challenge.

Since the beginnings of commercial nuclear power production, and especially over the past 25 years, there have been numerous initiatives assessing the potential role of multinational repositories (MNRs) in enhancing global safety, security and environmental protection. Early studies, in particular the EC-funded SAPIERR projects, analyzed the benefits and challenges associated with implementing an MNR. This led in 2009 to the establishment of a selffinanced Working Group to carry out the necessary groundwork to enable the establishment of one or more operational, shared multinational waste management solutions. Cooperation over the last 11 years between 12 countries led at the beginning of 2021 to the establishment of a new Association – the ERDO Association for Multinational Radioactive Waste Solutions (see figure on page 7). ERDO is based at the headquarters of the Dutch radioactive waste management agency, COVRA.

Our goals are:

- to work together to address the common challenges of safely managing the long-lived radioactive wastes in our countries
- to carry out the necessary groundwork to enable the establishment of one or more operational, shared multinational waste management solutions

The Logic of a Dual-Track Approach

Every country has a national responsibility under the IAEA Joint Convention and, for EU Member States, under the EC Waste Directive, to establish a programme and schedule for the safe management and disposal of radioactive wastes and spent fuel. Because many of the challenges faced are common to different countries, there are potential benefits to be gained through sharing knowledge, technologies and facilities.

- Shared, multinational approaches to common problems have economic advantages: the work and the costs involved in developing a national programme can be reduced
- Decades of cooperative RD&D have helped to optimise technical solutions but shared strategic initiatives to implement joint solutions and facilities can optimise the costs of waste management
- There will be strategic and economic benefits for countries that make use of shared facilities – and also benefits to countries that host these
- For almost all countries, target dates for operation of a national GDF lie decades into the future. This allows ample time for evaluation in parallel of the shared GDFs that are one focus of the ERDO Association. Our members are developing both options until the optimum solution for each country becomes apparent – this is the Dual-Track approach
- Involvement in Dual-Track projects implies no prior commitment to use or host a shared GDF
- The prospect of a shared disposal solution encourages the development of common technical approaches to the interim treatment and storage of radioactive wastes
- Dual-Track encourages developing effective national capabilities not only for a domestic programme, but also to act as a provider or an 'intelligent customer' of shared solutions

The ERDO Association for Multinational Radioactive Waste Solutions

ERDO's evolution from a EU-project to an Association.

Membership

- Membership is open to any organisation supporting the aims of the Association: commonly, ministries, waste management organisations, regulators, research entities or international organisations
- Organisations from seven countries have participated in preparation of the Association. Until now, six countries have confirmed membership:
  - ARAO, Slovenia
  - COVRA, Netherlands
  - Dekom - Danish Decommissioning, Denmark
  - Fond-NEK, Croatia
  - Ministry of climate and environment, Poland
  - NND, Norway

What will the ERDO Association do?

ERDO envisages a long-term programme of shared activities that aim to develop solutions solutions to waste management problems and, eventually enable progress towards shared facilities. As a relatively small, self-financed body, the ERDO Association can concentrate resources and manage projects effectively on modest budgets with efficient timescales. Specifically, the ERDO Association will:

- Act as an open forum for sharing technical knowledge and experience among its members through regular meetings to share information and update each other on progress
- Identify and carry out projects
- Establish a knowledge centre for members to assist them in resolving issues in their own programmes
- Act as knowledge centre for external organisations seeking expertise in shared solutions
- Act as a voice in the international media and fora to promote shared waste management solutions

Coordination between ERDO and IGD-TP

As stated earlier many of the challenges faced in GDF development are common to different countries, regardless of the size of inventory, and regardless of whether they pursue a national disposal policy or a dual track approach. It is important that all efforts to advance the progress towards safe GDF options for all countries be coordinated and appropriate measures are in place to ensure that IDG-TP and ERDO activities are complementary. COVRA, the host organisation for ERDO, is a member of the IGD-TP executive group (EG) and has delivered ERDO's views into IGD-TP meetings and into the SRA that was produced. Through IGD-TP and also through the national WMOs in ERDO, input is also provided by the Association to the EURAD programme of the EC, most specifically on issues related to promoting multinational sharing options in pre-disposal and disposal RD&D:

