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D1.5.2. MASTER DEPLOYMENT PLAN and JOINT ACTIVITIES OUTLINES 2015

IMPLEMENTING GEOLOGICAL DISPOSAL OF RADIOACTIVE WASTE TECHNOLOGY PLATFORM (IGD-TP)

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1 Foreword

The Strategic Research Agenda (SRA) identified and prioritized the research, development and demonstration (RD&D) issues that could be pursued together in Europe to achieve the IGD-TP vision. The SRA was published in July 2011. The strategy for the joint RD&D interest was organised under seven Key Topics comprising of a total of 36 individual Topics. The IGD-TP EG reviewed the content of the SRA in 2014. The SRA was analysed to be still valid, however some additions were included to this Deployment Plan resulting from the analysis as can be noted in the MDP.

Sixteen Topics were identified as being of high priority and urgency for future deployment of the SRA within the Key Topics. Further Cross-Cutting Activities were identified including Dialogue with the regulators, Competence maintenance, education and training, Knowledge management, and Communication.

The goal of the Master Deployment Plan (MDP) is to outline and steer the cooperative actions flowing from the SRA and to assist the IGD-TP Executive Group (EG) members and other participants in communicating the progress and providing for opportunities to engage in these Joint Activities (JA). The goal of the Joint Activities is to assist in achieving the Vision 2025 by implementing joint RD&D and producing there expected results expected from the activities. These results contribute contributing to new research, development and demonstration (RD&D) knowledge in geological disposal as foreseen in the IGD-TP's deployment planning for the years to come.

Each SRA Topic under a specific Key Topic was classified accordingly into this deployment scheme as one of the five types of Joint Activities of the IGD-TP and together with the overall timeline in the SRA report this permitted the development of a Master Deployment Plan for the period 2011-2016.

The guidance of the Executive Group was also considered in the identification of Joint Activities that should be pursued first. The first Master Deployment Plan was presented in the Deployment Plan published in June 2012 and it has been update in 2013, 2014 and now in 2015.

The collaboration in the IGD-TP has initiated a total of 12 Joint Activities. The various Joint Activities have developed a total of 9 Technical Projects that are on-going and the IGD-TP has supported five proposals in the framework of the first Horizon 2020 (H2020) call

The deployment of the Joint Activities has reached a stage where it was necessary to extend the deployment planning horizon beyond the year 2016 in this Master Deployment Plan. The work to extend the planning horizon has been initiated by the EG and the Secretariat by carrying out an assessment on the state-of-the art of the IGD-TP's SRA. This work has been completed early 2015 and the result of this SRA Analysis is presented in this Master Deployment Plan.

This document presents an update of the Master Deployment Plan and the activity outlines for the individual Joint Activities as at the end of 2014. It takes into account the outcomes of the IGD-TP's 5th Exchange Forum (EF) held in Kalmar and the decisions taken during the Executive Group meetings EG14, EG15, in 2014, and EG16 in 2015.

2 Introduction

In the IGD-TP's SRA, the RD&D issues identified by implementers as important to the advancement of their programmes and which are were of common interest to all or some of the IGD-TP Executive Group members and other participants, were initially grouped into seven thematic areas called Key Topics. Each Key Topic represents an area under which specific related for achieving RD&D results need to be achieved for implementing the Vision 2025. The Key Topics defined were:

1. Safety case,
2. Waste forms and their behaviour,
3. Technical feasibility and long-term performance of repository components,
4. Development strategy of the repository,
5. Safety of construction and operations,
6. Monitoring, and
7. Governance and Stakeholder involvement.

In addition, a number of Cross-Cutting Activities (CC) was defined:

- Dialogue with regulators,
- Competence maintenance, education and training,
- Knowledge management (incl. information preservation, memory keeping),
- Communication and other activities supporting information exchange.

Common RD&D needs were identified and the Topics under each Key Topic were classified according to importance and urgency for the WMO's programmes and for reaching the Vision 2025.

The SRA is in turn translated into a Deployment Plan (DP) of Joint Activities to be carried out by the Technology Platform by its members and participants. The Joint Activities were derived from the individual SRA Topics and prioritized along a timeline for their implementation. The start of each activity required a leading organisation and volunteering participants for the activity, who also contribute resources to the Joint Activity's implementation. The kind of resources contributed depends on which type of Joint Activity is deployed (see Section 3.3 for further details).

During the evolution of the deployment of the activities, the need for the number of type of Joint Activities has also reduced. And there have been no Joint Activities in the field of Technological Transfer (TT) yet.

3 IGD-TP's Strategic Documentation

3.1 Report status at the end of 2014

Name	Full reference	Acronym	Version	Date of issue
Vision Report	EUR24160 EN - Implementing geological disposal Of radioactive Waste Technology Platform - Vision Report - Luxembourg: publications Office of the European Union 2009-48pp.; ISBN 978-92_79-13622-1; ISSN 1018-5593; doi 10.2777/53840	Vision 2025	Final version	2009
Strategic Research Agenda	IGD-TP SRA2011 - IGD-TP Implementing Geological Radioactive Waste Technology Platform Strategic Research Agenda 2011; July 2011; ISBN 978-91-979786-0-6	SRA	SRA 2011	July 2011
Deployment Plan	IGD-TP DP2011 - IGD-TP Implementing Geological Radioactive Waste Technology Platform - Deployment Plan 2011-2016 June 2012, ISBN 978-91-979786-1-3	DP	Final version	June 2012
Master Deployment Plan 2013	D1.5 Master Deployment Plan and Joint Activities outlines 2013 - Implementing Geological Radioactive Waste Technology Platform (IGD-TP)	MDP	Final version	June 2013
Master Deployment Plan 2014	D1.5.1 Master Deployment Plan and Joint Activities outlines 2014 - Implementing Geological Radioactive Waste Technology Platform (IGD-TP)	MDP	Final version	June 2014

3.2 Revisiting the contents of the SRA in 2014 and 2015

In the SRA seven Key Topics were identified. In addition, Cross-Cutting Activities (CC) and Waste Management programme specific activities (WMS) have also been identified. The list of the Key Topics with their contents1 is given below in In addition, the authors concluded that, Topics and Key Topics of current SRA are still relevant. Minor adjustments could be made. The SRA adequately covers the needs from the more advanced countries but not the lesser advanced countries. However, national issues should be left aside. The yearly update of MDP is currently enough to reflect the changes of the proposed work program of the IGD-TP.

Thus, considering that the IGD-TP's Vision document is still valid, the EG members recommend it should not be changed, but it should be amended when decisions regarding licensing are taken. The experience is that the minor changes that come up can be handled through the yearly update of the Master Deployment Plan. However, it is recommended to review the urgency/priorities relatively frequently (to be defined: once

[1] The "Topic" is derived from the SRA and several Topics belong to each of the identified Key Topics. The Topics are to some extent interrelated and require further RD&D in order to round off the scientific and technical basis needed for licensing. The outcome and achievements from these Topics will be used not only in the decision making on technical and safety related details of the disposal system's licensing process, but also for final quality and confidence check and approval of the safety case.

every year?), since priorities tend to change over the years and depending on how the different programs develop. The regular establishment of a state of progress of the knowledge and a board of correspondence with the topics of the SRA, in particular the achievement of the objectives, could help to that.

Finally, it is proposed to keep the specific working group dedicated to the less advanced programs needs in the framework of the SecIGD2 project.

Finally the new table of priorities is as follow (In red changes in 2015)

Table 3-1: List of the Key Topics and related Topics with their foreseen start and outcome - dates, and an indication of their priority (H: high, M: medium, L: low).

N°	List and Contents of the Topics for a given Key Topic	Start – date	End– date	Priority within the Key Topic
1	Key Topic 1: Safety case			
1.1	Increase confidence in, and testing and further refinement of the tools (concepts, definition of scenarios and computer codes) used in safety assessments	2012	2020	M
1.2	Improve safety case communication. This includes safety case communication on: Short-term safety of construction and operations, the transient phase, long-term safety.	2012	2025	M
1.3	Increase confidence in and further refinement of methods to make sensitivity and uncertainty analyses.	2015	2020	M
2	Key Topic 2: Waste forms and their behaviour			
2.1	High burn-up fuels: rapid release fraction and matrix dissolution	2015	2020	H
2.2	Release from ILW and their detailed characterization	2012	2016	H
2.3	MOX fuel: relation between structure and dissolution	2022	2028	M
2.4	High burn-up fuels and criticality	2015	2020	M
2.5	Improved data on vitrified HL waste	2012	2015	L
3	Key Topic 3: Technical feasibility and long-term performance of repository components			
3.1	Full-scale demonstration of a HLW container (from manufacturing to emplacement)	2015	2020	H
3.2	Buffer and backfill emplacement	2016	2020	H
3.3	Construction of underground facilities: Confirmation of rock properties for detailed repository design	2012	2018	H
3.4	Repository layout design including operational safety, reversibility and retrievability concerns	2015	2020	H
3.5	Pilot demonstration of repository operation	2011	2017	H
3.6	Full-scale plugging and sealing experiments and demonstrations	2012	2018	H
3.7	Non-destructive testing information exchange	2013	2019	L
3.8	Knowledge preservation	2016	2023	L
3.9	Long-term stability of bentonite in crystalline environments	2011	2017	H
3.10	Long-term behaviour of seals and plugs	2011	2017	H
3.11	Evolution of cement-based seals	2015	2023	M
3.12	Interaction of cement with clays	2016	2024	M
3.13	Optimisation of low pH cements	2016	2022	M
3.14	Salt backfill	2012	2018	M
3.15	Iron-bentonite interaction	2015	2023	M
3.16	Sharing of knowledge on HLW container materials behaviour	2012	2023	L
3.17	Thermal effects of bentonite-waste container contact performance at above 100°C	2015	2023	L
4	Key Topic 4: Development strategy of the repository			

N°	List and Contents of the Topics for a given Key Topic	Start – date	End– date	Priority within the Key Topic
4.1	Methodologies for adaptation and optimisation during the operational phase	2012	2018	M
5	Key Topic 5: Safety of construction and operations			
5.1	Improved methodology, approaches and documentation on risk assessment, risk management, further documentation for reporting operational safety issues – Operational Safety remain High see 3.4 –	2012	2018	M
5.2	Strategies to evaluate the impact of operational safety issues on the disposal system (long-term safety, design, costs…)	2019	2025	M
6	Key Topic 6: Monitoring			
6.1	Monitoring strategies and programmes for performance confirmation	2011	2015	H
6.2	Monitoring technologies and techniques	2011	2015	H
6.3	Monitoring of the environmental reference state	2011	2016	H
6.4	Monitoring of engineered barrier systems	2016	2020	H
6.5	Post-closure monitoring parameters and techniques	2023	2030	M
7	Key Topic 7: Governance and stakeholder involvement			
7.1	Governance of decision making processes: methods for the integration of technical, social and economic information	2011	2014	H
7.2	Use of research results for open and transparent dialogue with stakeholders (methods, tools, guidance)	2016	2025	M
7.3	Involvement of stakeholders, influence on the work of the researchers and the decision makers	2016	2025	M

. The Cross-Cutting and Waste Management programme Specific activities are given in Table 3-2.

Table 3-1: List of the Cross-Cutting Activities (CC) and of the Waste Management programme Specific activities (WMS)[2] *–*

CC: Cross-Cutting Activities	
CC1	Dialogue with the regulators
CC2	Competence maintenance, education and training
CC3	Knowledge management
CC4	Communication
WMS - Waste Management programme Specific activities	
WMS1	Site characterisation
WMS2	Transportation
WMS3	Requirement management system
WMS4	Waste acceptance
WMS5	Industrial scheme
WMS6	Economics of funding and planning

3.3 Types of Joint Activities for the deployment of the SRA

The review of the Topics listed in the IGD-TP's Strategic Research Agenda (SRA) made it possible to identify the different types of Joint Activities that should be used to help the deployment of the SRA Topics, and more specifically to supply those tasked with the management of a given Topic (or Joint Activity) with guidelines that can assist them in their task.

Five different generic types of Joint Activities that could be implemented for the deployment of the SRA Topics were identified by the Deployment Plan Working Group in 2012:

1. Organizational Working Group (ORWG): This is a working group coming together for the specific procedural purpose for organising around a Topic. Its activity focuses on either the strategic or practical organisational approaches around the respective SRA Topic (e.g. organising peer reviews or benchmarking) more than on detailing the technical matters related to a technical or scientific Topic itself. It aims to have a task and a time specific focus during its lifetime. The ORWG can also provide for more permanent infrastructures e.g. in the case of organising expert pools for peer reviews or improvements in organisational efficiency at the participant organisations via benchmarking practices.
2. Technical/Scientific Working Group (TSWG): This is a working group with the specific purpose of development of a scientific or technical Topic i.e. preparatory work is conducted on a Topic to generate a possible Technical Project. Details for preparing a project plan and launching a joint project will be developed within this activity. This type of work may include, for example, a more detailed scoping and framing of a scientific or technical issue or the preparation of state-

[2] IGD-TP DP2011 - IGD-TP Implementing Geological Radioactive Waste Technology Platform - Deployment Plan 2011-2016

of-the-art reports for a focused identification of needs prior to the development of a technical project plan.

3. Information Exchange Platform (IEP): This type of activity can provide organised forums of exchange between the IGD-TP members and other participants. It allows for discussion on programmatic choices around technical options available, in order to highlight differences and to learn from the experience of others and the IEP can address various Topics during its lifetime.
4. Technical Project (TEP): This type of activity covers technical or scientific work on a specific SRA Topic. A TEP can either be ready for launch as is, or may need minor clarification before a detailed project plan and project agreement between the parties can be produced before starting the technical or scientific project.
5. Technological Transfer (TT): This type of activity concerns actors (generally two) with some (generally one) possessing knowledge that the others (generally one) are ready to acquire. For example, it can be based on agreements of transfer of previously acquired results or knowledge on a commercial basis or on in-kind contribution.

3.4 Engaging the IGD-TP participants into deployment

The methodology for the deployment is the following[3]:

- For each Joint Activity an activity outline is produced. This work is done by the Joint Activity leader with the assistance of the interested parties in the Joint Activity and the Secretariat.
- The on-going and new activity outlines are presented at each EG meetings (for example the latest group of Joint Activities were considered in the EG meeting in November 2014).
- The EG members decide on their respective participation to the new Joint Activities. A leading organisation for the Joint Activity is decided and designated to produce an initial scope of work that will go out with a call for volunteers[4] from the IGD-TP. Along with the call for volunteers, potential dates of meetings and a suggested list of activities of the group can be announced on the IGD-TP's extranet. The type of Joint Activity chosen for the Topic will give an indication of the type of funding required for the activity.
- Once the Joint Activity participants have been identified:
  1. The initial activity outline is discussed and detailed; it can be modified at this stage.
  2. Further discussions on the financing, on more specific planning and on the Joint Activity schedule take place among the participants under the lead of the selected organisation (in most cases an EG member).
- A given activity's schedule is then included into the Master Deployment Plan and the progress of the activity is monitored along with all the other elements that are listed in it. The Secretariat is responsible for following up the progress in the Master Deployment Plan. The Secretariat also assists the individual activities by providing the governance and management guidelines and further support especially in dissemination and in the use of the IGD-TP extranet as the activity develops.

3.5 Future transformation of the types of Joint Activities

Taking into account the evolution and experience gained in the deployment of the activities, a future transformation and reduction of the types of Joint Activities was suggested by the secretariat.

[3] The elements that are given here are described in detail in the Terms of Reference for the Executive Group
[4] Therefore joining any given Joint Activity is a voluntary decision of the participants to contribute to the activity

It is suggested to consider only four types of Joint Activities instead of five:

1. Technical/Scientific Working Group (TSWG): This is a working group with the specific purpose of development of a scientific/technical or organisational Topic i.e. preparatory work is conducted on a Topic to generate a possible Technical Project (EC funded or not) or practical organisational approaches around the respective SRA Topic (e.g. organising peer reviews or benchmarking) This type of work may include, for example, a scoping and framing of a scientific/technical/organisational issue or the preparation of state-of-the-art reports for a focused identification of needs prior to the development of a technical project plan.
2. Information Exchange Platform (including Organisational WG type activities) (IEP): This type of activity can provide organised forums of exchange within the IGD-TP members and participants or with other organisation outside IGD-TP (SNETP, ENEN ….). It allows e.g. for discussion on programmatic choices around technical options available, in order to highlight differences and to learn from the experience of others and the IEP can also address various topics during its lifetime.
3. Technical Project (TEP): This type of activity covers technical or scientific work on a specific SRA Topic. A TEP can either be ready for launch as is, or may need minor clarification before a detailed project plan and project agreement between the parties can be produced before starting the project activity.
4. Technological Transfer (TT): This type of activity concerns actors (generally two) with some (generally one) possessing knowledge that the others (generally one) are ready to acquire. For example, it can be based on agreements of transfer of previously acquired results or knowledge on a commercial basis or on in-kind contribution.

