safe solutions for radioactive waste

IGD-TP Newsletter

Issue #3, March 2015

"By 2025, the first geological disposal facilities for spent fuel, high-level waste and other long-lived radioactive waste will be operating safely in Europe."

Editorial

Dear Reader,

In 2014, the IGD-TP has actively supported four technical and scientific working group leading to technical proposals submitted to the first EC H2020 call. Three have been approved by the EC. In parallel to the preparation of the proposals seven other activities have supported the sharing of knowledge. One example is the interaction with SNETP which has been strengthened through the preparation of a common factsheet on nuclear development and radioactive waste management. A new working group with representation from SNETP was formed during IGD-TP 5th Exchange Forum in Kalmar. The Strategic Research Agenda, SRA has been reviewed by our Executive Group. Some minor changes were made regarding prioritisation between topics described in the SRA.

The IGD-TP intends to deepen its relations with ENEN regarding competence development. A presentation of ENEN activities was given during the 5th Exchange Forum. Contacts have been taken with the OECD NEA/IGSC. Several IGD-TP members are actively participating in IGSC groups, and therefore a better coordination of our activities will be profitable for both groups.

The first H2020 call has also opened a new action aimed at increasing the coordination and integration between research, development and demonstration (RD&D) programmes in member states. Some of the members in IGD-TP have decided in collaboration with SITEX, CNRS and JRC-ITU to explore the possibility of setting up a Joint Programming initiative on waste management and geological disposal. This initiative, called JOPRAD, has already obtained expressions of interest from many actors in research. While supporting this action, the IGD-TP will ensure to maintain the efficiency of the platform's technical and scientific work to meet the Vision and the objectives set by the platform. .

A workshop will be organised in Pitesti Romania on May 26 in conjunction to the Nuclear 2015 Conference organised by Institute for Nuclear Research Pitesti, Romania. During this workshop a draft guidance document for less-advanced programmes will be presented. The purpose of this document is to support RD&D planning for geological disposal of radioactive waste . The objectives of the workshop is to ensure that the guide contains the right level of information for end-users and those organisations responsible for deciding and/or developing RD&D plans. We strongly encourage interested parties to participate in this event.

After the success of the last Exchange Forum in Kalmar, IGD-TP is now organising the 6th Exchange Forum (Nov 3-4, 2015) in London. Four working groups will help prepare new activities and projects that will reinforce coordination with other platforms.

See you in Pitesti and London!

Monica Hammarström, Chair

Content

IGD-TP 5th Exchange Forum, October 2014, Kalmar, Sweden

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ANNOUNCEMENT

CC4 - COMMUNICATION & DISSEMINATION , SecIGD2 Project, WP2

PLANDIS meeting

The objectives of the PLANDIS workshop (PLANning geological DISposal of radioactive waste in Europe) are to communicate, assess and provide feedback for improvement of a draft guidance document in support of RD&D planning for geological disposal of radioactive waste.
The objectives for the organizers focus on ensuring that the guide is providing the required added value to potential users, including improving the guide where possible through participants' feedback. With respect to the participants, the overall objectives are to become informed about the guide and contribute to its further development. From a more practical point of view they will also (i) gain experience in ranking R&D tasks of direct relevance to the magnitude and stage of their respective national programme, and (ii) benefit from interaction in a rather 'informal' setting with professionals working on RD&D prioritization in a disposal programme at a similar stage as their own, and with experienced RD&D planners.

Target Audience
The event will be of particular interest to decision makers, governmental bodies in charge of radioactive waste management, waste management organizations, technical support organizations, representatives of civil society and experts knowledgeable in governance and involvement of civil society.

Venue
The workshop will be hosted by the Institute for Nuclear Research Piteşti in Romania.
For details of workshop venue, travel and accommodation visit: www.igdtp.eu and www.nuclear.ro

Contact: secretariat@igdtp.eu

Deadline

March 15, 2015	Registration opens
May 15, 2015	Registration closes
May 26, 2015	Workshop

SAVE THE DATE!