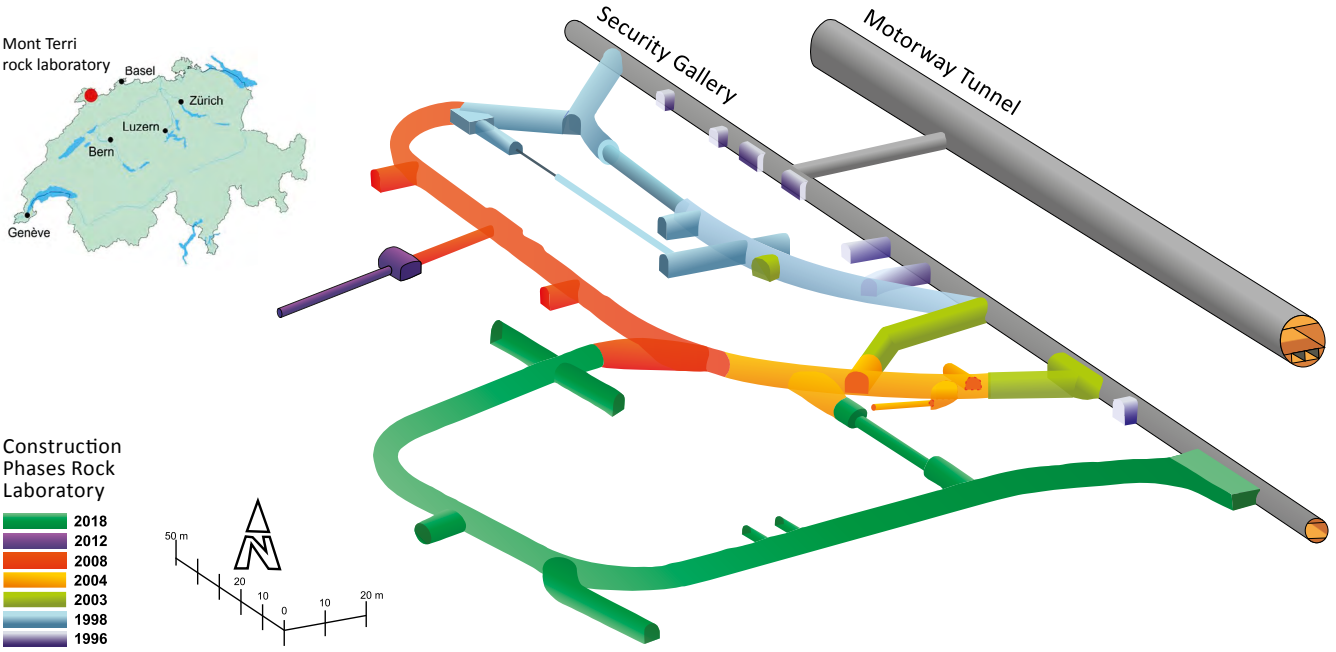
On 16.9.2021, ERDO held a webinar on "The road to sharing " to discuss the logic of the dual track approach and to present ERDO's plans for future work.

Contact the ERDO Secretariat: marja.vuorio@covra.nl

Mont Terri celebrates 25 years

The Mont Terri Rock Laboratory celebrates 25 years of science in the service of society

(Contribution by Christophe Nussbaum, swisstopo)



Perspective view of the Mont Terri rock laboratory, status 2020: it started in 1996 in small niches, then continuously expanded in 1998, 2004, 2008 and 2012, with the last major expansion in 2018-19 doubling the size of the laboratory. The total length of the rock laboratory is 1280 m.

Mont Terri rock laboratory

The Mont Terri Rock Laboratory celebrates its 25th anniversary of scientific activities in the service of society! On 4 November 2021, together with Swiss Federal Councillor Viola Amherd, the Project Partners will have the opportunity to get to know the laboratory, our current research, and to exchange views with experts and experienced research partners on the current state of knowledge on the geological storage of radioactive waste and CO_2.

The laboratory represents an unprecedented collaboration of people with different nationalities and cultures, pursuing common goals and tackling societal challenges side-by-side for future generations. When it was founded in 1996, no one could have imagined that the study of the Opalinus Clay in the Canton of Jura would develop in such a remarkable way, the establishment of an an internationally renowned research laboratory dedicated to storage. Together with our 22 research partners, we have developed the laboratory step-by-step (see figure above). At the beginning of the project, the disposal and storage of radioactive waste was the focus of our research activities. The results garnered through investigations in the rock laboratory are of decisive importance today for the acceptance of deep geological repositories in Switzerland and abroad. In the last 25 years, researchers from the partners have gained a tremendous amount of knowledge about deep geological disposal in claystones. A cumulative body of

Mont Terri celebrates 25 years

knowledge has come together. More specifically, the Mont Terri rock laboratory has made a significant contribution to the definitive selection of Opalinus Clay as a host rock for radioactive waste in Switzerland. The last 25 years have shown that claystones like the Opalinus Clay can safely contain radioactive waste over very long periods of time. However, claystones and mudstones not only have the function of confinement as host rock, but they also prevent gases such as CO_2 from penetrating into the biosphere from deeper layers. This is especially important for geological storage of CO_2. Over the last decade, we have been conducting experiments on the performance of Opalinus Clay as caprock.