4 Main evolutions of the Master Deployment Plan since MDP 2014

4.1 H2020 Work Programme 2014-2015

In 2014, five project proposals supported by the IGD-TP EG were submitted in the framework of the first H2020 call. Four were accepted

The proposals accepted are listed below:

Development & Demonstration of monitoring strategies and technologies for geological disposal - Modern2020 (JA 7)
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 (JA6)
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. Cebama project will start on 1st June 2015.

Influence of microbial processes on geological disposal of radioactive waste – MIND (JA6b)
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.

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.

4.2 Technical Projects (TEPs)

In 2014 three Technical Projects supported by the EURATOM grant and followed up by the IGD-TP EG ended (REDUPP, MoDeRn, and PEBS) and one project's duration was extended (LUCOEX).

EC Project	Start Date /Duration	Description	Total cost	EC contribution	Status
Lucoex	Start date 2011-01-01 Duration 56 months	Large Underground Concept Experiments	6,52	2,8	On going
First-Nuclides	Start date 2012- 01-01 Duration 36 months	Fast / Instant Release of Safety Relevant Radionuclides from Spent Nuclear Fuel	4,7	2,5	COMPLETED
REDUPP	Start date 2011-04-01 Duration 36 months	Reducing Uncertainties in Performance Prediction	1,6	0,9	COMPLETED
DOPAS	Start date 2012-09-01 Duration 48 months	Full Scale Demonstration of Plug And Seals	15,7	8,7	On going
PEBS	Start date 2010- 03-01 Duration 48 months	Long-term Performance of Engineered Barrier Systems	6,5	2,8	COMPLETED
MoDeRn	Start date 2009- 05-01 Duration 54 months	Monitoring Developments for safe Repository operation and staged Closure	5	2,8	COMPLETED
BELBaR	Start date 2012-03-01 Duration 48 months	Bentonite Erosion: effects on the Long term performance of the engineered Barrier and Radionuclide transport	5,1	2,6	On going
SecIGD2	Start date 2013-01-01 Duration 36 months	Secretariat IGD-TP	1,4	0,8	On going
CAST	Start Date 2013-10-01 Duration 54 months	CArbon-14 Source Term	14,7	4,5	On going

4.3 Technical and Scientific Working Groups

4.3.1 TSWG and IEP specific updates

TSWG JA4: Monitoring the Environmental Reference State

The IGDTP JA4 Meeting took place in September 2014.

JA4 aims to deliver a reference framework for waste management organisations, which will support development of their environmental monitoring strategies and detailed monitoring programs. This work is likely to include information on the spatial, temporal and technical scope of monitoring; sampling and analysis techniques for key environmental parameters; managing large data sets; data interpretation and accounting for environmental trends as well as the involvement of stakeholders in the design and implementation of monitoring programs.

TSWG JA6a: Cement-Organics-Radionuclide Interactions (CORI)

At EG14, the EG agreed on the setting up of a TSWG lead by B. Kienzler (KIT) with M. Altmaier (KIT) presently organising the TSWG CORI. Organic materials are present in nuclear waste repositories and potentially influence their functionality and performance. Especially in the context of low and intermediate level waste disposal, the amount and chemical diversity of organics will significantly increase relative to what is present as organic additives, e.g. superplasticizers, in the cementitious materials used in a repository. Highly alkaline conditions characteristic for cement based materials are expected to increase the potential impact of certain organics on repository performance. The TSWG CORI is currently discussing relevant issues in the context of Cement-Organics-Radionuclide-Interactions. As identifed during the first meeting of CORI in March 2015 where 28 representatives from 4 WMOs and 16 research institutes participated, five topics are prioritized: (i) organics inventories in different countries; identification of relevant organics in PA, (ii) degradation of organics => result of hydrolysis and radiolysis, (iii) mobility of organics in cementitious environment and their interaction with Fe, (iv) mobility of organics-RN complexes in a cementitious environment, and (v) modelling, upscaling, TDB, application to PA. At the IGD-TP EF 6, the TSWG CORI will present the results and discussions on Cement-Organics-Radionuclide-Interactions, summarize the present state-of-knowledge and identify the most critical issues and data needs.

TSWG JA12 Adaptation and optimisation of the repository

Secretariat presented the status of the activity with slides provided by Jiri Slovak:

SURAO received completed questionnaires from 5 EG members - ANDRA, SKB, NDA, Ondraf and Puram (see attached file).

Preliminary results of the questionnaire show that there are potential common interests that might form the basis for new project proposal. On Tuesday at the EF5 meeting in Kalmar Jiri Slovak discussed the potential joint activity with prof. Ivanov from Bulgaria and from Slovakia Javys co.

SURAO sent both of them a copy of the questionnaire because both countries (BG and SK) should be potential countries for “adaptation” – see presentation of prof. Ivanov.

SURAO will therefore:

- send questionnaire to Bulgaria and Slovakia (Javys) and ask for definition of their interests
- develop initial ideas of the objective and tasks of the new project proposal “Adaptation and Optimisation of the Repository”

- arrange a meeting of interested partners in Prague for the second half of January 2015
- develop a final version of the objectives and tasks of the JA12 for final discussion at the next EG16 meeting.

IEP IGD-TP/SNETP

The IEP activities were discussed during EF5 with two perspectives:

- Information from IGD-TP to SNETP: How are changed waste forms considered by WMO?
- Information from SNETP to IGD-TP: What are the expected developments in waste forms?

- The Factsheet was also discussed, its purpose is to communicate that we are working together and have identified common ground for further exchange, it concludes:
  - Nuclear energy gives rise to radioactive waste that will need disposal
  - Good progress is being made in some countries on geological disposal
  - New reactor systems might simplify repository systems but will not eliminate needs for deep disposal.
  - Work on deep disposal should not be delayed waiting for new reactor systems
  - R&D concerning new reactor systems should include waste disposal from the start

The final version will be published in the spring of 2015.

In 2015, Anders Sjöland takes over the lead of this activity for IGD-TP.

New topics for discussions

New topics for discussion or factsheets were proposed:

- Advanced fuels,
- Non-fuel waste /non-standard waste,
- Utilities and fuel data,
- Flexibility of repositories?

4.3.2 New TSWGs

TSWG JA1a "Dissolution rate for doped fuel" (J. Andersson) (Title to be modified by the TSWG Leader – other proposal "in-can processes")

At EG16, Johan Andersson presented the project "Dissolution rates for doped fuel in groundwater conditions buffered to actual repository conditions". This project came up after the rejection of the Saferock project and taking into account the criticism of the reviewer. It is aimed at proposing a new internal TSWG that may be turn into a project if it attracts enough interest.

The overarching goal of the project is to improve understanding of fuel behaviour in realistic repository conditions and handle development of modern fuel characteristics.

The potential participants to this TSWG are:

- WMOs with interest in direct disposal of spent nuclear fuel
- Research organisations and consultants to lead work packages

TSWG JA10a : "Bentonite Mechanical Properties" (J. Andersson) (Title to be modified by the TSWG Leader "other proposal "Large scale THM behaviour of swelling clay based components")

At EG16, Johan Andersson presented the project "Bentonite Mechanical Properties".

Bentonite is a common issue in most programs. However, the behaviour is considered in an optimistic way i.e. with a full homogenization. Following the FORGE and PEBS experiment it is considered that the conceptual understanding of the saturation processes and the properties of the bentonite objects (buffer/seals) is not fully predictable. It is proposed in this TSWG to study the possibility, using laboratory and field data to continue the modelling improvements. This TSWG may take full benefit of the experiments carried out in Mont Terri (EB) and in Äspö (Prototype Repository).

4.3.3 New IEPs

New IEPs with IGSC/NEA

The IGD-TP EG noted that for the OECD/NEA's Integration Group for Safety Case (IGSC) meeting 16, 3 task groups are active with the same titles as existing IGD-TP JA's. Documentation from this workshop has been provided to EG members.

- Safety case communication which has been put on hold within IGD-TP, after lack of availability from EG members. However, this WG is led for IGSC by Ulrich Noseck who is involved in IGD-TPs activities,
- Knowledge management which has been put on hold within IGD-TP after one meeting in Helsinki and one in Châtenay (project leader Manuel Capouet/ ONDRAF),
- Safety of Construction and Operation which is managed by Piet Zuidema and is active within IGD-TP and led by F. Boissier (Andra) for NEA IGSC.

The IGD-TP EG noted that a JA on safety case communication is not necessary within IGD-TP since this topic is a mature issue in IGSC.

The EG proposed that a letter should be prepared for the attention of Lucy Bailey (Future Chair of the IGSC) and Claudio Pescatore (OECD NEA) in order to inform them about the IGD-TP position and work on these topics.

New IEP on JA 11c Analogues

Walter Steininger proposed to open a new Joint activity dealing with the JA11

Rationale

Beyond the "traditional" application of applying "natural" analogues - use/apply/contemplate about different or more elaborate ways of the application / use of the term "analogue", i.e. industrial' analogues, 'contemporary' analogues, 'operational' analogues, 'national' analogues, 'social' analogues, 'negative' or 'anti' analogues,, 'self' analogues.

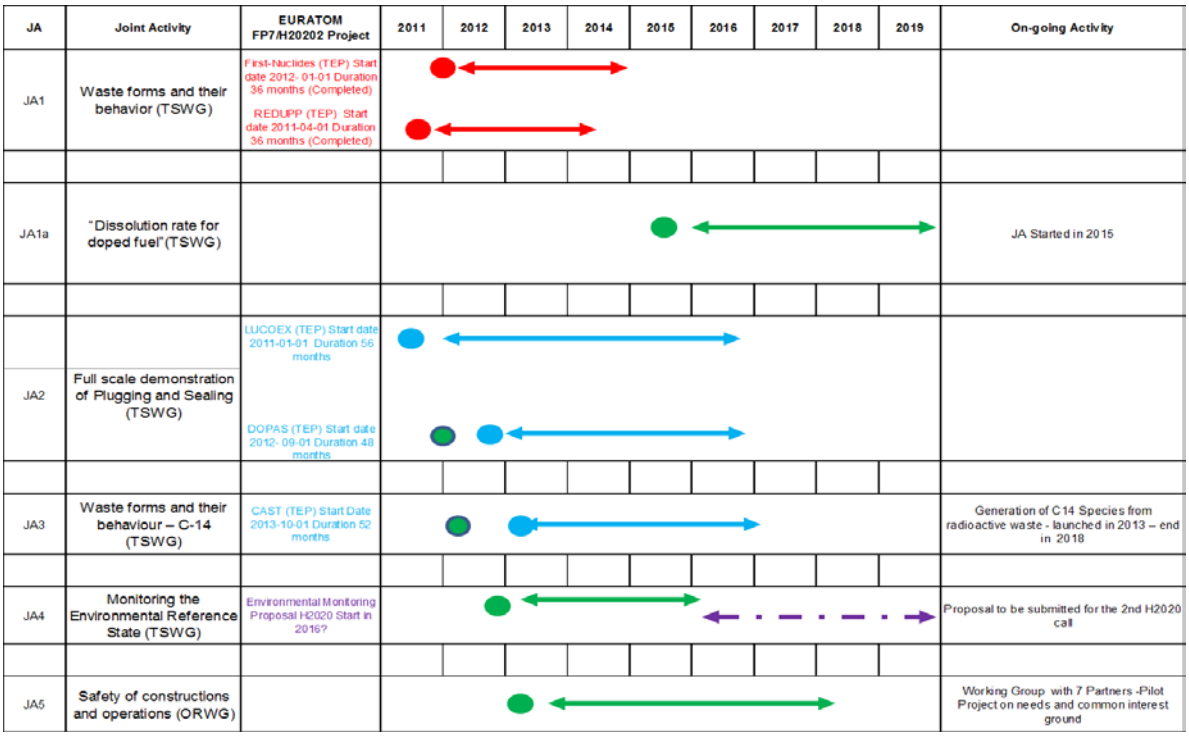
That means: a number of issues that could usefully be addressed in the future are e.g.

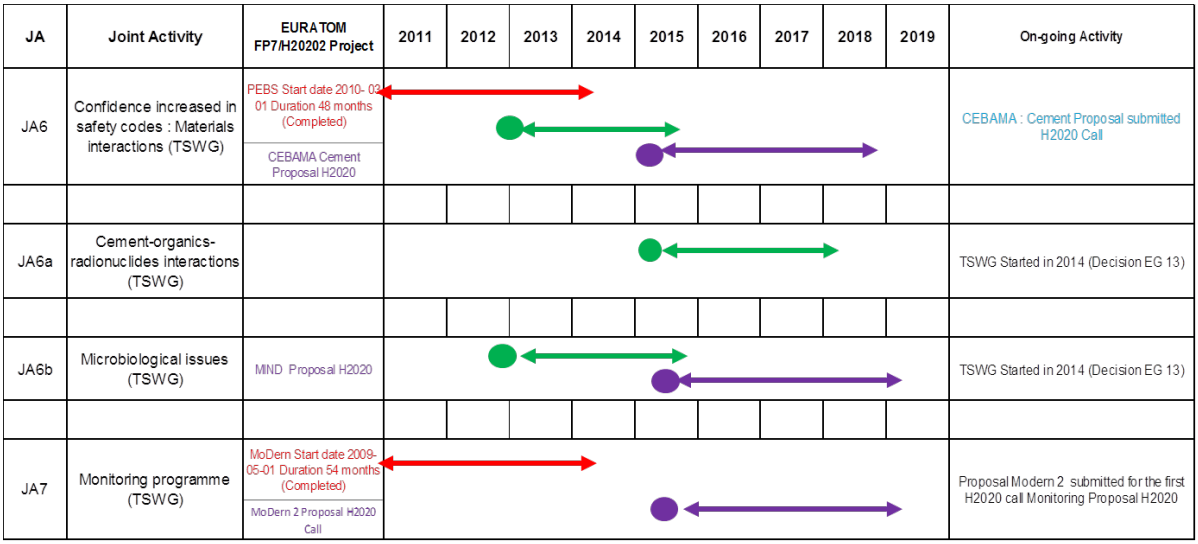
- Identify the various roles that natural analogues could play within the overall Safety Case (different applications are possible, each may have their own specific requirements),
- Critically assess the NA studies and information within the context of safety assessment (to understand implications of the differences and the similarities between the analogue and repository systems),
- Use analogues not in isolation, i.e. use it in combination with other multiple lines of reasoning,
- Avoid over interpretation and abuse of analogue information,
- Because the use of analogues for public communication and dialogue remains unproven, this is still an area worthy of further consideration,
- Apply the term "analogue" in a broader sense.

Possible benefits of an IEP will be integration of this topic into TP´s research area portfolio through interaction with the international Natural Analogue Working Group and their experience and networks.

5 Master Deployment Plan of the SRA 2012-2019

Table 5-1: Master Deployment Plan

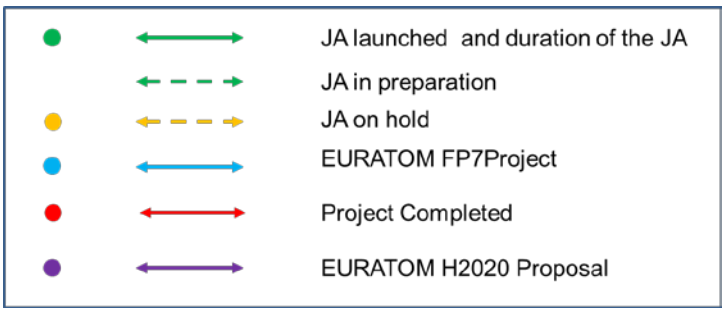




JA	Joint Activity	EURATOM FP7/H20202 Project	2011	2012	2013	2014	2015	2016	2017	2018	2019	On-going Activity
JA8	Safety Case – Handling of uncertainties (TSWG)											New title of activity: "Handling of Uncertainties in the Safety Case for Deep Geological Repositories"
JA9	Safety Case communication: Safety case peer review											JA to be managed in interaction with IGSC/NEA
JA10	Long-term stability of bentonite in crystalline environments (TEP)	BELBaR Start date 2012-03-01 Duration 48 months										
JA10a	"Bentonite mechanical properties "											JA Started in 2015
JA11a	JA 11a: Sharing of knowledge on HLW container materials behaviour (IEP)											Proposal for a small pilot project in preparation
JA11c	Analogues											Activity started in 2014

JA	Joint Activity	EURATOM FP7/H20202 Project	2011	2012	2013	2014	2015	2016	2017	2018	2019	On-going Activity
JA12	Adaptation and optimisation of the repository (ORWG)											Activity to start in 2014
JA13	Communicating results from RD&D (IEP)	SecIGD2 Start date 2013-01 Duration 36 months										JA supported by Secretariat SecIGD2 Project organization of public events in 2014 and 2015
JA14	Competence, Maintenance, Education and Training (CMET) (ORWG)	SecIGD2 Start date 2013-01 Duration 36 months										JA supported by Secretariat SecIGD2; ToR of the WG approved in 2012
JA15	Nuclear Knowledge Management (ORWG)											JA to be managed in interaction with IGSC/NEA
JA16	WMO Programme Specific issues (IEP)											JA on Hold
JA	Interface Working Group											JA on Hold

JA	Joint Activity	EURATOM FP7/H20202 Project	2011	2012	2013	2014	2015	2016	2017	2018	2019	On-going Activity
JA	Waste form developments – IGD-TP/SNETP											IEP (Decision EG 13)
JA	Interaction SITEX/ Research Entities	JOPRAD Proposal H2020 Call										Proposal submitted for the first H2020 call Monitoring Proposal H2020



6 Joint Activities and activity outlines

6.1 Listing of Joint Activities

Important note:
The following activity outlines, name of JA leaders and EG responsible to report at the EG are open to evolve over time as the projects progress.