JA6a meeting
Date: 10-11th March 2015
Place: Karlsruhe, Germany

WM 2015
Date: 15-19th March 2015
Place: Phoenix, USA

European Nuclear Gen II, III, IV Days
Date: 17-19th March 2015
Place: Brussels, Belgium

CLAY Conference
Date: 23-26th March 2015
Place: Brussels, Belgium

Nuclear 2015
Date: 27-28th May 2015
Place: Mioveni, Romania

77th EAGE Conference 2015
Date: 1-4th June 2015
Place: Madrid, Spain

LUCOEX Final Conference
Date: 2-4th June 2015
Place: Oskarshamn, SWEDEN

Petrus PhD Conference 2015 on Radioactive waste management and disposal
Date: 22-26th June 2015
Place: Université de Lorraine, Nancy, France

TopFuel 2015
Date: 13-17th September 2015
Place: Zurich, Switzerland

More info on www.igdtp.eu

PAST EVENT

5th IGD-TP Exchange Forum (EF5)

Co-organised by the IGD-TP Secretariat and SKB, the 5th Exchange Forum took place on 28-30th October 2014 in Kalmar Sweden. The aims were to:

1. Provide a forum for informal exchanges between the participants around common interests in RD&D;
2. Inform on working groups activities and EC projects ;
3. Explore the main achievements of the IGD-TP since its inception and to discuss if the priorities presented in the SRA have been adequately covered by the joint activities and associated projects.
4. Express new ideas that could i) complement our SRA priorities and ii) lead to new Research, Development and Demonstration (RD&D) topics over the next five years.
5. Continue the work with SITEX and SNETP started in 2013 in order to bring forward new subjects for collaboration and/or identify subjects of common interest.

About 130 participants took part in plenary sessions as well as in 4 parallel Working Group sessions and a walkabout session organised by the CMET WG (see article below). Finally, a visit of the Äspö laboratory was organised.

WG1
Safety Case: Handling of uncertainties

WG3
Information Exchange Platform with SNETP

WG2
Microbiological Studies

WG4
Priorities & lessons learned after 4 years of implementation of SRA

Next Exchange Forum (EF6) will be held on 3-4 November 2015, in London, UK.

JA14 - Competence Maintenance, Education and Training Working Group Activities

CMET Walkabout session at EF5

The CMET working group (WG) members, together with the Petrus III project partners, organised a session in October 2014 at the IGD-TP 5th Exchange Forum. This session followed an interactive workshop model consisting of nine walkabout stations. The aim of the session was to collect the IGD-TP participants' views about a potential voluntary accreditation scheme in geological disposal and to increase awareness about the ECVET approach that is currently in a pilot phase in European Union. Around 50 participants provided input in the walkabout and there was a positive interest towards the topic even though for many participants acknowledged that the ECVET approach was quite new to them. The outcomes of the walkabout were further discussed in the 4th CMET WG meeting that took place in November 2014 in Paris. The outcomes will contribute to the SecIGD2/CMET feasibility study on voluntary accreditation scheme that is planned for preparation by the end of 2015.
For more information, please visit www.igdtp.eu

Photos: Radek Vasicek/CTU and Marjatta Palmu, Posiva

Glimpses from the Kalmar CMET Walkabout

IGD-TP NEWS & ACTIVITIES

JA8: Handling of Uncertainties in the Safety Case for Geological Disposal of Radioactive Waste

Safety cases are based on understanding of the intrinsic safety of a disposal system in terms of the safety functions provided by multiple barriers. This understanding is demonstrated by presenting a range of different safety arguments, including modelling results. Such modelling needs to take account of the inevitable uncertainties of data and models, especially when describing the evolution of the disposal system over long time scales. Proper handling of uncertainties in the safety case is an important topic that has been identified by a number of WMOs and stakeholders. Work on this that has been carried out and published by the OECD/NEA and the IAEA in the context of previous EC R&D projects (e.g. PAMINA) revealed essential needs for further research, specifically in view of new theoretical developments.

The ultimate goal "to have confidence" in the long-term safety of geological repositories means "to have reached a positive judgment that a given set of conclusions are well supported". To reach this goal for a specific disposal concept and site under consideration, it is necessary to identify uncertainties and to assess their influences on the relevant safety functions. Uncertainties need to be considered in the scenarios, models and data that underpin the safety case. "Handling of uncertainties" comprises the investigation, management and communication of these uncertainties, including analysis of the influence of quantifiable uncertainties on the results of post-closure performance assessment. Not all uncertainties are significant or detrimental to safety.