The results and evaluations of the last 25 years have been documented in more than 2000 technical notes and reports, as well as scientific papers in international peer-reviewed journals. It must be said that every disposal concept and every geologic host rock has advantages and disadvantages. In the following, we briefly list these strenghs and weaknesses below. Both weaknesses can be reduced with adequate measures, such as ensuring enough distance between emplacement galleries to avoid overheating, and engineered lining measures that guarantee short term stability of the access galleries.

Strengths and weaknesses of Opalinus Clay as host rock for radioactive waste disposal Strengths:

Strengths:

1. Claystone formations such as the Opalinus Clay exhibit extensive retention potential for sorbing radionuclides due to the large reactive surface areas of clay minerals. The majority of radionuclides remain stuck and will be sorbed onto clay mineral surfaces.
2. Non- or weakly-sorbing radionuclides are transported through Opalinus Clay by molecular diffusion, which is a slow process. By the time these radionuclides reach the biosphere, they have decayed to the point where they no longer pose a threat to the environment.
3. Opalinus Clay reveals distinct self-sealing properties due its smectite-illite mixed-layer clay minerals. Interconnected fracture networks, which are formed in the excavation-damaged zone during repository construction or possibly generated in the future by earthquakes, will self-seal in relatively short time spans. Thus, rapid radionuclide transport along preferential flow paths out of the repository into the biosphere is unlikely.

Weaknesses:

1. Heat conductivity of Opalinus Clay is rather small when compared to other host rocks. Heating of Opalinus Clay over 100 degrees Celsius in a high-level waste repository might create a thermally induced damaged zone and/or reduce the sorption capacity.
2. Construction of a repository at greater depths (e.g., at 800 m depth) could result in a more extended EDZ (excavation damaged zone) and high tunnel convergence. This is a challenge in terms of stability for the engineers.

Mont Terri celebrates 25 years

Future developments

The Mont Terri rock laboratory is a so-called generic rock laboratory. This means that it is used exclusively for research and there will never be a deep geological repository here. This is in contrast to a site-specific rock laboratory that is built at the chosen location for the storage of radioactive waste. But there is still a long way to go until a site for deep radioactive waste disposal is chosen in Switzerland. Until then, the Mont Terri rock laboratory will still exist, and possibly even longer.

An important feature of the Mont Terri rock laboratory is that the Project Partners are free to choose their research priorities. In this way, unconventional projects are also given a chance. One is also allowed to make mistakes and commit errors. We have gained many interesting insights only after an experiment has "failed." Other special points are that innovative projects usually have a good chance of being realised, individual experimental partners share the costs, and the operators do not interfere, they only ensure adherence to the contracts and conditions of the owner, the Canton of Jura.