JA Leaders and Rapporteurs

JA N°	Listing of joint activities (DP)	JA Leader	EG Rapporteur	Organisation
1	Waste forms and their behaviour	Kastriot Spahiu, Peter Wikberg peter.wikberg@skb.se	J. Andersson johan.andersson@skb.se	SKB
1a	"Dissolution rate for doped fuel"	Lena Evins lena.evins@skb.se	J. Andersson johan.andersson@skb.se	SKB
2	Full scale demonstration of Plugging & Sealing	Johanna Hansen Johanna.Hansen@Posiva.fi	Tiina Jalonen Tiina.Jalonen@Posiva.fi	Posiva
3	Waste forms and their behaviour C14	Steve Williams Steve.Williams@nda.gov.uk	Jon Martin jonathan.martin@nda.gov.uk	RWM
4	Monitoring the Environmental Reference State	Catherne Galy catherine.galy@andra.fr elisabeth leclerc elisabeth.leclerc@andra.fr	Frédéric Plas Fréderic.plas@andra.fr	Andra
5	Safety of construction and operations	Piet Zuidema Piet.Zuidema@nagra.ch	Piet Zuidema Piet.Zuidema@nagra.ch	Nagra
6	Confidence increase in Safety Codes : Matérial interaction	Xavier Bourbon xavier.bourbon@andra.fr	Frédéric Plas Fréderic.plas@andra.fr	Andra
6a	Cement-organics-radionuclides interactions	Marcus Altmaier marcus.altmaier@kit.edu	W.Steininger walter.steininger@kit.edu	BMWi
6b	Microbiological issues	Birgitta Kalinowski Birgitta.Kalinowski@skb.se	J. Andersson johan.andersson@skb.se	SKB
7	Monitoring programme	Johan Bertrand johan.bertrand@andra.fr	Frédéric Plas Fréderic.plas@andra.fr	Andra
8	Handling of Uncertainties in the Safety Case for Deep Geological Repositories	Walter Steininger, Ulrich Noseck, Alexander Becker, Ulrich.noseck@grs.de, Dirk-alexander.becker@grs.de	WalterSteininger walter.steininger@kit.edu	BMWi
9	Safety Case communication: Safety case peer review	IGSC - NEA Group		
10	Long-term stability of bentonite in crystalline environments	Patrik Sellin, patrik.sellin@skb.se	Johan Andersson johan.andersson@skb.se	SKB
10a	"Bentonite Mechanical Properties" (provisory title)	Patrik Sellin, patrik.sellin@skb.se	Johan Andersson johan.andersson@skb.se	SKB
11a	Sharing of knowledge on HLW container materials behavior	Cristiano Padovani cristiano.PADOVANI@nda.gov.uk	Jon Martin jonathan.martin@nda.gov.uk	RWM
11b	Repository layout design			
11c	Analogues	Walter Steininger walter.steininger@kit.edu	WalterSteininger walter.steininger@kit.edu	BMWi
12	Adaptation and optimisation of the repository	Jiri Slovak slovak@rawra.cz	Jiri Slovak slovak@rawra.cz	SURAO
13	Communicating result from RD&D	Jon Martin jonathan.martin@nda.gov.uk; Ray Kowe raymond.kowe@nda.gov.uk	Jon Martin jonathan.martin@nda.gov.uk	RWM
14	Competence Maintenance, Education and Training: CMET	Marjatta Palmu Marjatta.Palmu@Posiva.fi	Tiina Jalonen Tiina.Jalonen@Posiva.fi	Posiva
15	Nuclear Knowledge Management: NKM	IGSC - NEA Group		
16	WMOs IEP (WMO 1-6)			

	Interface Working Groups	Ewoud Verhoef Ewoud.Verhoef@covra.nl (E.Neeft)	Ewoud Verhoef Ewoud.Verhoef@covra.nl (E.Neeft)	COVRA
	SNETP/IGD-TP WG	Anders Sjöland anders.sjoland@skb.se	Johan Andersson johan.andersson@skb.se	SKB

6.2 JA1: Waste Forms and their behaviour

JA1: Waste Forms and their behaviour		
SRA Key Topic: 2 Waste forms and their behaviour		**Type of activity:** TEP for 2.1 TSWG on other Topics
Joint Activity leader:	**KIT/Bernhard Kienzler** bernhard.kienzler@kit.edu	
Joint Activity leader contact in IGD-TP EG (if not leader)	**KIT/Walter Steininger:** walter.steininger@kit.edu	

SRA Topic:

N°	SRA Topic	Priority
2.1	High burn-up fuels: rapid release fraction and matrix dissolution	H
2.4	High burn-up fuels and criticality	M
2.5	Improved data on vitrified HL waste	L

On-going activity:
Report to Executive Group by the JA Leader on the Euratom FP7 Project "FIRST Nuclides"

Time table: As from 2012 to 2020

TSWG

Interested EG members

Andra	Stephan Schumacher stephan.schumacher@andra.fr	**BMWi**	Bernhard Kienzler (*FIRST Nuclides)* bernhard.kienzler@kit.edu
Nagra	Lawrence Johnson lawrence.johnson@nagra.ch	**RWM**	Cristiano Padovani cristiano.padovani@nda.gov.uk
ONDRAF	Danièle Boulanger (end user group) d.boulanger@nirond.be	**Posiva**	Piia Juhola piia.juhola@Posiva.fi
SURAO	Antonin Vokal vokal@SURAO.cz	**SKB**	Kastriot Spahiu, Johan Andersson johan.anderssong@skb.se

TEP - FP7 project FIRST Nuclides

CP FIRST-Nuclides

- **Objective:** Quantification the rapid release of radionuclides from spent fuel after canister failure.
  - Relation of FGR to IRF for ^{129}I, ^{79}Se, ^{135}Cs, for high burn-up / lin. power rate ranges, full set of sample sizes, typical groundwater, aerobic to reducing conditions, quantification (speciation) of ^{14}C, Se
  - Modelling
  - Training, Education, Dissemination
- **Partners:** 10
- **Associated Groups:** 13
- **End-Users:** 6
- **Funding:** total: 4.74 Mio. €, EC contribution: 2.49 Mio. €
- **Duration:** 01.01.2012 – 31.12.2014

Implementing Geological Disposal of Radioactive Waste - Technology Platform

Workflow/Reporting

- 5 Scientific/technical workpackages
- 2 Annual Workshops
  - Topical sessions supported by presentations of AREVA and others
  - Proceedings published KIT Scientific Reports 7639 & 7676
- Final Workshop: Karlsruhe, 1st – 2nd September 2014 in connection with the 27th Spent Fuel Workshop 3rd - 5th Sept.
  - Proceedings available from www.firstnuclides.eu (KIT SR in prep.).
- Presentations of End-Users & Topical Sessions
- Up to now, 166 reports, publications and oral presentations at conferences.
  - Summary of the S&T outcome available www.firstnuclides.eu Deliverable D5.13, paper to be published in Journal of Nuclear Materials.

Implementing Geological Disposal of Radioactive Waste - Technology Platform

Outcome

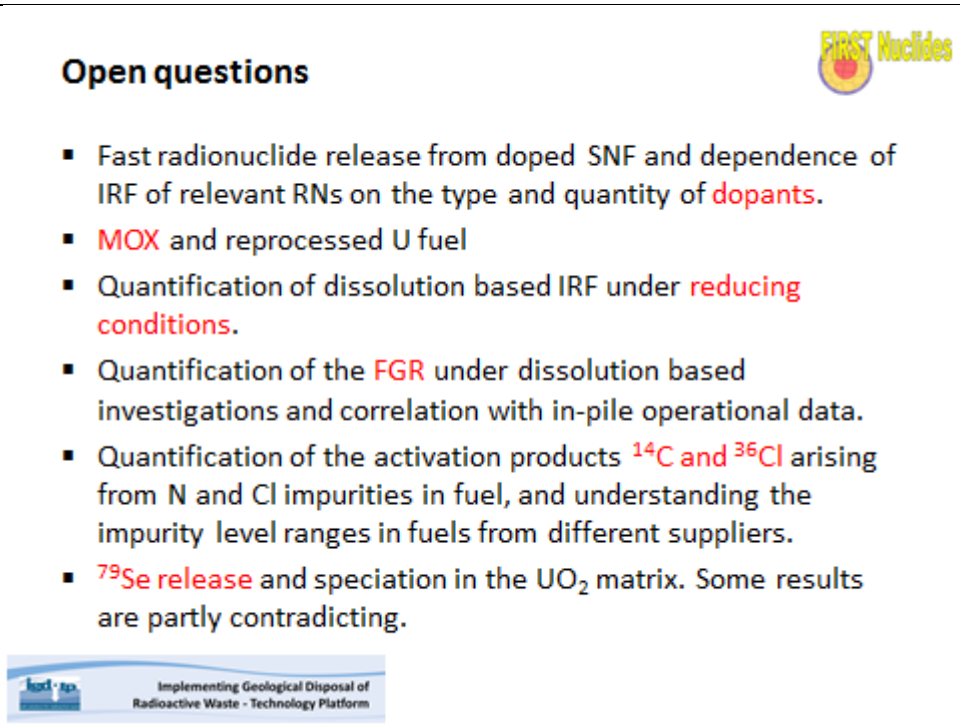
- Measured IRF of fission gases, Cs, I, ^{14}C, ^{79}Se, ^{99}Tc, … up to 1 yr.
- Cumulative IRF measurements at 45 different time steps for 12 different types of high burn-up LWR fuel, for up to 3 sample preparations, and up to 20 isotopes.
- Dependency of the IRF on power plant operational parameters: For high burn-up fuel fission gas release (FGR) and IRF depends much more on the linear power rate than on burn-up.
- Dependency of the IRF and the leaching conditions
- Transition between IRF and the significantly slower release processes due to UO_2 matrix corrosion
- Modelling (speciation of ^{14}C, water access to micro cracks, etc.)
- Database of all FIRST-Nuclides IRF data & previously published data

Implementing Geological Disposal of Radioactive Waste - Technology Platform

End-User opinion (spokesman: Lawrence Johnson, Nagra)

- Highly relevant for all WMO involved in repository development for direct disposal of spent nuclear fuel.
- IRF contributes substantially to the peak release after container breaching and its potential radiological consequences.
- Results important for PA because
  - data from experimental determination of rapid release fractions for moderate and high burn-up UO_2 fuels, including doped fuels, expected to be used much more by reactor operators in the future, and
  - Improvement of analytical techniques for some difficult to measure radionuclides such as ^{14}C and ^{79}Se,
  - Improved data on fission product retention of TRISO fuel and
  - Insights into mechanisms related to fission product release
  - Data base for release of Cs and I from high burn-up fuel and comprehensive comparisons of IRF with fission gas release (FGR), which are necessary in order to be able to estimate IRF data for populations of fuel rods in various reactor operation conditions.

Implementing Geological Disposal of Radioactive Waste - Technology Platform



Updated Information: May 2015

6.3 JA1a: "Dissolution rate for doped fuel"

JA1a: "Dissolution rate for doped fuel"		
SRA Key Topic: 2 Waste forms and their behaviour		**Type of activity:** TSWG s
Joint Activity leader:	**SKB Lena Evins lena.evins.skb.se**	
Joint Activity leader contact in IGD-TP EG (if not leader)	**SKB Johan Andersson johan.andersson@skb.se**	

SRA Topic:

N°	SRA Topic	Priority
2.1	High burn-up fuels: rapid release fraction and matrix dissolution	H
2.4	High burn-up fuels and criticality	M
2.5	Improved data on vitrified HL waste	L

On-going activity:
JA started in 2015 (Decision EG16)

Time table: As from 2015 to 2020

TSWG

Interested EG members

SKB	Lena Evins lena.evins.skb.se		
Nagra		Posiva	
ONDRAF		Andra	

Decision EG16

Johan Andersson presented in EG16 the TSWG project "Dissolution rates for doped fuel in groundwater conditions buffered to actual repository conditions". This project came up after the rejection of the Saferock project and taking into account the criticism of the reviewer. It is aimed at proposing a new internal TSWG that may be turn into a project if it attracts enough interest. This TSWG is named "Dissolution rate for doped fuel" and is included in the Key Topic 1 "Waste forms and their behaviour"
The overarching goal of the project is to improve understanding of fuel behaviour in realistic repository conditions and handle development of modern fuel characteristics.
The potential participant to this TSWG are:

- ☐ WMOs with interest in direct disposal of spent nuclear fuel
- ☐ Research organisations and consultants to lead work packages

To ensure a possibility to launch a project, the JA coordinator should drive the development of the WG, to avoid miscommunication and misunderstanding regarding roles. Then he should be the coordinator of the proposal.

Philippe Lalieux noted that the fuel manufacturers are often modifying the fuel characteristics without

taking into account the disposal constraints. Thus it could be interesting to study the possibility to involve the fuel manufacturer in the project. The IGD-TP/SNETP Group may help for that purpose.
Ewoud Verhoef pointed out that research reactor fuel may deserve also attention through this project.
Frédéric Plas added that the real geochemistry environment should be taken into account and that this project should not be rock specific.
The EG decided to launch a new TSWG (JA1a - "Dissolution rate for doped fuel"). EG Interested should nominate the leaders and the correspondents.
The WMO interested are: SKB, Ondraf, Andra, Nagra, and Posiva… The leader of the activity will be Lena Evins (SKB).

Updated Information: EG16 March 26 2015

6.4 JA2: Full scale demonstration of plugging and sealing

JA2: Full scale demonstration of plugging and sealing		
SRA Key Topic: 3 Technical feasibility and long-term performance of repository components		**Type of activity:** TEP for 3.6 TSWG
Joint Activity leader:	**Posiva/ J.Hansen** Johanna.Hansen@Posiva.fi	

SRA Topic:

N°	SRA Topic	Priority
3.6	Full-scale plugging and sealing experiments and demonstrations	H
3.10	Long-term behaviour of seals and plugs	H
3.14	Salt backfill	M

On-going activity:
Report to Executive Group by the JA Leader on the Euratom FP7 project "DOPAS"

Time table: As from 2012 to 2018

TEP

Interested EG Members

Andra	Jean-Michel. Bosgiraud Jean-Michel.Bosgiraud@andra.fr	**BMWi**	André Rübel andre.ruebel@grs.de
Nagra	Hanspeter Weber hanspeter.weber@nagra.ch	**RWM**	Dean Gentles dean.gentles@nda.gov.uk
COVRA	J. Grupa, grupa@nrg.eu	**Posiva**	**Johanna Hansen** **Johanna.Hansen@Posiva.fi**
SURAO	Marketa Dvorakova dvorakova@SURAO.cz	**SKB**	Esther Jonsson esther.jonsson@skb.se

TSWG Content of the activities

Topic 3.6
After having produced technical design specifications of the plugging and sealing components, large scale tests in underground laboratories or in other representative conditions are envisaged both in crystalline and in clay environments. Individual tests will be performed on various Topics (construction of concrete and bentonite seals, selection and preparation of a proper test location, performance tests and modelling…) prior to building a full scale demonstration experiment. => Formulated into a TEP DOPAS. TSWG for Topic 3.6 not needed at the moment.

Topic 3.10
The need for further work in the proposed priority areas discussed above is strongly linked to the specific repository design concept developed for a specific host rock environment, including consideration of the associated future possible evolutions of the backfilling and sealing systems. These aspects need to be considered carefully in the development of specific cooperative work.