There are different strategies available for handling uncertainties, and a Technical/Scientific Working Group (TSWG) set up under Joint Activity 8 (referring to the SRA´s key topic 1: Safety Case) is exploring and further developing these strategies. This TSWG is composed of European WMOs and a number of research institutions from European countries and the USA. JA8 meetings were held in May and September 2013, and a further meeting was held in October 2014 as part of the IGD-TP 5th Exchange Forum. The TSWG is addressing three topic areas:

- ***Management of uncertainties***. This comprises general strategies for management of uncertainties, specific aspects of handling uncertainties in different time frames, regulatory decision-making under uncertainty, and communication aspects.
- ***Uncertainty identification and quantification***. This is focused on the use of expert judgement to quantify uncertainties, derivation of probability density functions for parameter value uncertainties, and consideration of the importance of correlated uncertainties.
- ***Sensitivity analysis***. This aims at providing a survey and assessment of sensitivity analysis methods in view of the requirements of post-closure performance assessment, a comparison of methods using numerical experiments, and consideration of the relationship between the results of sensitivity analysis and the identification of R&D needs.

JA6a - Cement-organics-radionuclides interactions (CORI)

JA6a meeting

Organics are present in cement based materials as: (1) Waste components, and (2) Organic cement additives, sometimes in significant concentrations, especially in low pH cements.

The organic components, as well as their degradation products, may interact with radionuclides forming soluble complexes affecting the mobility of the radionuclide source term. The TSWG CORI will discuss among others following topics:

- General and concept specific issues, such as organic inventories in disposal projects, waste, construction materials…
- Transformation of organic polymers into aqueous ligands by various degradation processes
- Interactions of organic degradation products with respect to aqueous complexation, solubility and sorption.
- Redox processes in the presence of organics, microbial processes and relevance of organic/iron interactions.

The TSWG meeting on cement-organics-radionuclide-interactions (CORI) will be held on **10-11th March 2015 in Karlsruhe Institute of Technology (KIT), Institute for Nuclear Waste Disposal (INE), Karlsruhe, Germany.**

The aim of the CORI meeting is (i) introducing key aspects of the topic via 2-3 invited lectures, (ii) have short presentations from the participants on specific interests and perspectives, and (iii) discuss future research required in this field. The meeting will be open for any interested group. The CORI meeting is expected to provide for a broad overview on current activities and interests, and allow prioritisation of topics and research activities which would eventually benefit from a joint research approach.

Please communicate your interest in participating the CORI TSWG meeting in Karlsruhe by by email to marcus.altmaier@kit.edu

NEWS from TECHNICAL PROJECTS

JA2 - Full scale demonstration of plugging and sealing

LUCOEX

LUCOEX Conference *homepage*

Initiated in 2010, LUCOEX (Large Underground Concept Experiments) aims to prove the technical feasibility for a safe and reliable gallery construction, manufacturing and emplacement of buffer components, emplacement of waste packages and finally backfilling and sealing of galleries for four different repository concepts. Two of these proof-of-concept (p-o-c) installations are now in monitoring while two will be finalized during the start of 2015.

ANNOUNCEMENT - Final LUCOEX Conference (2-4th June 2015)

The **final LUCOEX Conference** will focus on how to accomplish full-scale demonstration tests of repository concepts for the disposal of radioactive waste based on the experiences and challenges of the LUCOEX project. It will focus on **planning**, **excavation** of tunnels/ drifts, **manufacturing of components** and **installation equipment**, **installation techniques**, **instrumentation/monitoring** and **workers safety**. This will be the final opportunity for interested parties to participate in a direct dialogue with all project partners.

Venue: Forum Oskarshamn, Södra Långgatan 15, Oskarshamn, SWEDEN

Conference contact: Mary Westermark, SKB mary.westermark@skb.se +46857938720

Scientific contact: Erik Thurner, SKB erik.thurner@skb.se +4684598480

Registration, submissions of abstracts and instructions for hotel bookings at: http://www.lucoex.eu/conference/.

LUCOEX Project Update

KBS-3 Horizontal Disposal (Sweden / SKB)

The proof-of-concept installation for KBS-3H horizontal disposal in crystalline rock was successfully completed during the end of 2013 and has performed during 2014 a successful verification of the possibility to drill a 100
m pilot hole with very strict acceptance criteria's. The goal is now to finalize the reporting during 2015 and continue the monitoring of the experiment.