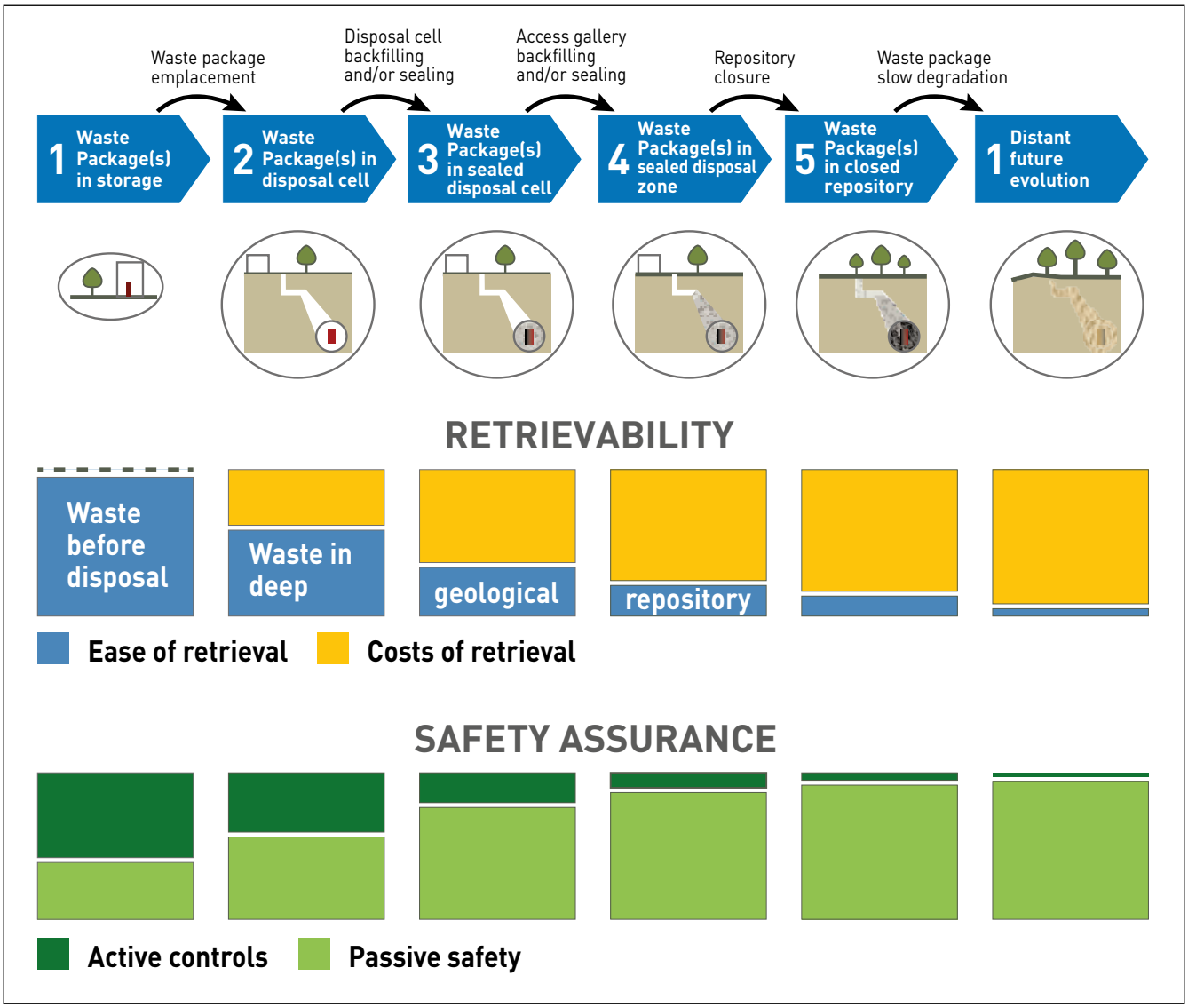
So, what needs to be researched in the next 15 to 20 years? Research into all aspects of a repository for the deep storage of radioactive waste in clay rocks will continue to be the main theme. But increasingly, the rock laboratory will also make an important contribution to the federal government's Energy Strategy 2050. CO_2 experiments have already begun and will continue. Experiments on geothermal energy could also be included in the future.

In the following, we present some research priorities that might be tackled in the coming years, provided that the Project Partners will agree upon them. In the field of radioactive waste, there is still a whole series of questions to be clarified that could well be carried out in a generic rock laboratory like the one at Mont Terri. Some of the future potential research topics are listed below:

- A fundamental set of questions are: does a repository for high-level radioactive waste in a claystone really work as predicted (i.e. as the models say)? Do we understand all the processes and do they run in a staggered manner? Answers to these questions require long-term demonstration experiments in the range of 50 years and more. This would mean that long-term experiments would be inherited by the next generation. And the next generations could then better judge on the long-term safety of a deep geological repository, and also make the decision when a repository has to be closed.
- Experiments in the sandy facies of the Opalinus Clay: in the last 25 years, we have focussed on the clayey type (shaly facies) of the Opalinus Clay, thoroughly investigating all its aspects. But we kept away from investigating the sandy type. Research has showed, however, that the sandy facies may have advantages that we previously overlooked. The new Gallery 2018 was built in the sandy facies and has been ready for experiments since the beginning of 2020. Experiments following this theme have already been launched and are continuing. Other key research targets are new diffusion experiments where radionuclides diffuse into the clay in a thermal field. In addition, a large sealing experiment, the so-called Sandwich Experiment was started. It is investigating which materials can be used to completely seal shafts and galleries and to saturate them as homogeneously as possible.
- Experiments to optimise the technical barriers of a repository in Opalinus Clay by using materials other than steel; many deep geological repository concepts in clay facies use steel containers to confine the highly radioactive waste. Steel is a proven material with many advantages, but it has also disadvantages. A significant one is anaerobic corrosion, whereby hydrogen is formed. A whole range of chemical-microbiological processes take place in the long-term of such a repository. These are further coupled with thermo-hydraulic-mechanical processes, making the whole a complex system. The question here is whether steel could be replaced by other materials. Ceramics are already being researched, but have never been tested in-situ in the Mont Terri rock laboratory until now. Certainly, the repository system and some processes could be simplified with such alternative containments.
- To what extent can we minimise the area of a repository in the Opalinus Clay? The spatial footprint of a deep repository will range from a few to some tens of square km, depending on how much high-level heat-producing waste has to be disposed. The question here is whether one can accept increased temperatures in the near field without losing positive properties such as retention and self-sealing of the claystone. A smaller repository area would massively reduce costs of a repository.
- All questions regarding a realistic retrieval of radioactive waste: these should be demonstrated now, and not in 20 years at a site-specific laboratory. Such a realistic retrieval concept will certainly have an impact on the repository concept. Here we can also learn from our Project Partner ANDRA, who has already demonstrated their retrieval concept.

IGD-TP Projects – What is going on?

Working group on the technical aspects of retrievability



Modified after NEA leaflet on Retrievability and Reversibility (2011)

Retrievability is increasingly recognised as an important aspect to take into account during the design stages of a geological disposal facility (GDF). Some countries are already committed by law to implement retrievability provisions. Retrievability has also become a societal and political concern almost everywhere. Retrieval of the waste is not restricted anymore to the operational phase.

Therefore, within the framework of the IGD-TP, sharing knowledge about retrievability was identified in the IGD-TP Strategic Research Agenda.

Within this context, ONDRAF/NIRAS organised a workshop to share knowledge about the technical aspects of retrievability between the WMOs. This workshop was held in May 2021.

Each participating WMO (ANDRA, BGE, COVRA, NAGRA, ONDRAF/NIRAS, POSIVA, RWM and SKB) gave a presentation about the approach and the technical solutions developed in their country to address retrievability in the geological disposal facility design (concept, terminology, requirement, etc.).

A discussion was then held leading to the decision to publish an internal IGD-TP technical note summarising the situation in each country. This document is currently under preparation.

IGD-TP Projects – What is going on?

IGD-TP R&D Activities

The waste management organisations (WMOs) undertake many bilateral and multilateral research activities, some of which are organised through the IGD-TP. The ongoing activities, their objectives and current status are summarised here.

Activity	Objective	WMOs Involved	Status
KINA - Kiruna Natural Analogue	The KINA project aims to investigate a smectite clay body that has been in contact with a magnetite ore body for hundreds of millions of years under repository-like conditions.	SKB, Nagra, RWM, POSIVA, Andra, NWMO	Samples have been prepared for isotopic dating and analyses. Swelling pressure measurements have been made. Further sampling is planned.
CCSC - Climate change in the safety case	As climate evolution is a global topic there are clear benefits in WMOs sharing knowledge and expertise. This project involves exchange of applied methodologies, uncertainty estimations and results between the WMOs to ensure consistent argumentation.	SKB, Posiva, RWM, ANDRA, Nagra, BGE, COVRA, SURAO, ONDRAF/NIRAS	A series of meetings have been held so far and a comparison of the results of the different global climate simulations has been started.
PCCS - Post-closure criticality safety	Criticality safety over long, post- closure, timescales is unique to geological disposal. This project aims to benefit WMOs by sharing knowledge and approaches to demonstrating criticality safety, including discussion of applied methodologies, knowledge gaps and results.	RWM, ANDRA, Nagra, ENRESA, SKB, PURAM, BGE, ONDRAF/NIRAS, US DOE, NWMO	A series of information exchange workshops are planned, with the latest on scenario selection held in September.
Technical aspects of retrievability	This project aims to exchange knowledge regarding the approach and the technical solutions developed by each WMO to address retrievability in geological disposal facilities, and to identify common needs for future development.	ANDRA, BGE, COVRA, ENRESA, NAGRA, ONDRAF/NIRAS, POSIVA, RWM, SKB	A workshop was held in May 2021 and a synthesis document of the situations in each of country is being produced.
Seismic hazards assessment	A workshop is to be held to identify the similarities and differences between WMOs regarding: disposal facility contexts and concepts; regulatory requirements; and seismic hazard assessment approaches. Possible opportuni- ties for further collaborative projects between one or more WMOs may be identified.	BGE, COVRA , ENRESA, NAGRA, ONDRAF/NIRAS , Posiva, PURAM, RWM, SKB, SÚRAO	Initial planning meeting held in August and the workshop is planned for November.
LOMIR - Long-term monitoring of ^{14}C compounds released during corrosion of irradiated metal	This project continues an ongoing corrosion experiment with irradiated stainless steel. Additional sampling will be carried out to i) verify an increase in the ^{14}C content in the gaseous phase with time, ii) verify constant concentration of aqueous ^{14}C-carrying species, and iii) quantify the retention of ^{60}Co by corroding irradiated steel.	Nagra, SKB, BGE	The experiment is ongoing at PSI and a sampling plan developed.
iCHANCE - Chemotoxic and non-radioactive contaminants evaluation	Understanding the non-radiological and chemotoxic properties of radioactive wastes is essential. This project involves sharing knowledge and approaches in evaluation of the transport of chemotoxic and other non-radiological contaminants.	PURAM, Nagra, RWM, COVRA, ONDRAF/NIRAS, ENRESA, BGE	A benchmarking workshop is planned to consider the inventory, transport calculations and methodologies applied.