Topic 3.14
Crushed salt backfill forms an important barrier function in a salt repository in the long term. Laboratory investigations on the coupled behaviour of crushed salt will be performed and used to improve and calibrate modelling approaches and supply necessary material parameters, so that the confidence in long-term prediction is improved.

Short description of the Joint Activities for the Topics:

Topic 3.6, DOPAS Project (started in September 2012 until August 2016, 48 months)

DOPAS

Last one year period of DOPAS project will start in September 2015. The DOPAS training course will take a place in September 14th to 18th 2015 in Prague and Josef Gallery Czech Republic and topical seminar on plugging and sealing DOPAS 2016 will be arranged in Turku with site visit to Olkiluoto, Finland, May 25th to 27th 2016.

See description of DOPAS project below and more information about DOPASevents in http://www.posiva.fi/en/dopas.

Topic 3.10
- Description of state of the art (2012).
- Technical WG on the subject (2013).

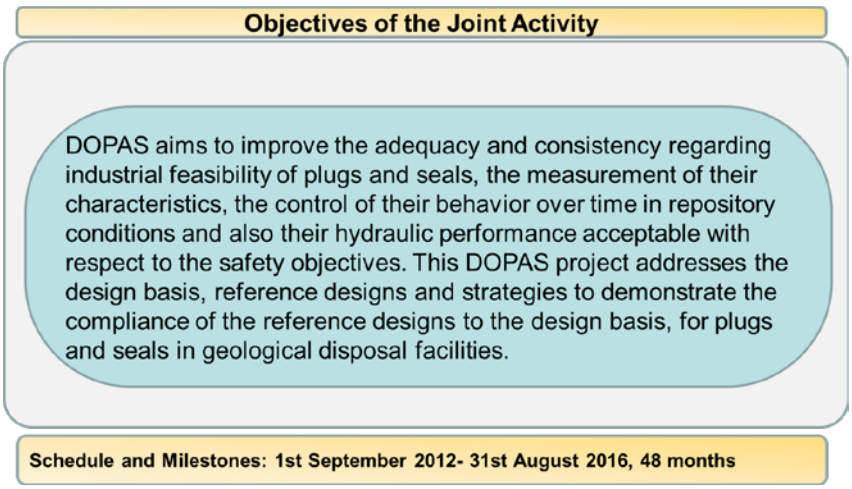
Topic 3.14
- 2012-2014, lab tests on backfill compaction at different temperature, stress and moisture content, model improvement and calibration.
- 2014, interim report on state of the art, identification of remaining uncertainties
- After 2014, technical working group on the topic

TEP DOPAS http://www.posiva.fi/en/dopas

Interested EG Members

Andra	Jean-Michel. Bosgiraud Jean-Michel.Bosgiraud@andra.fr	**BMWi**	André Rübel andre.ruebel@grs.de
Nagra	Hanspeter Weber hanspeter.weber@nagra.ch	**RWM**	Dean Gentles dean.gentles@nda.gov.uk
Posiva	**Johanna Hansen** **Johanna.Hansen@Posiva.fi**	**SURAO**	Marketa Dvorakova dvorakova@SURAO.cz
SKB	Esther Jonsson esther.jonsson@skb.se		

TEP- FP7 project DOPAS



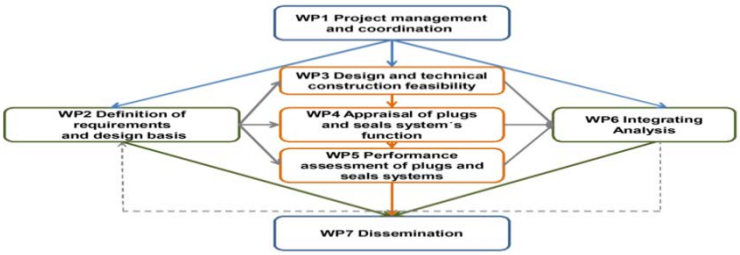
Expected results of the Joint Activity

DOPAS is a practical demonstration experimental project with one specific target to increase public confidence by informing a wide audience about the safety of geological disposal, the importance of demonstrating full scale safe plugs and seals, and the state-of-the-art and practical implementation of such demonstration work. Demonstrating plugs and seals at full scale is an essential part of RTD work gain experience on new and innovative methods and how they are applied for construction of repositories. Other WMOs will be able to benefit by obtaining strategies that show how to proceed from the design basis phase into the implementation phase. The DOPAS results can be used for different geological environments including crystalline host rock, clay host rock and salt host rock. The main results from the DOPAS project in addition to the demonstrators will be the summary reports for the DEM and RTD work packages (WP2-WP5), which will compile the experiences and lessons learned from implementing the full-scale demonstrations, including information on development of design, selection on materials, practicalities related to industrial feasibility, and methods for assessing the experiments and how they fulfil the requirements. The main public reports will be subjected to independent review, using the so called Expert Elicitation procedure, which will be used for assessing the quality of the reports later in the project. Among other dissemination activities, DOPAS will organise an international plugs and seals training workshop from 14-18 September 2015 in the Czech Republic, targeting among others younger scientists within and outside the DOPAS consortium. The training workshop will include practical exercises for increasing the participants' understanding of multidisciplinary thinking in waste management and disposal implementation. The applicants for the training workshop should, therefore, represent a wide range of research and technical areas. An international topical seminar on plugging and sealing technology for geological disposal of radioactive waste will be organised towards the end of DOPAS project on 25-27 May 2016 in Turku, Finland, where the results of the project will be presented to WMOs and the wider scientific community. The seminar will be organised collaboratively with the (IGD-TP).

The consortium DOPAS

DOPAS Work Packages and Demonstration experiments:

Demonstration experiments which will be partially or wholly implemented during the DOPAS project are a full-scale seal (FSS) implemented on the surface in Saint-Dizier, France, an experimental pressure sealing plug (EPSP) underground in the Josef Gallery in Czech Republic, a deposition tunnel dome plug (DOMPLU) in the Äspö Hard Rock Laboratory in Sweden, a deposition tunnel wedge plug (POPLU) in the underground rock characterisation facility ONKALO (future spent fuel repository) in Finland, and components of a shaft sealing system (ELSA) in Germany. The DOPAS project is implemented in seven work packages (WPs). Three WPs are research and technological development (RTD) activities, and consist of development of the design basis and conceptual design work for plugs and seals to be demonstrated within DOPAS (in WP2); performance assessment of plugs and seals (in WP5); and integrating analyses of the DOPAS project (in WP6). Two of the work packages are demonstration (DEM) activities and covers (in WP3) the detailed design of plugs and seals to be tested, laboratory characterisation and development needed for selecting proper materials and technologies for plugs and seals, tests in metric scale and practical construction and installation of demonstrations and their reporting; and (in WP4) the monitoring and follow up of the demonstrations, including the analyses on the plug and seal behaviour. WP3 and WP4 also summarise and synthesise generic learning on plugs and seals achieved in the DOPAS project.



Updated Information: Johanna Hansen - April 14, 2015

6.5 JA3: Waste forms and their behaviour C14

JA3: Waste forms and their behaviour C14		
SRA Key Topic: 2 Waste form and their behaviours		**Type of activity:** TEP TSWG
Joint Activity leader:	RWM/Steve Williams Steve.Williams@nda.gov.uk	

SRA Topic:

N°	SRA Topic	Priority
2.2	Release from ILW and their detailed characterization	H

On-going activity:
Preparation of state of the art reviews covering current status of knowledge on:

- Steel corrosion and C-14 release
- Zircaloy corrosion and C-14 release
- Sample choice, analytical techniques and release for spent ion-exchange resins
- Inventory and C-14 release from irradiated graphites

Overview of treatment of C-14 in current safety assessments
Operation of the CAST website

Time table:
As from 2013 to 2018

TEP

Interested EG members

Andra	Stephan Schumacher stephan.schumacher@andra.fr	**BMWi**	Ulrich Noseck Ulrich.Noseck@grs.de
COVRA	Erika Neeft Erika.Neeft@covra.nl (Ewoud Verhoef)	**ENRESA**	Jose Luis Leganes jlen@enresa.es
Nagra	Lawrence Johnson lawrence.johnson@nagra.ch	**RWM**	**Steve Williams** **Steve.Williams@nda.gov.uk**
ONDRAF	Danièle Boulanger d.boulanger@nirond.be	**SURAO**	Antonin Vokal vokal@SURAO.cz
SKB	Borje Torstenfeldt; K. Källstöm Borje.Torstenfelt@skb.se		

Other interested participants

CEA, France ; INR, Romania ; GRS, Germany ; PSI, Switzerland ; SCK.CEN, Belgium ; KIT, Germany ; ENEA, Italy ; RWMC, Japan ; FZJ, Germany ; ITU, Germany ; UJV, Czech Republic ;Enresa, Spain ;NRG Netherlands ; VTT, Finland ; Fortum, Finland ; LEI, Lithuania ; SI IEG NASU, Ukraine ; Armines, France ; FNAG, Germany ; IFIN-HH, Romania ; CNRS/IN2P3, France ; Amec, UK ; Ciemat, Spain ; Areva, France ; EdF ; France

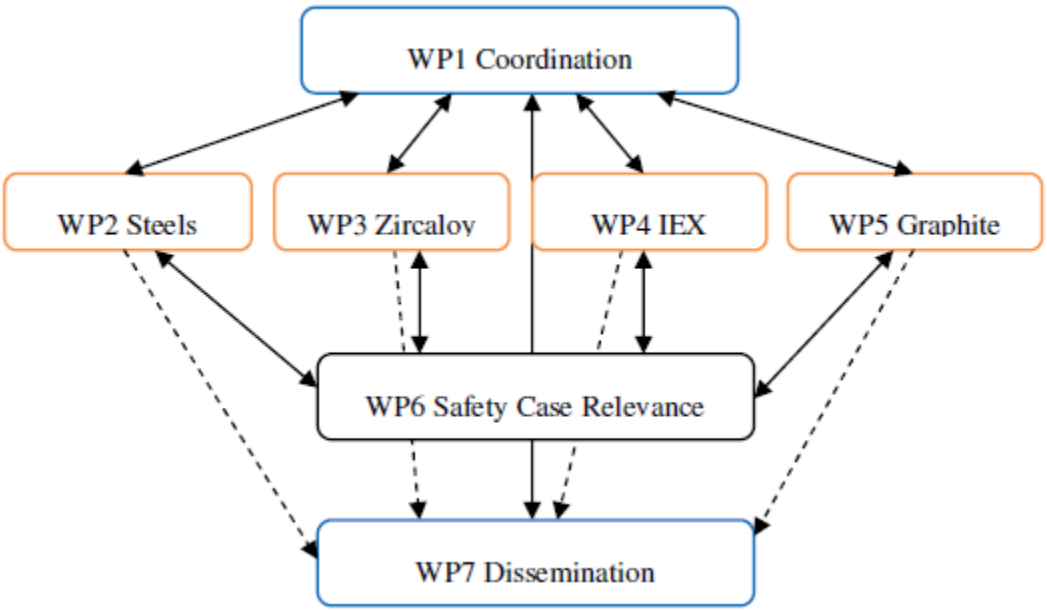
The CAST project (CArbon-14 Source Term) aims to develop understanding of the potential release mechanisms of carbon-14 from radioactive waste materials under conditions relevant to waste packaging and disposal into underground geological disposal facilities. The increased understanding provided through CAST should decrease uncertainties in long-term safety assessments and increase confidence in safety cases. The project focuses on the release of carbon-14 as dissolved and gaseous species from irradiated metals (such as steels, Zircaloys), irradiated graphite and from ion-exchange materials.

TEP- FP7 project CAST

CArbon-14 Source Term (CAST)
Start Date 2013-10-01 End Date 2018-03-31

The objectives of the CAST project are to:
a) gain a scientific understanding of the rate of release of carbon-14 from the corrosion of irradiated steels and Zircaloys and from the leaching of ion-exchange resins and irradiated graphites under geological disposal conditions, its speciation and how these relate to carbon-14 inventory and aqueous conditions;
b) evaluate this understanding in the context of national safety assessments; and
c) disseminate this understanding and its relevance to safety assessments to interested stakeholders and provide an opportunity for training of early career researchers.

The structure of CAST Work packages is:



- Work Package 1: 'Management' led by Radioactive Waste Management Limited (RWM), UK
- Work Package 2: 'Steels' led by Nagra, Switzerland
- Work Package 3: 'Zircaloy' led by Andra, France
- Work Package 4: 'Ion-Exchange Resins' led by CEA, France
- Work Package 5: 'Graphite' led by RWM, UK
- Work Package 6: 'Relevance to Safety Cases' led by Niras/Ondraf, Belgium
- Work Package 7: 'Dissemination' led by Covra, Netherlands

Work Packages 2 to 5 undertake fundamental scientific experiments and develop conceptual models for carbon-14 release from a range of radioactive waste materials. Work Package 6 will relate the results to national safety cases, while Work Package 7 will ensure that the CAST results and the implications are disseminated to all partners and interested stakeholders. Each Work Package will produce a final report to record the findings; these will be published along with a Final Report assimilating all of the results into one

overview report

Progress in CAST
The CAST project began on 1st October 2013 and the CAST website became operational in December 2013 under Work Package 7 (**http://www.projectcast.eu/**).

The CAST kick-off meeting was held in London in November 2013. Work under all Work Packages has commenced with the early focus of CAST being the preparation of the state of the art reviews covering current status of knowledge on: steel corrosion and C-14 release (under Work Package 2); Zircaloy corrosion and C-14 release (under Work Package 3), sample choice, analytical techniques and release from spent ion-exchange resins (under Work Package 4); and inventory and C-14 release from irradiated graphites (under Work Package 5). In addition, contributions to the overview of the treatment of C-14 in current safety assessments are being prepared under Work Package 6.

There are 33 CAST partners:
Radioactive Waste Management Limited (RWM), UK
Nationale Genossenschaft Fuer Die Lagerung Radioaktiver Abfaelle, CH
Agence Nationale Pour La Gestion Des Dechets Radioactifs, FR
Commissariat a l Energie Atomique et aux Energies Alternatives (CEA), FR
Nationale Instelling Voor Radioactief Afval en Verrijkte Splijtstoffen VZV, BE
Centrale Organisatie voor Radioactief Afval NV, NL
Regia Autonoma Pentru Activitati Nucleare Drobeta Tr. Severin Ra Sucursala Cercetari Nu-cleare Pitesti, RO
Gesellschaft Fuer Anlagen- und Reaktorsicherheit (GRS) MbH, DE
Paul Scherrer Institut, CH
Studiecentrum Voor Kernenergie, BE
Karlsruher Institut fuer Technologie, DE
Agenzia Nazionale Per Le Nuove Technologie, L'Energia e lo Sviluppo Economico Sos-tenibile, IT
Radioactive Waste Management Funding and Research Center, JP
Forschungszentrum Juelich GMBH, DE
JRC – Joint Research Centre – European Commission, BE
UJV REZ, a.s., CZ
Empresa Nacional de Residuos Radioactivos s.a., ES
Teknologian Tutkimuskeskus VTT, FI
Fortum Power and Heat Oy, FI
Leituvos Energetikos Institutas, LT
Institute of Environmental Geochemistry of the National Academy of Sciences of Ukraine, UA
Association pour la Recherche et le Developpment des Methodes et Processus Industriels – Armines, FR
Furnaces Nuclear Applications Grenoble, FR
Nuclear Research and Consultancy Group, NL
Institutul National de Cercetare –Dezvoltare Pentru Fizica si Inginerie Nucleara 'Horia Hulubei', RO
Radioactive Waste Repository Authority, CZ
Svensk Karnbranslehantering AB, SE
Centre National de la Recherche Scientifique, FR
Amec Nuclear UK Ltd, UK
Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas- Ciemat, ES
Areva NC SA, FR
Electricite de France S.A., FR
MCM McCombie, Chapman, McKinley Consulting Kollektivgesellschaft, CH

Updated Information: Steve Williams, April 2014

6.6 JA4: Monitoring of the environmental reference state

JA4: Monitoring of the environmental reference state		
SRA Key Topic: 6 Environmental Monitoring		**Type of activity:** TSWG
Joint Activity leader:	**Elisabeth Leclerc** elisabeth.leclerc@andra.fr	

SRA Topic:

N°	SRA Topic	Priority
6.3	Monitoring of the environmental reference state	H

On-going activity:
First draft TSWG Report Issued in June 2012 by the JA Leader
Preparation of a H2020 R&D proposal
Meetings (Minutes available):
2014 January 14th, France
2014 March 20th, France

Time table: to 2018

TSWG

Interested EG members

Andra	Catherine Galy catherine.galy@andra.fr Elisabeth Leclerc elisabeth.leclerc@andra.fr	**ENRESA**	Silvia Rueda srus@enresa.es
Nagra	Edith Beising Edith.Beising@nagra.ch Herwig Müller herwig.mueller@nagra.ch	**RWM**	Mark Gough mark.gough@nda.gov.uk
ONDRAF	Christophe Depaus c.depaus@nirond.be	**Posiva**	Tuomas Pere tuomas.pere@posiva.fi Jere Lahdenperä Jere.Lahdenpera@Posiva.fi
SURAO	Jiri Slovak slovak@SURAO.cz	**SKB**	Susanna Andrén susanna.andren@skb.se Tobias Lindborg tobias.lindborg@skb.se

Other interested participants

ENEA	Antonietta Rizzo antonietta.rizzo@enea.it	**UNIMI**	Marie-Claire Cantone marie.claire.cantone@fisica.unimi.it Yvan Veronese

TSWG Content of the activities

Explanation of the contents of the activity:

The objectives of the IGD-TP Joint Activity 4 "Monitoring the Environmental Reference State" are defined as follows: "How to define, structure, organize and manage the studies associated with the assessment of a reference state of the environment before beginning the construction works". This project will focus on developing methodologies to define and monitor the reference state. Because the environment is a highly dynamic system made of multiple components (biosphere, hydrosphere, atmosphere, lithosphere, geosphere) interacting at different scales (space and time), few years of monitoring are required to obtain good representative view of the reference state. Therefore, collecting and organizing the data in order to comply with the regulation and answer the public expectation is a real challenge. There is a need for a methodology to define and monitor the relevant parameters characterizing the environmental reference state.
This project aims to answer these needs by formalizing a multi-disciplinary methodology for geological disposal sites. Special focus will be on Environmental Impact Assessment (EIA) and knowledge exchanges at pan-European level. In combination this proposal will also address the strong public interest expressed around geological disposal projects by providing communication tools as well as widely accepted monitoring methodologies.