Ongoing Tests in ONKALO (Finland/Posiva)

A new test-hall has been constructed in Finland for the testing of the unique machinery developed for the Posiva's repository. Posiva uses this test-hall for the development of the automation system for the buffer transportation and installation machinery. Final above ground tests were performed during the beginning of 2015 after which the underground testing will commence for both the machinery and the problem handling tools developed in ONKALO demonstration area.

Finalizing the Installation in Mont Terri

The proof-of-concept installation for the Swiss disposal concept in Mont Terri has been completed regarding excavation, component manufacturing and installation. All the instrumentation for both far-field/near-field have been installed and in December the first heater on low power was switched on to verify that everything functions as planned. Focus is now to backfill the rest of the drift covering the second and third heaters and finally to install the plug which will seal the drift for the duration of the multi-year thermal experiment studying the interaction between the clay barriers and the heat from the spent fuel(excluded from scope of LUCOEX).
After installation NAGRA will change to long-term monitoring mode and start looking into the data in greater detail and increase their reporting efforts.


Prototype backfilling machine driving into the FE tunnel at Mont Terri

Monitoring Continues in BURE (France, ANDRA)

The first work package to complete their technical work was the French Proof-of-Concept installation, where ANDRA successfully performed the excavation, component manufacturing, installation and sealing of the galleries in accordance with the French concept for geological disposal. They are now in a multi-year Heater Experiment to analyse the interaction between the clay barriers and the heat from the spent fuel.

New Deliverables

The following new deliverables are now available for download on www.lucoex.eu:

- Manufacturing of buffer and filling components
- Deposition machine upgrades
- Designing the gap filling tool
- Digging and emplacement of the cell

NEWS from TECHNICAL PROJECTS

JA6 - Confidence increased in safety codes

PEBS

Long-term Performance of Engineered Barrier Systems

PEBS (Long-term Performance of Engineered Barrier Systems) was initiated in 2010 to study the complex interaction of thermal, hydraulic, mechanical and chemical processes in clay-based engineered barrier systems for geological repositories. During the 4-year project, investigations were conducted by 17 partners from Europe, China and Japan.

The work performed within PEBS involved several laboratory and in-situ experiments, covering a broad range of time and spatial scales. The experimental results provided the database for the validation and enhancement of coupled numerical simulations. New material models were developed and applied for the extrapolation of the observed EBS behaviour to the long-term performance. A special focus was the integration of existing and newly gained knowledge on the EBS evolution in order to constrain the conceptual and parametric uncertainties in the context of long-term safety assessment.

With the described comprehensive scientific approach, the PEBS project was thus able to:

- deepen the knowledge and understanding of the THM-C evolution of the EBS;
- provide a more quantitative basis for relating the evolutionary behaviour of the EBS to its safety functions as a repository system component;
- clarify further the significance of residual uncertainties for long-term performance assessment.

In addition to the scientific objectives, the dissemination of the essential results to the broad scientific community was an important aim of the project. The consortium used its expertise for information purposes and to promote knowledge and technology transfer through training.

As the PEBS project was nearing completion, the **International Conference on the Performance of Engineered Barriers**, held at BGR Hannover, provided a platform to disseminate the outcomes of the project to the scientific community. More than 180 participants from 17 countries used this opportunity to present and discuss the current state of research on the performance of engineered barriers in geological repositories for high-level nuclear waste. The conference was rounded up by a panel discussion with international experts, which provided a summary of topics relevant for the design of future joint projects.