Secretariat News and Meeting Announcements

Upcoming Meetings

1-5 November 2021	IAEA	**IAEA 2021 International Conference on Radioactive Waste Management: Solutions for a Sustainable Future** Location: Vienna, Austria
11-13 and 26 January 2022	igd-tp	**IGD-TP Symposium and Webinar: The role of optimisation in radioactive waste geological disposal programmes** Location: (1) Zurich, Switzerland; (2) Online
6-10 March 2022	WM Symposia	**Waste Management Symposium 2022** Location: Phoenix, USA
21-23 March 2022	DAEF	**DAEF 2022:** **3rd Conference on Key Topics in Geological Disposal** Location: Cologne, Germany
28-30 March 2022	EURAD	**EURAD Second Annual Event 2022** Location: Fontenay-aux-Roses, France
4-8 April 2022	NEA	**International Conference on Geological Repositories (ICGR): Advancing Geological Repositories from Concept to Operation** Location: Helsinki, Finland
30 May –3 June 2022		**FISA 2022 – EURADWASTE '22** Location: Lyon, France
13-16 June 2022		**8th International Clay Conference** Location: Nancy, France

New IGD-TP Members

Since our last newsletter we have welcomed two new organisations to the IGD-TP:

- CSD Engineers AG (www.csd.ch) is a Swiss engineering company with knowledge and experience of safety assessment, groundwater modelling, rock lab and demonstration experiments, and field investigation. They have also participated in design, optimisation and cost studies for deep geological disposal projects in Europe during the last 25 years, as well as conventional small and large infrastructure projects in Switzerland during the last 50 years. Their modelling team can carry out high-performance computing for sub-surface processes and can analyse, visualise and manage field, lab and modelling data.
- The Geotechnical Institute of the Technische Universität Bergakademie Freiberg (tu-freiberg.de/en/geotechnics) has expertise in the modelling of coupled physical phenomena in various host rocks and engineered barrier systems and their numerical realisation. This includes open-source software development for the analysis of coupled THMC/B processes in geological repositories and their components. The Institute also participates in the DECOVALEX project as well as in various national, European and Sino-German research projects, and EURAD (ACED, DONUT, GAS). The Institute operates a geomechanical laboratory featuring a range of experimental facilities for the thermal, hydraulic and mechanical characterisation of geomaterials for geotechnical applications, and TU Freiberg operates its own underground laboratory for teaching, public outreach and research activities.

The IGD-TP now has 143 member organisations from 28 countries active in geological disposal. All our member organisations and their contact points are listed at: igdtp.eu/members

IGD-TP Website igdtp.eu

We have continued to develop the activities pages on the IGD-TP website by adding historical and ongoing collaborative research projects. You can now find project summaries, key reports and links to further information for 46 projects. We also announce events and news relevant to geological disposal research on our website. Please contact the IGD-TP Secretariat (secretariat@igdtp.eu) if you would like to highlight something of interest to our community.