The following work packages and tasks have been identified:

1. State of the art on environmental initial state and monitoring requirements and practises, State of the art common specifications, Review, Synthesis, Restitution
2. Methodological and technical (innovative) approaches
    a. Hydrogeology and subsurface studies
    b. Biodiversity reference state
    c. Socio-economic reference state
    d. Radiochemical reference state : monitoring and banking
3. Information and communications technology (ICT) for information accessibility, societal & local stakeholders dialog and involvement
    a. Information gathering: to answer public expectations (surveys, public consultations…)
    b. Information broadcasting to improve public awareness

Final output

The project will aim to a common view for good practices on:

1. Comprehensive review of international requirements and practices : synthetic document
2. Agreed upon methodology and associated toolbox for defining environmental reference/zero state
3. Information gathering and broadcasting methodologies

Last Update : April 24 2014

6.7 JA5: Safety of construction and operations

JA5: Safety of construction and operations		
SRA Key Topic: 5 Safety of construction and operations		**Type of activity:** ORWG
Joint Activity leader:	**Piet Zuidema** Piet.Zuidema@nagra.ch	

SRA Topics:

N°	SRA Topic	Priority
3.4	Repository layout design including operational safety, reversibility and retrievability concerns	H
5.1	Improved methodology, approaches and documentation on risk assessment, risk management, further documentation for construction safety issues and operational safety issues	M
5.2	Strategies to evaluate the impact of construction phase and operational phase safety issues on the overall disposal system (long-term safety, design, operational procedures, resulting costs…)	M

On-going activity:
ORWG
Report to Executive group by the JA Leader

Expected products
Topic 5.1, a report on approaches and applications of risk management for construction safety and operational safety and evaluation of commonalities and differences approaches chosen in the different programmes.
Topic 5.2, a report listing the issues, the options and their impact on long term safety, construction safety, operational safety, costs, logistics, etc.

Time table: As from 2012 to 2016

ORWG

Interested EG members

Andra	Myriam Rabardy myriam.rabardy@andra.fr	**BMWi**	W. Bollingerfehr Bollingerfehr@dbe.de
COVRA	Erika Neeft Erika.Neeft@covra.nl (Ewoud Verhoef)	**Nagra**	**P. Zuidema** **Piet.Zuidema@nagra.ch**
RWM	Steve Barlow Steve.BARLOW@nda.gov.uk	**ONDRAF**	Philippe van Marcke p.vanmarcke@nirond.be
Posiva	E. Palonen Erkki.Palonen@Posiva.fi	**SURAO**	Ilona Pospiskova pospiskova@SURAO.cz
SKB	Jan-Olof Stal jan-olov.stal@skb.se		

Other interested participants
NMWO: Neale Hunt (nhunt@nwmo.ca)

TSWG Content of the activities

***Explanation of the content of the activities*:**

Topic 5.1 (methodology, approaches and documentation on risk)

Taking into account the design studies undertaken in the past decades - which have been particularly influenced by the long-term safety issues - the work should include:

- checking the available information on operational safety from facilities in operation, under construction or under development (evaluation of the current state of knowledge and checking where information exchange with other industries might provide important contributions, for example, mining and tunnelling industry, nuclear industry (interim storage, nuclear power plants, …), etc.
- development of a common understanding on methodological issues including defining safety concepts for the construction phase and the operational phase, development of common databases (e.g. lists of incidents/accidents and their characterisation, source term data, etc.), implementation of information exchange forums (if desirable).
- Example of additional development and demonstration: Feedback from operational safety to design (e.g repository architecture (including design of radiation protection areas and equipment), design of specific systems (e.g. rescue systems, ventilation systems, etc.).

Topic 5.2 (Strategies to evaluate the impact of operational and construction issues on the disposal system)

Developing strategies and evaluating the impact of specific construction and operational issues on repository design, operational procedures, long-term safety, complexity of overall system and resulting cost of geological repositories. This contributes directly to the planning and the design of repository systems. This includes the discussion of requirements and approaches in dealing with construction and operation safety (also considering special requirements e.g. related to ventilation and radiation protection). This discussion also includes the identification of factors that significantly influence the design, the operational procedures and the resulting costs.
The goal is to better understand the benefits and disadvantages with regard to safety, cost, logistics and technical challenges of different design options e.g. for transport to underground (e.g. drift vs. shaft), for vault designs (tunnels, small vaults, large vaults etc.), for package emplacement methodologies (e.g. remote, semi-remote, manual, by row or column), for ventilation, etc. These issues are also important in making the optimisation process (ALARP) visible.
Besides the design of the repository, operational procedures will also be evaluated, including emergency plans.

ORWG UP DATE Pilot Project

Pilot Project on Operational & Construction Safety
outcomes of the preliminary questionnaire

- Partners addressed:
  - Members of IGD-TP working actively on operational & construction safety issues
- Background questions:
  - What information is available from which organisation?
  - Do we have a common ground? (approaches, methods, tools, data, waste & repository types)
- Feedback from 8 countries and interested organisations:
  (7 implementers, 1 ministry)
  - Canada, NWMO (strong interest expressed)
  - Belgium, ONDRAF-NIRAS
  - Finland, POSIVA
  - Germany, BMWi/DBE
  - UK, RWM
  - Netherlands, COVRA
  - Sweden, SKB
  - Switzerland, Nagra
  - France, Andra

Preliminary Questionnaire

- type of disposal system (SF, HLW, LILW, long-lived ILW)
- assumed conditions of investigated operation
  - normal operation
  - [design basis] accidents
    (mechanical/thermal impact, flooding, combinations, other)
  - other
- type of work done
  - identifications of accidents
  - scoping calculations
  - system-specific / site-specific analyses
  - deterministic / probabilistic analyses
  - other
- feedback of results to define requirements on …
  - design
  - waste acceptance criteria
  - other

ORWG Way forward

- Document with a proposal for "the way forward" sent to interested EG members and other interested participants on 31.05.2013.
- Proposed next milestone: A two-day workshop around September 2013 with the main aim of outlining the EGD-TP Pilot Project Final Report; including a conclusion whether a follow-on EU Project is considered worthwhile by the participants.
- An internal report is provisionally scheduled for the end of 2013.

Updated Information: Piet Zuidema - June 6, 2013

6.8 JA6: Confidence increase in the safety assessment codes - Materials interactions

JA6: Confidence increase in the safety assessment codes - Materials interactions

SRA Key Topic: 1 Safety case		**Type of activity:** TSWG
Joint Activity leader:	**Xavier Bourbon xavier.bourbon@andra.fr**	

SRA Topics:

N°	SRA Topic	Priority
1.1	Increase confidence in, and testing and further refinement of the tools (concepts, definition of scenarios and computer codes) used in safety assessments	M

Material interaction, especially cement and clay based interactions.

On-going activity:
TSWG

Time table: As from 2012 to 2020

TSWG

Interested EG members

Andra	Xavier Bourbon xavier.bourbon@andra.fr	**Nagra**	**Piet Zuidema** **Piet.Zuidema@nagra.ch**
RWM	Steve Barlow Steve.BARLOW@nda.gov.uk	**ONDRAF**	M.Capouet m.capouet@nirond.be
BMWi	Ulrich Noseck Ulrich.Noseck@grs.de	**PURAM**	Attila Baksay baksay.attila@rhk.hu
SURAO	Dmitrij Lukin lukin@rawra.cz	**SKB**	Patrik Sellin patrik.sellin@skb.se

TSWG Content of the activities

Explanation of the contents of the activity:
Basically there are two categories of numerical models used for SA, first of all the performance assessment models and then there are process models describing specific phenomena such as interactions between processes.
For the first: description of material interactions require coupled hydro-geochemical codes to describe processes relevant to performance of repository components (e.g. cement-clay interactions, cement-host rock interactions, metal-clay interactions…). They must be studied and analysed over long time scales, consistent with the time scales associated with those of a geological repository for SNF/HLW. Since they occur very slowly with low intensity reactions, analyses need efficient and reliable simulation tools.
Coupled codes that evaluate these processes need to be verified, qualified and checked to improve their reliability. One way to achieve this objective is benchmarking, based on high standard knowledge, analytical solutions and experimental data. The idea is to test and compare various material interaction models used in performance assessment.

TSWG UP DATE CEBAMA Project

The overall objectives of Cebama are to support the implementation of geological disposal by improving significantly the knowledge base for the Safety Case for European repository concepts. The research planned in Cebama is largely independent of specific disposal concepts and addresses different types of host rocks in addition to bentonite. Cebama is not focusing on one specific cement material, but aims to study a variety of important cement-based materials in order to provide insight on general processes and phenomena which can then be easily transferred to different applications and projects. Specific objectives of Cebama are summarized as follows:

- **Perform experimental studies to understand the interface processes between cement-based materials and the host rocks (crystalline rock, Boom Clay, Opalinus Clay (OPA), Callovo-Oxfordian (COX)) or bentonite backfill and assess the impact on physical (transport) properties.**
  - Understand how chemical reactions affect porosity, water and gas transport properties at the interface for the following systems. These aspects are investigated by laboratory tests and up-scaling by utilization of in-situ tests (both ongoing and new tests).
    - Low pH cementitious component – crystalline rock
    - Low pH cementitious component - bentonite
    - Low pH cementitious component - OPA, COX
    - High pH cementitious component – crystalline rock
    - High pH cementitious component - bentonite
    - High pH cementitious component – OPA, COX, Boom Clay.

- **Study radionuclide retention processes in high pH concrete environments. Radionuclides which have high priority from the scientific and applied perspective are selected.**
  - Analyse the retention of some specific radionuclides in high pH concrete environment, especially: Be, C, Cl, Ca, Se, Mo, I, Ra.
  - Assess the impact of chemical alterations (e.g., high pH concrete ageing, carbonation, transition from oxidizing to reducing conditions) on radionuclide retention.

- **Improve validity of numerical models to predict changes in transport. Support advanced data interpretation and process modelling, covering mainly issues responsible for the changes in transport properties.**
  - Allow improved interpretation of experiments on chemical interactions affecting porosity, water and gas transport properties at the interfaces by process level and mechanistic modelling.
  - Extrapolate modelling to system-level to modelling for Safety Case application.

Further objectives cover dissemination of key results to scientific and non-scientific oriented stakeholders as well as training and education of young professionals for carrying over the expertise into future implementation programmes.

Cebama and its objectives are based on the common position of the IGD-TP and reflect key technical and scientific issues assessing the transport properties (e.g. permeability, porosity) of concrete/cement-based materials and the related effects on the mobility of radionuclides in an underground disposal over long periods of time. During this prolonged period, the material can undergo alterations especially in contact with

groundwater. Newly formed alteration products can retain or release radionuclides. The durability of cementitious materials is dependent on the chemical and physical evolution of the repository system. These processes have the potential to significantly change the original properties of the cement-based materials. These alterations evolve series of highly time dependent coupled physico-chemical processes. Understanding of the relevant interactions and their impact on the whole repository system is essential to accurately develop predictive models. It is clear that the relevant interactions depend on the actual cement-based materials, the groundwater compositions and the surrounding engineered and natural materials.

The Cebama project addresses key issues of relevance for long term safety and key scientific questions related to the use of cement-based materials in nuclear waste disposal applications. The scientific quality and impact of the project builds on joining the best expertise available to tackle these problems and emphasizing how the knowledge can be applied in the Safety Analysis and Safety Case**.** Cebama will extend the state-of-the-art with respect to integration of key scientific and long-term safety issues. Progress beyond the state-of-the-art is achieved by providing basic and trustworthy knowledge, modeling tools and arguments for the Safety Case.

Some background

Discussions on a dedicated project targeting cement-based materials were initiated in 2012 at the 3rd IGD-TP Exchange Forum (EF3) in Paris. The proposal was supported by a technical scientific working group (TSWG), established by the IGD-TP. A meeting of this TSWG was held in May 2013 at Ghent. The objectives of the planned research and innovation action have been presented at the 4th IGD-TP Exchange Forum (EF4), which took place on October 29-30th 2013 in Prague, Czech Republic. The Waste Management Organizations (WMO) had formulated a common position with clear prioritizations, which was the basis of the Cebama proposal, submitted in September 2014 in the frame of H2020 call. After positive evaluation of the Cebama proposal, Cebama is starting 1st of June 2015.

Next Steps: Kick-Off meeting (summer 2015)

Updated Information: M. Altmaier (KIT) for Cebama, May 2015.

6.9 JA6a: Cement-Organics-Radionuclide Interactions

JA6a: Cement-Organics-Radionuclide Interactions

SRA Key Topic: 1 Safety case		**Type of activity:** TSWG
Joint Activity leader:	**Marcus Altmaier marcus.altmaier@kit.edu**	

SRA Topics:

N°	SRA Topic	Priority
1.1	Increase confidence in, and testing and further refinement of the tools (concepts, definition of scenarios and computer codes) used in safety assessments	M

Material interaction, especially cement and clay based interactions.

On-going activity: TSWG Cement-organics-radionuclides interactions

Time table: As from 2012 to 2020

TSWG

Interested EG members

SKB	Klas Källström klas.kallstrom@skb.se	**BMWi**	M. Altmaier Marcus.altmaier@kit.edu
Andra	EG member to complete	**RWM**	EG member to complete
Nagra	EG member to complete		
ONDRAF	EG member to complete		

TSWG: Cement-Organics-Radionuclide Interactions (CORI)

Following the first announcement at the 5th Exchange Forum held in Kalmar, October 2014, the TSWG CORI had its first meeting in March 2015 in Karlsruhe, where a group of 28 scientists gathered from 4 Waste Management Organisations and 16 Research Organisations. The current activities of TSWG CORI were defined at this meeting and the discussions summarized below.

Organic materials are present in nuclear waste repositories and potentially influence their functionality and performance. Especially in the context of low and intermediate level waste disposal, the amount and chemical diversity of organics will significantly increase relative to what is present as organic additives, e.g. superplasticizers, in the cementitious materials used in a repository. Highly alkaline conditions characteristic for cement based materials are expected to increase the potential impact of certain organics on repository performance.

The first TSWG CORI meeting was organized around invited and contributed oral presentations, including a

WMO presentation expressing the joint view of Andra, Nagra, ONDRAF-NIRAS, RWM and SKB on the CORI topic, and 11 presentations from Research Organisations focusing on technical details related to cement-organics-radionuclide-interactions. On the second day of the meeting, the outcome of the first day was summarized by KIT, topics discussed and prioritized, and the next steps for the TSWG CORI identified. It was clearly noted by the CORI group that in many areas very close agreement exists between the WMO interests as outlined in the joint presentation and the individual research interests.