For further information, visit: www.pebs-eu.de

New Deliverables

Several new Deliverables are available for download on www.pebs-eu.de, among others:

- ✓ PEBS Final Scientific Report
- ✓ Integration of the Short-term Evolution of the Engineered Barrier System (EBS) with the Long-term Safety Perspective
- ✓ Extrapolation of the Models Developed to the Repository Long-term Evolution and Evaluation of Uncertainties

NEWS from TECHNICAL PROJECTS

JA3 - Waste forms and their behaviour C14

CAST

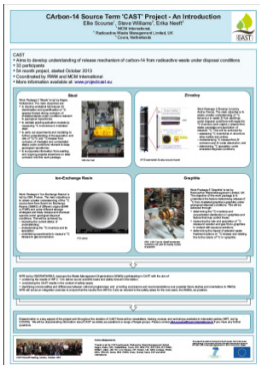
The CAST Project (CArbon-14 Source Term) (10/2013-05/2018) aims to develop understanding of the potential release mechanisms of C14 from radioactive waste materials under conditions relevant to waste packaging and disposal to underground geological disposal facilities. The CAST consortium brings together 33 partners with a range of skills and competencies in the management of radioactive waste containing C14, geological disposal research, safety case development and experimental work on gas generation.

In 2014 Ondraf/Niras hosted the **2nd CAST General Assembly Meeting** in Brussels on 20-22 October. The meeting was a success, with 36 participants attending from many different European countries and Japan. The next General Assembly Meeting will be held on 14-15 October 2015 in Romania; we welcome observers to attend the General Assembly Meetings, please contact Ellie Scourse for further information.

In addition to the General Assembly Meeting, Andra hosted a joint Work Package (WP) 2 and 3 meeting in July 2014. WP2 and 3 are utilising similar experimental methodologies so there is benefit to close knowledge dissemination between these WPs.

12 deliverables have been published on the CAST website. The key outcomes so far are:

- For WP2 (Steels) – the main deliverable produced so far is the State of the Art review of steel corrosion and C14 release (D2.1). Analytical procedures are currently being developed.
- For WP3 (Zircaloy) – five deliverables have been produced, including: a State of the Art review (D3.1), a Definition of operating conditions and presentation of the leaching experiments (D3.2), a Description of the analytical procedures for gaseous and dissolved C14 species quantification (D3.3), a Progress report on the corrosion tests in the hot-cell experimental set-up (D3.4) and the first Annual Report (D3.5)
- For WP4 (Ion-Exchange Resins) – the first year was dedicated to producing a state of the art review on sample choice, analytical techniques and current knowledge of release from spent ion-exchange resins(D4.1). The first Annual Report has also been published (D4.2).
- WP5 (Graphite) – the first Annual Progress Report (D5.2) has been published. Other deliverables have also been published including a report on graphite categories in the RBMK reactor in the Ukraine (D5.3). Contributions to the review of current understanding have been compiled towards delivery of D5.5 report.



- For WP6 (Relevance of results in national contexts & safety assessments) all participants have provided detailed information on how C14 is currently handled in their safety assessments. These have been compiled and are currently being reviewed across the WP towards the delivery of D6.1 report in the next year.

A CAST poster was presented at the IGD-TP Geodisposal Conference in Manchester in 2014 and is available on the CAST website.

The CAST website can be found at: http://www.projectcast.eu/

NEWS from TECHNICAL PROJECTS

JA2 - Full scale demonstration of plugging and sealing

DOPAS

Status of DOPAS and its Experiments

FSS (Experiment 1), Saint Dizier, France
The final phase of major emplacement activities of the experiment carried out in the above ground drift model in Saint Dizier was finished when the low pH shotcrete containment wall was installed in September 2014. REM "metric scale resaturation" test, which is part of DOPAS WP5, was installed in September 2014.
EPSP (Experiment 2), Josef URC, Czech Republic
The EPSP plug location in the Josef underground laboratory has been instrumented and the inner plug was emplaced by shotcreting technology. The work will continue with clay core emplacement. The plug construction will be ready in Spring 2015.

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Underground work for POPLU Experiment ongoing.

DOMPLU (Experiment 3), Oskarshamn, Sweden
The DOMPLU monitoring phase in the Äspö Hard Rock laboratory at depth of 460 m is ongoing and the data freeze for DOMPLU reporting was done in September 2014.
POPLU (Experiment 4), Eurajoki, Finland
The Posiva wedge shaped plug requires an excess in bedrock hosting the plug and the slot production of this excess was completed in the ONKALO Underground Rock Characterisation Facility at the future disposal level in January 2015. The construction activities for casting the POPLU plug and installing the sensors are expected to take first half of 2015.