- There is a common view of the several groups participating the TSWG CORI meeting to further develop TSWG CORI.
- The TSWG CORI is open for additional partners. New groups interested to join TSWG CORI should contact Marcus Altmaier of KIT-INE (marcus.altmaier@kit.edu).
- **In order to further develop CORI, five "CORI Key-Topics" were identified which will be discussed and elaborated in more detail**. For each of the topics, a lead-partner was identified who volunteered to organize the discussions. (A tentative list of CORI partners interested to develop the "CORI Key-Topics" was derived at the CORI meeting and is part of the "CORI meeting summary" presentation which is part of the minutes which can be downloaded at the IGD-TP website).
    - **Organics inventories in different countries. Identification of relevant organics in PA (lead: Nagra)**
    - **Degradation of organics => Result of hydrolysis and radiolysis (lead: Subatech)**
    - **Mobility of organics in cementitious environment and their interaction with Fe (lead: Amphos21)**
    - **Mobility of organics-RN complexes in a cementitious environment (lead: CEA)**
    - **TDB, modelling, upscaling, application to PA (lead: KIT-INE)**

- A questionnaire on CORI topics was prepared and distributed by KIT-INE to the partners. This document is used to gather information on ideas, priorities, resources and interests related to CORI. It is also used as input for the "CORI Key-Topics" groups organizing discussions and preparing related IGD-TP EF6 presentations.
- Follow up meetings of "CORI Key-Topics" groups developing CORI are planned for June to August 2015. In September/October 2015, a joint meeting of CORI is scheduled to summarize discussions on "CORI Key-Topics" group level which will be announced at the IGD-TP website and via email by KIT.
- CORI will participate with a parallel session at the upcoming IGD-TP EF6 in London, 2015. The TSWG CORI will present the results and discussions on Cement-Organics-Radionuclide-Interactions, summarize the present state-of-knowledge and identify the most critical issues and data needs.

TSWG UP DATE Pilot Project

Some background

A Technical/Scientific Working Group (TSWG) is organized within the IGD-TP (JA6a) on Cement-Organics-Radionuclide Interactions – CORI. The first meeting of the TSWG CORI organized by KIT-INE was held on the 10th and 11th of March 2015, in Karlsruhe, Germany. The meeting was announced at the IGD-TP website, at the 5th Exchange Forum held in Kalmar, October 2014, and via email. Minutes from the

CORI meeting in Karlsruhe are available on the IGD-TP website.
Next Steps: - Separate meetings over summer 2015 to further develop “CORI key Topics”of main interest. - Joint TSWG CORI meeting Sept/Oct 2015. - Presentations on TSWG CORI at IGD-TP EF 6.
Updated Information: M. Altmaier (KIT), Mai 2015

6.10 JA6b: Microbiological issues

JA6b Microbiological issues		
SRA Key Topic: 1 (tbc) Safety case		**Type of activity:** TSWG
Joint Activity leader:	Birgitta Kalinowski Birgitta.Kalinowski@skb.se	

SRA Topics (tbc):

N°	SRA Topic	Priority
1.1	Increase confidence in, and testing and further refinement of the tools (concepts, definition of scenarios and computer codes) used in safety assessments	M
1.2	Improve safety case communication. This includes safety case communication on: Short-term safety of construction and operations, the transient phase, long-term safety.	M

Material interaction, especially cement and clay based interactions.

On-going activity:

Proposal MIND (Microbiology In Nuclear waste Disposal) consisting of 15 partners was approved Grant agreement no: 661880.

The project will officially start June 1

Time table: Start June 1, 2015- End 2019

TSWG

Interested EG members

Andra	Achim Albrecht Achim.Albrecht@andra.fr	**SKB**	**Petra Christensen** **petra.christensen@skb.se**
Nagra	Olivier Leupin Olivier.Leupin@nagra.ch	**Posiva**	Tiina Lamminmäki tiina.lamminmaki@posiva.fi
ONDRAF/Niras	Xavier Sillen x.sillen@nirond.be	**SKB**	Klas Källström Klas.kallstrom@skb.se
RWM	Robert Whittleston robert.whittleston@nda.gov.uk		

Other participants

Karsten Pedersen, kap@micans.se'; Tuire Haavisto, 'tuire.haavisto@tvo.fi'; Joe Small, joe.s.small@nnl.co.uk; Natalie Leys, Natalie.leys@sckcen.be; Katinka Wouters, kwouters@sckcen.be

TSWG Content of the activity : Microbiological issues

Explanation of the contents of the activity:

Viable microorganisms can be found in most, if not all subterranean environments investigated, that has a temperature below 110 °C. The only environmental limitations for subterranean life seem to

be temperature, water availability and supply of electron donors and acceptors. The conditions for life in each and every repository will be defined by local conditions and types of wastes and barriers. Several general questions apply to all repository types, and the status of knowledge varies significantly from repository to repository. The TSWG for microbiology concluded at EF4 that the following main microbial processes may influence the safety of disposal of spent fuel and long-lived radioactive wastes in geological formations:

1. Microbial degradation of repository components.

Sulphate reducing bacteria produce sulphide with organic material and/or hydrogen thereby accelerating corrosion processes. Iron-reducing bacteria can reduce structural iron in swelling clays which will reduce swelling capacity. Many microbial processes generate organic and inorganic acids that may decrease high pH and eventually corrode cements and concrete structures.

2. Microbial production and consumption of gases.

Microorganisms produce and consume gases such as methane, hydrogen and carbon dioxide. The consumption of gas can be beneficial while production often causes safety problems.

3. Microbial migration of radionuclides.

Microorganisms produce complex formers and low molecular weight acids that can increase the migration rate of radionuclides. Microorganisms and viruses can act as colloids that sorb and transport radionuclides.

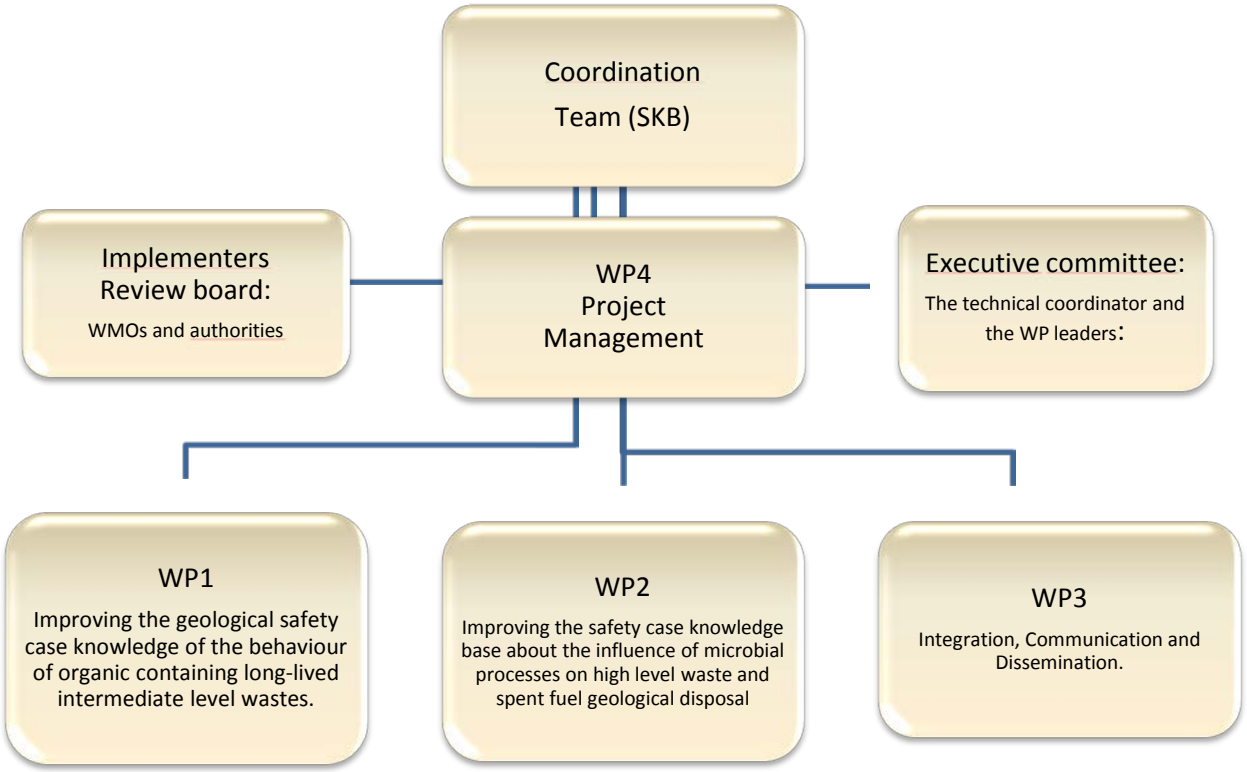
The safety case can benefit significantly from new knowledge in geomicrobiology and the deep biosphere. Recent development in methods for probing microbial processes using advanced genome technologies and advances in imaging and spectroscopy.

After this meeting the JA leader with support from the rest of the group suggested that a proposal to Horizon 2020 addressing these issues should be submitted.

The MIND project was a result from the TSWG discussions at EF4 in Prague, fall 2013.
is now preparing for the start.

The work packages are lead by Joe Small (NNL), Karsten Pedersen (MICANS), Katinka Wouters & Natalie Leys (SCK-CEN) and Petra Christensen & Birgitta Kalinowski (SKB) respectively :

WP1:	Improving the geological safety case knowledge of the behavior of organic containing long-lived intermediate level wastes.
WP 2:	Improving the safety case knowledge base about the influence of microbial processes on high level waste and spent fuel geological disposal.
WP 3:	Integration, Communication and Dissemination.
WP 4:	Project Management.



Next Steps:

Updated Information: Birgitta Kalinowski April 2015

6.11 JA7: Monitoring programme

JA7: Monitoring programme

SRA Key Topic: 6 Monitoring		**Type of activity:** TSWG
Joint Activity leader:	**Johan Bertrand johan.bertrand@andra.fr**	

SRA Topics:

N°	SRA Topic	Priority
6.1	Monitoring strategies and programmes for performance confirmation	H
6.2	Monitoring technologies and techniques	H
6.4	Monitoring of engineered barrier systems	H

On-going activity:
Activity to be re launched At EF 4 taking into account outcomes of MoDeRn Project.

Time table: As from 2012 to 2015-2020

TSWG

Interested EG members

Andra	Johan Bertrand johan.bertrand@andra.fr	**BMWi**	M. Jobmann jobmann@dbe.de W.Steininger walter.steininger@kit.edu
ENRESA	J.C. Mayor jmaz@enresa.es ; Jose Luis Fuentes jl.fuentes@aitemin.es	**Nagra**	Bernd Frieg bernd.frieg@nagra.ch
RWM	Simon Norris simon.norris@nda.gov.uk	**ONDRAF**	M. Van Geet m.vangeet@nirond.be
Posiva	Jere Lahdenperä Jere.Lahdenpera@Posiva.fi	**SKB**	Assen Simeonov Assen.Simeonov@skb.se
SURAO	Jiri Slovak slovak@rawra.cz		

Other interested participants : RWMC: (eto@rwmc.or.jp)

Technical Project (TEP) – Modern2020 (2015-2019)

The TSWG submitted the Modern2020 proposal on September 17th, 2014 in the framework of the H2020 Euratom WP2014-2015 call (topic NFRP-06-2014 – Supporting the implementation of the first-of-the kind geological repositories). The project has been favourably evaluated by the Commission (Project 662177) on February 17th, 2015.

EC Project	Duration	Total cost	EC contribution
Development and Demonstration of monitoring strategies and technologies for geological disposal **Modern2020**	**48 months**	**9,6M€**	**6M€**

Objectives of the project
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 will address 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.

The project officially starts **June 1st, 2015** and will last 4 years (48 months).
The Kick-Off meeting is organised on June 30th, 2015.

List of Modern2020 partners:
The consortium brings together 28 organisations from Europe, Switzerland and Japan:

ANDRA	FR
AITEMIN	SP
AREVA NC	FR
CTU	CZ
DBE TEC	DE
EDF	FR
ENEA	IT
ENRESA	SP
ETH Zurich	CH
EURIDICE	BE
GSL	UK
IRSN	FR
NAGRA	CH
Nidia srl	
NRG	NL
NIRAS	BE
POSIVA	FI
RWM	UK
RWMC	JP
SKB	SE
SURAO	CZ
TUL	CZ
UANTWERPEN	BE
UGOT	SE
UMONS	BE
UNILIM	FR
USTRATH	UK
VTT	FI

WP2 will address the development of monitoring programme design basis, monitoring strategies and the role of monitoring in decision making by focusing on specific national programmes. These programmes are those related to disposal of high-level waste and spent fuel in the Czech Republic, Finland, France, Germany, the Netherlands, Sweden and Switzerland. Stakeholders will be involved in each task of this WP to explore how their early involvement should be addressed appropriately

The overall objective of **WP3** is to conduct research and technical developments on monitoring technologies.

WP4 intends to demonstrate the practical implementation of specific monitoring plans (developed in WP2) through several *in-situ* demonstrations including the application of innovative monitoring techniques (WP3) to further enhance the knowledge on the operational implementation of specific disposal monitoring. These demonstrations will rely on a combination of monitoring technologies and they will be carried out in a variety of host rocks. To contribute to a "best value for money" approach, all of these are built upon either existing infrastructure (FE in Mont Terri and TEM in Grimsel) or will be attached to infrastructure that will be developed and financed by resources outside of this project (Full scale *in-situ* system test in Onkalo, HA in Bure, LTRBM in Tournemire). Synergies with WP2 are expected with a strong interaction with stakeholders. The *in-situ* aspect is essential for testing the monitoring plan in repository-like conditions and provides input for all implementers, allowing an assessment of the range of use and possible limitations of the tested systems

WP5 will rely on qualitative action research. In close collaboration with the consortium partners and other WP leaders, stakeholder engagement activity will be set up throughout the project's lifetime, and in direct relation to the R&D work developed in work packages 2, 3 and 4. At various stages in the project, exchange meetings or workshops will be set up, during which interaction between the researchers in the different strands, the concerned implementers and the participating local citizens, will be organised. The international meetings will be organised in parallel with planned project-meetings. At the local level, meetings will be organised within the framework of existing organisational structures and decision making processes. A Q&A section will be developed on the website to secure continuation of the interaction over the course of the project.
Relevant data for this work package will be gathered by means of literature review, document analyses, (indepth) interviews, (participatory) observations during meetings and excursions, and feedback forms from participants.
For practical reasons, we will invite citizen stakeholders from countries where a local organisation of stakeholders around RMW sites is established. The most directly concerned groups are to be found in France (the CLIS de Bure), Sweden (Municipality of Östhammar) and Finland (Municipality of Eurajoki). Therefore they are the first to be invited to participate. In addition we aim to incorporate Belgian local stakeholders.
Geological disposal in Belgium is still more explicitly in a research phase, and although not the designated future host communities, the municipalities of Dessel and Mol, and their local partnerships, STORA and MONA, are hosts and neighbours to the centralised storage facility for HLW and to the HADES URL. The partnerships have a particular interest in monitoring since part of their mission is to follow research activities carried out in these facilities. A Belgian delegation already participated in MoDeRn.
The stakeholder engagement activity will be organised and researched at two levels i) direct participation of a selected group of stakeholder representatives during Modern2020 meetings and workshops, and ii) linking this activity back to the respective local communities, to investigate how the representatives connect to the local work and to observe possible impact on the local level.