DOPAS 2016
Plugging and Sealing Seminar

Location Turku Finland

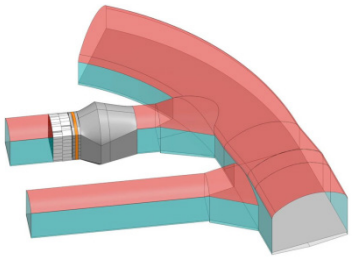
25-27th May 2016

This seminar is open for anyone who is working now or in the future with repository closure related full -scale experiments for the radioactive waste management and spent fuel disposal in geological formations. Plenary, oral presentations and poster sessions will be organized. An optional technical tour to Olkiluoto repository location will be arranged.

Schedule:

- Call for abstracts Summer 2015.
- Deadline for abstracts 11/2015.
- Final programme available 2/2016.
- Seminar 25-27/05/2016 or 6/2016

Stay tuned to www.posiva.fi/en/dopas and IGD-TP website for more details.



The **DOPAS newsletter 3** has been published in December 2014 and is available here.

FOCUS on HORIZON2020

Successful IGD-TP projects within the first EURATOM H2020 call (2014-2015)

Towards a Joint Programming on Geological Disposal - JOPRAD

JOPRAD aims to prepare the setting up of a Joint Programming on Radioactive Waste Disposal that would be established to coordinate at the European level, national research programmes and the associated research and development (R&D) activities on geological disposal for high activity long lived radioactive waste. This action includes reviewing of all strategic aspects linked to a stepwise move towards a Joint Programming in this field.

JOPRAD will involve organisations that are active in the safety, management and disposal of radioactive waste and research entities. The steps will be to i) engage in discussion with Member States representatives in order to clarify the organisation of their national R&D consistent with the implementation of the Council Directive ; ii) identify existing research programmes that could contribute to the identification of common scientific objectives and activities as well as specific aspects that the organisations would like to develop in the Joint Programme ; iii) Draft the joint "Programme Document" that should be the technical background of the Joint Programming.

Development & Demonstration of monitoring strategies and technologies for geological disposal - Modern2020

The overall objective Modern2020 is to provide the means for developing and implementing an effective and efficient repository operational monitoring programme, taking into account the requirements of specific national programmes. Modern2020 focuses on monitoring of the near-field during repository operations. The work addresses the following issues: i) Strategy: develop a detailed methodology for screening safety cases to identify needs-driven monitoring strategies and to develop approaches for responding to monitoring information ; ii) Technology: resolve outstanding technical issues in repository monitoring, including gaps in research in monitoring technologies (coupling of different wireless data transmission technologies, research into power supply, geophysics, reliability and qualification of components.; iii) Demonstration and Practical Implementation: enhance the knowledge on the operational implementation and demonstrate the performance of state-of-the-art and innovative techniques by running full-scale and in-situ experimentations; iv) Societal concerns and Stakeholder Involvement: Develop and evaluate ways for integrating public stakeholders concerns and societal expectations into national repository monitoring programmes.

Cement-based materials, properties, evolution, barrier functions -Cebama

The overall goal of Cebama is to support implementation of geological disposal of nuclear waste by improving the knowledge base for the Safety Case. Cement-based materials are highly relevant in this context, being used as waste forms, liners and structural components or sealing materials in different types of host rocks and disposal concepts. Specific objectives of Cebama are (i) experimental studies of interface processes between cement based materials and host rocks or bentonite, and assessing the specific impact on transport properties, (ii) quantifying radionuclide retention under high pH cement conditions, and (iii) developing comprehensive modeling approaches. Modeling will support interpretation of results and prediction of the long-term evolution of key transport characteristics such as porosity, permeability and diffusion parameters especially in the interface between cement based materials and the engineered and natural barriers.

Influence of microbial processes on geological disposal of radioactive waste – MIND

The MIND project brings together 15 European groups working on the impact of microbial processes on safety cases for geological repositories across the EU, focusing on key questions posed by waste management organisations. The emphasis is on quantifying specific measureable impacts of microbial activity on safety cases under repository-relevant conditions, thus altering the current view of microbes in repositories and leading to significant refinements of safety case models currently being implemented to evaluate the long-term evolution of radioactive waste repositories. The integration of society and policy oriented studies in the project also extends the impact of the project outside the scientific and technical domain, while a study of expert conceptualization, public perception and risk communication concerning microbial influences in geological disposal, will improve awareness of microbial issues on a broader level.