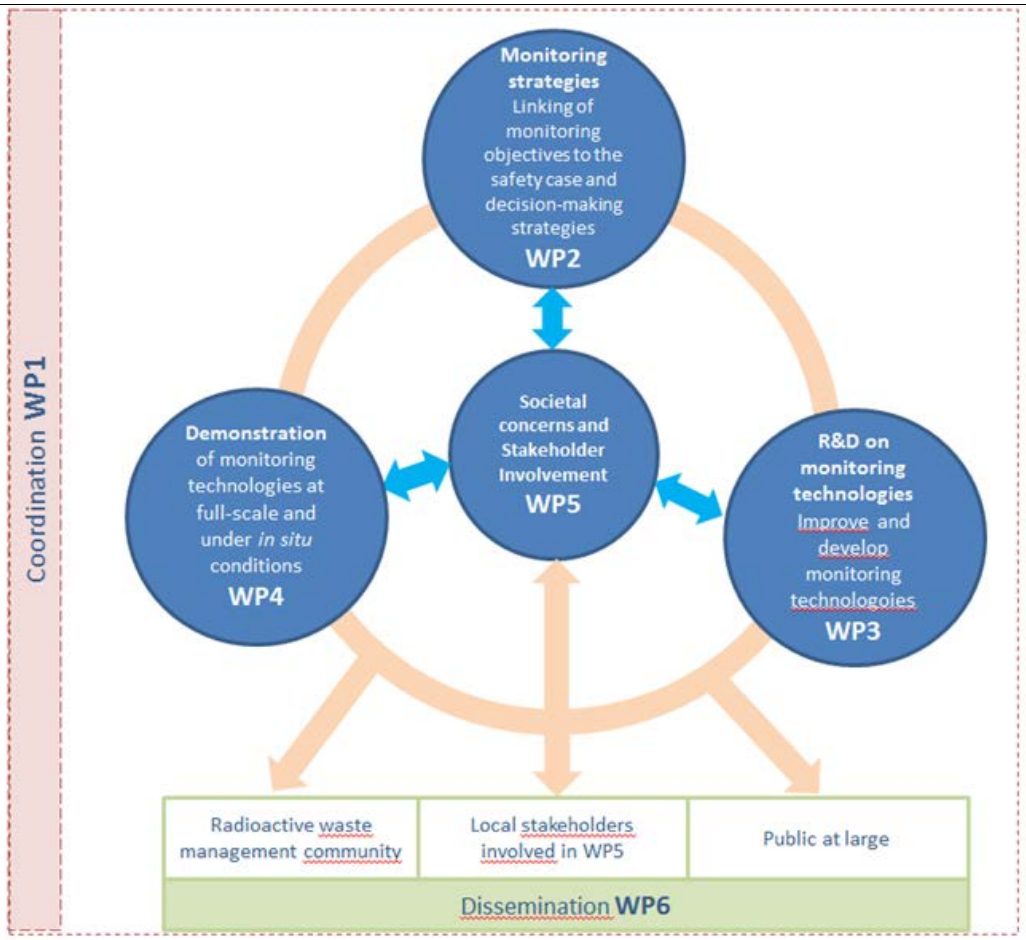


Figure 1: Modern2020 PERT Chart

TSWG Way forward

Planned work for the first year of the project

The main objective for Modern2020's first period is mainly to consolidate the working methodology of each work package and provide the first material for our project:

- WP2: Collect the information about monitoring programmes through a questionnaire and muldi-days workshops;
- WP3: Start the work for each technology development;
- WP4: Collect description and data from existing experiments. For each monitoring technologies, identify the potentials, limitations and restraints of different available techniques, equipment and/or procedures with respect to their use, applicability and functionality regarding the different demonstrators;
- WP5: select the participating community groups and formalize commitments. Local community 'representatives' to participate in Modern2020 project meetings and workshops will be sought and their specific role will be discussed and organized. Expectations from the part of the local community groups will be gathered and incorporated in the (Inter)Action Plan.

The first results should ensure our targets are up-to-date and that the final project output will be truly transformative.

Updated Information: Johan Bertrand 28/05/2015

6.12 JA8: Safety Case – Handling of uncertainties

JA8: Handling of Uncertainties in the Safety Case for Deep Geological Repositories

SRA Key Topic: 1 Safety Case		**Type of activity:** TSWG
Joint Activity leader:	**BMWi, W. Steininger, walter.steininger@kit.edu**	

SRA Topics:

N°	SRA Topic	Priority
1.1	Increase confidence in, and testing and further refinement of the tools (concepts, definition of scenarios and computer codes) used in safety assessments	M
1.2	Improve safety case communication. This includes safety case communication on: Short-term safety of construction and operations, the transient phase, long-term safety	M
1.3	Increase confidence in and further refinement of methods to make sensitivity and uncertainty analyses.	M

On-going activity:
Proposal under discussion.
Report to the Executive Group by the JA Leader

Time table: 2013 to 2016

TSWG

Interested EG members

Andra	Jacques Wendling, Jacques.wendling@andra.fr	**BMWi**	**Steininger, Noseck, Becker, ulrich.noseck@grs.de, dirk-alexander.becker@grs.de**
ENRESA	Miguel Angel Cunado mcup@enresa.es	**Nagra**	Jûrg Schneider Juerg.Schneider@nagra.ch
RWM	Lucy Bailey lucy.bailey@nda.gov.uk	**ONDRAF**	M.Capouet m.capouet@nirond.be
Posiva	Lasse Koskinen Lasse.koskinen@Posiva.fi	**SURAO**	Antonin Vokal vokal@SURAO.cz
SKB	Allan Hedin allan.hedin@skb.se	**COVRA**	J. Grupa, grupa@nrg.eu

TSWG Content of the activities

The activity focuses on three basic subjects that are altogether relevant for the SRA topics 1.1, 1.2 and 1.3

1. Management and communication of uncertainties.
2. Uncertainty identification and quantification.
3. Sensitivity analysis.

The OECD/NEA [7] notes that 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”. Site-specific and concept-specific safety assessments form an essential part of that, combining the assessment basis and the performance assessment (PA) of the geological repository. All safety assessments are subject to uncertainties, and proper handling of these uncertainties is essential for achieving confidence in the assessment results.

Short description of activities

Subject 1, management of uncertainties, deals with general aspects of the handling of uncertainties. Within this subject two research focuses were identified:

- general strategies for managing uncertainty,
- management of uncertainties in different timeframes of disposal system evolution.

Subject 2, uncertainty identification and quantification, deals with the issue of identifying the relevant uncertainties in the safety case and quantifying them by assigning adequate numerical distributions with the help of experts. Three research focuses were identified:

- elicitation of experts,
- derivation of probability distribution functions (PDFs),
- identification and quantification of parameter correlations.

Subject 3, sensitivity analysis, deals with identifying and testing methods for sensitivity analysis applicable to safety assessment models for repository systems. Sensitivity analysis is a valuable means for gaining system understanding and identifying research needs. Three research focuses were identified:

- survey and assessment of numerical and graphical sensitivity analysis methods in view of PA,
- comparison of methods using numerical experiments,
- triggering of research and development by sensitivity analysis.

TSWG for formulating a project proposal

Proposal for a future project: Confidence Building and Handling of Uncertainties in Safety Assessment for Geological Disposal Facilities

The project work is foreseen to be structured in four work packages (WPs). Three of them address fields of specific interest with regard to uncertainty handling as defined above, and one WP comprises the co-ordination, communication and outreach work. Each WP is subdivided into several tasks according to the research focuses identified above.

WP 1: Management of uncertainties
Task 1.1: Strategies for managing uncertainty
Task 1.2: Management of uncertainties in different time frames of disposal system evolution
Task 1.3: Regulatory decision-making under uncertainty
Task 1.4: Communication of uncertainty

WP 2: Uncertainty identification and quantification
Task 2.1: Expert judgement
Task 2.2: PDF derivation
Task 2.3: Identification and quantification of correlations

WP 3: Sensitivity analysis
Task 3.1: Survey and assessment of methods in view of PA
Task 3.2: Comparison of methods by numerical experiments
Task 3.3: R&D triggering

WP 4: Co-ordination
Task 4.1: Work co-ordination
Task 4.2: Training
Task 4.3: International conference

Several of the working tasks to be addressed in activity JA8 have already been recommended in recent international projects. With respect to uncertainty analysis, a proposal for a systematic procedure to derive

PDFs and a protocol to treat model uncertainties was developed in the EC project "Performance Assessment Methodologies in Application to Guide the Development of the Safety Case" (PAMINA, EC 2011). In the final PAMINA report it was recommended that these procedures should be applied and further developed in an international framework. Work in PAMINA also evaluated a range of methods for probabilistic sensitivity analyses. It was observed that the ability of various methods to handle model non-linearities differs, and different methods can identify different sensitivities. Consequently, it was recommended that more research is needed to establish a reliable procedure for sensitivity analysis where PA models are strongly non-linear, and this could be done most efficiently within an international framework.
A review of approaches to guide expert judgment was also made in as part of PAMINA. In the NEA/IGSC project "Methods for Safety Assessment of Geological Disposal Facilities for Radioactive Waste" (MeSA, OECD/NEA 2012), it was stated that it is necessary to examine such guidelines further and to determine whether and when more formal approaches to expert judgement are warranted. This is particularly relevant for system description and scenario derivation.

TSWG Way Forward

A TSWG was founded in May 2013 and held a second meeting in September 2013. In addition to the EG members, Galson Sciences Ltd (UK), NRG (NL), UJV (CZ) and Sandia National Laboratories (US) are participating in the TSWG. TSWG activities will continue for two years within specific sub-groups aligned to the topics above. An information exchange on the status of the work in the TSWG is planned in mid-2014 and will also be reported in a working group at the IGD-TP 5th Exchange Forum on 28-29th October 2014 in Kalmar, Sweden. A further technical meeting is planned for Spring 2015, with presentations of the results achieved by the TSWG members. On that basis the topics for further international investigation will be identified and documented, and a proposal will be prepared for a TEP in response to the EU Call 2015/2016.

Updated Information: April 2, 2014

6.13 JA9: Safety Case Peer Review

JA9: Safety case Peer Review		
SRA Key Topic: 1 Safety Case		**Type of activity:** ORWG
Joint Activity leader:	**.Posiva/ J. Vira** Juhani.Vira@Posiva.fi	

SRA Topics:

N°	SRA Topic	Priority
1.2	Improve safety case communication. This includes safety case communication on: short-term safety of construction and operations, the transient phase, long-term safety.	M

Product/Result from the activity:
Efficient framework for Implementing Organisations QA-related peer reviews of scientific and technical RD&D reports supporting the Safety Case prior its submission as a part of a license application.

On-going activity:
Activity put on Hold To be developed in the Framework of an IEP IGD-TP/IGSC-NEA to set up.

Time table: As from 2012 to 2025

ORWG

Interested EG members

Andra	Sylvie Voinis sylvie.voinis@andra.fr	**BMWi**	Jan Weber jan.weber@bgr.de Ulrich Noseck ulrich.noseck@grs.de
Nagra	Jûrg Schneider Juerg.Schneider@nagra.ch	**RWM**	Cherry Tweed cherry.tweed@nda.gov.uk
ONDRAF	C.Depaus c.depaus@nirond.be	**Posiva**	Juhani Vira Juhani.Vira@Posiva.fi
SURAO	Jiri Slovak slovak@SURAO.cz	**SKB**	Allan Hedin allan.hedin@skb.se

ORWG Content of the activities

Contact IGSC-NEA IGD-TP decided EG 16

Updated Information: EG16- April 20152

6.14 JA10 Long-term stability of bentonite in crystalline environments

JA10 Long-term stability of bentonite in crystalline environments		
SRA Key Topic: 3 Technical feasibility and long-term performance of repository components		**Type of activity:** TEP
Joint Activity leader:	**SKB/ Patrik Sellin, patrik.sellin@skb.se**	

SRA Topics:

N°	SRA Topic	Priority
3.9	Long-term stability of bentonite in crystalline environments	H

Product/Result from the activity:

- Results from laboratory and in-situ experiments on the impact on buffer properties.
- Joint understanding of buffer bentonite long-term stability which can be used in all WMO´s programmes using bentonite as buffer material.

On-going activity: TEP FP7 Project BELBaR

Time table:
As from 2011 to 2017

TSWG

Interested EG members

Nagra	Olivier Leupin olivier.leupin@nagra.ch	RWM	Lucy Bailey lucy.bailey@nda.gov.uk
Posiva	Petri Korkeakoski petri.korkeakoski@Posiva.fi	SURAO	Irena Hanusova hanusova@SURAO.cz
SKB	**Patrik Sellin** **patrick.sellin@skb.se**		

TSWG Content of the activities

Explanation of the objectives of the activity:

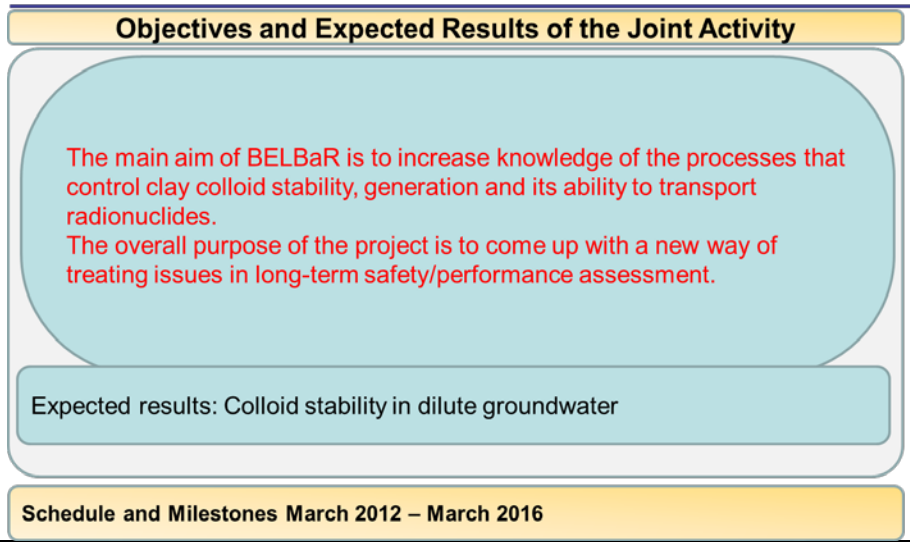
A project could consist of several parts:

- State-of-the-art summary of knowledge on bentonite buffer stability in the individual programmes and within the EC framework (BELBaR).
- Laboratory experiments which would exemplify difficult events/conditions for the buffer in the long-term perspective.
- In-situ experiments using expected conditions for the buffer in a repository-type environment.
- Modelling of laboratory and in-situ experiments.
- Summary of results and consequences for the programmes involved.

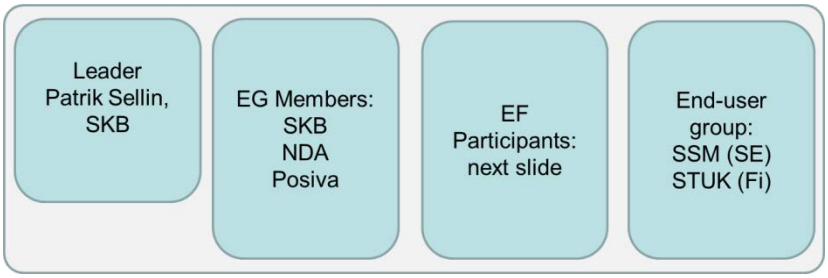
EC Project BELBaR

BELBaR: Bentonite erosion effects on the long term performance of the engineered barrier and radionuclide transport

BELBaR Objectives



BELBaR Consortium



EF Participants

No.	Acronym	Name	Country
1	SKB	Svensk Kärnbränslehantering	SE
2	CIEMAT	Centro de Investigatigaciones Energeticas, Medioambientales y Technologicas	ES
3	NRI	Nuclear Research institute Rez plc	CZ
4	KIT	Karlsruhe Institut of Technology	DE
5	POSIVA	Posiva OY	FI
6	VTT	Technical Research Instuitute of Finland	FI
7	ClayTech	Clay Technology	SE
8	JYU	University of Jyväskylä	FI
9	KTH	Kungliga Tekniska Högskolan	SE
10	NDA	Nuclear Decommissioning Authority	UK
11	B+Tech	B+Tech	FI
12	UNIMAN	University of Manchester	UK
13	HU	Helsinki University	FI
14	MSU	Lomonosov Moscow State University	RU

BELBaR Work Packages

- WP1: Safety Assessment
  - Lucy Bailey, NDA
- WP2: Erosion
  - Tiziana Missana, Ciemat
- WP3: Radionuclide and host rock interactions
  - Thorsten Schäfer, KIT
- WP4: Colloid stability
  - Radek Červinka, NRI
- WP5: Conceptual and mathematical models
  - Kari Koskinen, Posiva
- *WP6: Dissemination*
  - *Patrik Sellin, SKB*
- *WP7: Project management*
  - *Desirée Comstedt, SKB*

Updated Information: EG9 - November 30, 2012

6.15 JA10a " Bentonite Homogénéisation"

JA10a " Bentonite Homogeneisation"		
SRA Key Topic: 3 Technical feasibility and long-term performance of repository components		**Type of activity:** TSWG
Joint Activity leader:	**SKB/ Patrik Sellin, patrik.sellin@skb.se**	

SRA Topics:

N°	SRA Topic	Priority
3.9	Long-term stability of bentonite in crystalline environments	H

Product/Result from the activity:

On-going activity: TSWG Decided in EG16

Time table:
As from 2015 to 2020

TSWG

Interested EG members

Nagra		ENRESA	
Posiva		Andra	I
SKB	Patrik Sellin patrick.sellin@skb.se		

TSWG Content of the activities

EG16 Discussion

Johan Andersson presented the project "Bentonite Mechanical Properties" in EG16.
Bentonite is a common issue in most programs. However, the behaviour is considered in an optimistic way i.e. with a full homogenisation. Following the FORGE and PEBS experiment it is considered that the conceptual understanding of the saturation processes and the properties of the bentonite objects (buffer/seals) is not fully predictable. It is proposed in this TSWG to study the possibility, using laboratory and field data to continue the modelling improvements. This TSWG may take full benefit of the experiments carried out in Mont Terri (EB) and in Äspö (Prototype Repository).

A project on "Gas transfer at interfaces and within disturbed /damaged zone" could be included in this THM project or may be an independent project.

This TSWG may lead to a project in the framework of the second H2020 call. Patrick Sellin will be the JA Leader and Juan-Carlos Mayor will be involved in the project. Juan-Carlos Major indicated that the title should be changed because the TSWG will deal more with the homogenization of the bentonite structures that the mechanical properties.
Frédéric Plas pointed out that the major issue of this TSWG should to determine how these bentonite structures (components) will evolve after their construction to reach the performance domain they are built for. For instance it will take many years for a bentonite plug to reach the saturation and reach the objectives that are expected in term of long term safety.
The EG considered that there is sufficient interest to create a JA (JA10a: "Bentonite Mechanical Properties"). The title should be changed to reflect the actual objectives. The EG member interested are SKB, Andra, Enresa, PURAM… This TSWG may lead to a technical project (H202 2nd Call).
This TSWG will be led by Patrick Sellin. Patrick Sellin is asked:

- ☐ To prepare a meeting with the interested partners in the upcoming weeks,
- ☐ To prepare the setting up of a WG to open the discussion at the EF.

Call for ideas on a future Collaborative Project on Bentonite Homogenization

Background and objectives

PEBS

The main aim of the project PEBS (Long-term Performance of the Engineered Barrier System) was to evaluate the sealing and barrier performance of the EBS with time. The focus was to study the processes in the early evolution of the repository system and to evaluate the impact of the processes on the long-term safety functions.
The sealing ability is essential for the engineered clay barriers in all repository concepts. This is normally achieved by a swelling pressure and a low hydraulic conductivity. The swelling pressure may also impact the impact the barriers in the repository. The mechanical properties of the installed EBS, that may consist of a mixture of blocks, pellets and engineering voids, will be entirely different from the situation after full saturation. It is therefore important to understand:

1. The mechanical evolution during the saturation phase
2. The final situation after equilibrium

A good knowledge of the mechanical evolution is necessary to ensure that a given design is sufficient to meet the performance targets.
The main focus in the PEBS was on thermal and hydration issues. However, the mechanical homogenization was studied in the excavation of the EB experiment. Within this topic the summary some of the findings from PEBS are:

- The homogenization of a bentonite buffer is efficient; even it is installed as a mixture of high density blocks and low density pellets. The EB experiment has confirmed that a highly saturated bentonite barrier was able to seal all the initial voids.
- Numerical analysis is a useful tool to predict the resulting heterogeneity in the barriers after hydration. For the EB experiment; it can be observed that the results obtained from the modelling are consistent with the dismantling observations.
- Models have indicated that the final heterogeneity of mass in a bentonite barrier may depend on the wetting history

However, even though the homogenization in the EB was reasonably efficient, there are still remaining differences in dry density over the cross-section of the test. These range from ~1,300 kg/m3 to ~1,450 kg/m3, which would mean a substantial difference in swelling pressure and hydraulic conductivity over the cross-section.
General

The primary function of a bentonite barrier is to ensure that the transport of various substances through it is dominated by diffusion. The swelling pressure in the bentonite is expected to seal all gaps and ensure that the rock and the buffer are in good contact with each other. It is therefore important that the swelling pressure is maintained.
Water uptake after deposition of the buffer, backfill and seals, which are inhomogeneous at emplacement, will lead to swelling. This causes all gaps in the buffer, between rock and buffer and between canister and buffer to disappear, and the buffer to be homogenized. However, some inhomogeneity will remain due to friction in the bentonite. This residual inhomogeneity is of importance for the design premises and the configuration (voids, pellets and blocks) with which the buffer, backfill or seal is deposited.
Generally, in both design specifications and long term assessments of bentonite barriers it is assumed that homogenization will occur and that the hydro-mechanical properties of the barrier will be equivalent to the properties of mean installed density. This is an optimistic approach, and in that sense, different from most (all) other approaches in radioactive waste management. This approach may be valid under many circumstances; however the range of conditions for the validity has not been demonstrated.
It is especially important to know the degree of homogeneity/heterogeneity of the barrier at the end of the transient period. It is inevitable that various types of heterogeneity will be present at the end of construction. Therefore the question is how heterogeneity will evolve during the transient period.
- Average dry density is not sufficient to characterize the state of the barrier, maximum hydraulic conductivity will be controlled by the zone with the lowest dry density
- Swelling pressure will not only depend on the average dry density achieved but of the wetting/deformation history of the barrier as well
- Heterogeneity may be enhanced by thermal effects
- Heterogeneity may also be caused by other processes such as erosion; the degree of homogenisation achieved by the subsequent sealing of the erosion pathway remains uncertain.

In this context, bentonite exhibits a quite complex mechanical behaviour showing a degree of irreversibility in various situations under both saturated and unsaturated conditions. Irreversibility leads in a natural way to heterogeneity.
Irreversibility has been conclusively demonstrated in a series of tests performed by Clay Technology on saturated compacted bentonite samples. Those tests also show that existing mechanical models have difficulties reproducing this behaviour. There is less information concerning the equivalent situation under unsaturated conditions although it is likely that irreversible behaviour may be even more significant.
There is therefore the need to carry out fundamental laboratory tests on bentonite under saturated and unsaturated conditions in parallel with constitutive model developments specifically aimed to the description of irreversibility. It should also be noted that there is practically no information on the irreversibility of mechanical behaviour of pellets-based materials that are becoming an increasingly popular component of barriers and seals.
Finally, there is the possibility that heterogeneity will continue to evolve in the long term due to creep phenomena (bentonite creep only in the case of crystalline rock, bentonite and host rock creep in the case of argillaceous rock). The issue of bentonite creep has never been seriously addressed; it is not easy as it involves the very long term.

Objective

The overall objective of the project is to evaluate the performance of an inhomogeneous bentonite barrier. This will be achieved by cooperation between design and engineering, science and performance assessment. The evolution from an installed engineered system to a fully functioning

barrier will be assessed. This will require an increased understanding of material properties as well an increased understanding of the fundamental processes that leads to homogenization and improved capabilities for numerical modelling. The output will be a verification of the performance of current designs for buffers, backfills, seals and plugs and an improved handling of mass losses in long term assessments.

Proposed work areas

According to the PEBS and LUCOEX project conclusions and additional inputs received from other projects and interested parties, further research and demonstration activities are required in the following areas:

A: Strategy aspects:

A1) Review of currents designs for bentonite barriers in the European disposal concepts. This will include performance targets as well as manufacturing and installation aspects.

A2) Review of the assessment strategy for the evaluation of the performance of the bentonite barriers, with special attention given to the treatment of remaining inhomogeneities.

A3) Definition of the technical basis for the design of the barriers

B: Assessment aspects

B1) Definition of case studies for the verification of the performance of current barrier designs

B2) Definition of case studies for the verification/validation of quantitative models, based on results from laboratory an field tests

C: Scientific aspects

C1: Development of conceptual approaches for the mechanical evolution of a bentonite barrier

C2: Laboratory testing to gain understanding of material properties

C3: Modelling of cases for the verification/validation of quantitative models.

C4: Evaluation of data from (existing) field scale experiments

C5: Investigation of a natural analogue, e.g. a drill core through a bentonite deposit

D: Practical implementation

D1: Feedback to design/engineering, are current designs adequate or can they be improved?

D2: Feedback to safety assessments: how should the homogenisation process be described and how should an inhomogeneous system be treated?

Approach

The above list is not exhaustive and other ideas and proposals related to monitoring can be presented at the workshop. All proposed activities aim to produce a significant step forward from the current state-of-the-art on the description and handling of the mechanical evolution of a bentonite barrier. It is considered that the project benefits can be maximized with a comprehensive approach to the problem.

The project should therefore include research on scientific, methodological, strategic, and stakeholder involvement aspects, technology development, as well as the integration with the safety analysis and design strategy. In particular, demonstration activities should be carried out both at laboratory and full scale, preferably already existing URL experiments, and should include, if possible, studies of a natural analogue.

Updated Information: EG16 – May 2015

6.16 JA11a: Sharing of knowledge on HLW container materials behaviour

JA11a: Sharing of knowledge on HLW container materials behaviour		
SRA Key Topic: 3 Technical feasibility and long-term performance of repository components		**Type of activity:** ORWG
Joint Activity leader:	**RWM/** Jonathan Martin Jonathan.martin@nda.gov.uk	

SRA Topics:

N°	SRA Topic	Priority
3.16	Sharing of knowledge on HLW container materials behaviour	L

Product/Result from the activity:

Sharing of knowledge on High Level Waste container materials behaviour

On-going activity:

- To prepare a small pilot on the first priority.
- To gather the existing documentation on the subject and identify the key documents.
- To interact through the website to call for public references on specific subject.

Interest documentation Provided byRWM

Time table: As from 2011 to 2017

ORWG

Interested EG members

Andra	Didier Crusset didier.crusset@andra.fr	**COVRA**	Erika Neeft *Erika.Neeft@covra.nl (Ewoud Verhoef)*
BMWi	Walter Steininger walter.steininger@kit.edu Walter Bollingerfehr bollingerfehr@dbe.de	**RWM**	**Cristiano Padovani** **cristiano.PADOVANI@nda.gov.uk**
Nagra		**Posiva**	Marjut Vähänen Marjut.Vahanen@Posiva.fi
ONDRAF	M. Van Geet m.vangeet@nirond.be	**SKB**	Peter Wikberg peter.wikberg@skb.se
SURAO	Ilona Pospiskova pospiskova@SURAO.cz		

ORWG Content of the activities

Implementing Geological Disposal of Radioactive Waste Technology Platform

Background

As a result of an action from EG9 Nov 2012 Neil Smart made available to the EG two NDA reports on extensive reviews on the behaviour of HLW container materials in operational and post-closure phases.

- The first report (2010) focuses on the post-closure period and includes detailed technical appendixes on the behaviour of specific candidate materials considered in previous disposal programmes.
- The second study (2011) considers the corrosion behaviour of the same candidate materials in potential 'operational' environments as well as the implications of 'operational' factors on the corrosion behaviour during the post-closure period.

This work intends to assess the corrosion behaviour of a variety of candidate canister materials (copper, carbon steel, titanium, stainless steel, nickel alloys) in a range of scenarios relevant to geological disposal in the UK (but probably more broadly).

2

Implementing Geological Disposal of Radioactive Waste Technology Platform

Current activities

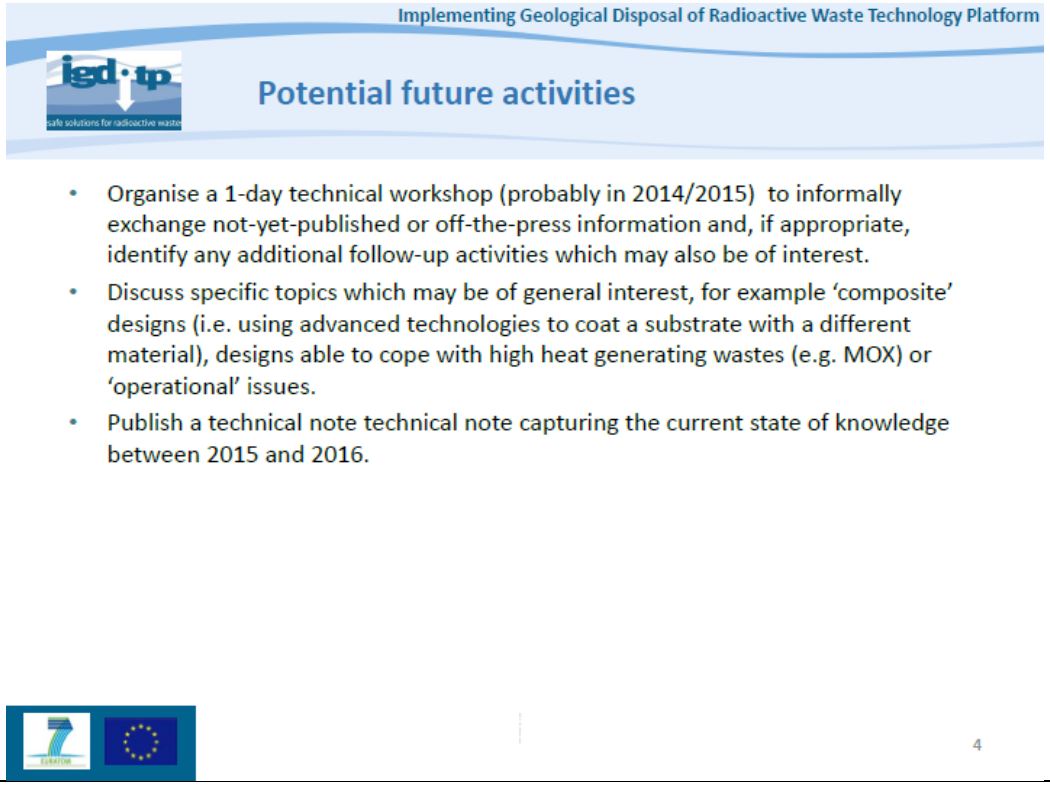
Cristiano Padovani has taken over from Neil as lead for JA 11a and set up a new folder on IGD-TP Projectplace "TSWG (11a)" under "IGD-TP Joint Activities: Projects and Working groups".

Cristiano has now added the two reports to this folder and:

- Is looking for volunteer partners to make available on the IGD-TP website relevant, recent work.
- Plans to upload additional, new documentation complementing this work focusing on considering the need of taking into account mechanical aspects (rather than a purely 'chemical' analysis) as well as updated technical appendixes describing the corrosion behaviour of candidate materials in 2014/2015.

3

Way Forward



Updated Information: EG12 – October 31, 2013

6.18 JA11c: Analogues

JA11b: analogues		
SRA Key Topic: 3 Technical feasibility and long-term performance of repository components		**Type of activity:** IEP
Joint Activity leader:	**BMWi/KIT Walter Steininger**	

SRA Topics:

N°	SRA Topic	Priority
Topics 7.1, 3.1, 3.2, 3.3, 3.4, 3.5, and 3.16	Analogues	M

Product/Result from the activity:

Discussion EG14

Walter Steininger proposed to open a new Joint activity dealing with the topic 3.1 (covered by JA11)

Rationale

The project of the Joint Activity outline is presented in the material.

Beyond the “traditional” application of applying “natural” analogues - use/apply/contemplate about different or more elaborate ways of the application / use of the term “analogue”, i.e. industrial’ analogues, ‘contemporary’ analogues, ‘operational’ analogues, ‘national’ analogues, ‘social’ analogues, ‘negative’ or ‘anti’ analogues,, ‘self’ analogues.

That means: a number of issues that could usefully be addressed in the future are e.g.

- Identify the various roles that natural analogues could play within the overall Safety Case (different applications are possible, each may have their own specific requirements),
- Critically assess the NA studies and information within the context of safety assessment (to understand implications of the differences and the similarities between the analogue and repository systems),
- Use analogues not in isolation, i.e. use it in combination with other multiple lines of reasoning,
- Avoid over interpretation and abuse of analogue information,
- Because the use of analogues for public communication and dialogue remains unproven, this is still an area worthy of further consideration,
- Apply the term “analogue” in a broader sense.

Possible benefits of an IEP: integration of this topic into TP´s research area portfolio, interaction with the international Natural Analogue Working Group and their experience and networks.

Time table: As from 2014 to 2020

IEP

Interested EG members

		COVRA	
BMWi	Walter Steininger walter.steininger@kit.edu	Posiva	
Nagra			

Updated Information: EG14 – June 4-5 2014

6.19 JA12: ORWG on Adaptation and optimisation of the repository

JA12: ORWG on Adaptation and optimisation of the repository

SRA Key Topic: 4 Development Strategy of the repository		**Type of activity:** ORWG
Joint Activity leader:	**SURAO/ J. Slovak** slovak@SURAO.cz	

SRA Topics:

N°	SRA Topic	Priority
4.1	Methodologies for adaptation and optimisation during the operational phase	M

Product/Result from the activity:

Report explaining that on the lifetime of a geological repository project, many developments can occur and help improving or optimizing the construction, operation, closure and monitoring of the facility
Roadmap for further work

On-going activity:
Proposal to be done by JA Leader

Time table: As from 2012 to 2018

ORWG

Interested EG members

Andra	Jean-Michel Bosgiraud Jean-Michel.Bosgiraud@andra.fr	**BMWi**	Walter Steininger walter.steininger@kit.edu
Nagra	Thomas Fries thomas.fries@nagra.ch	**RWM**	Sam King Samantha.King@nda.gov.uk
ONDRAF	M. Van Geet m.vangeet@nirond.be	**PURAM**	Peter Molnar molnar.peter@rhk.hu
SURAO	**Jiri Slovak** **slovak@SURAO.cz**	**SKB**	J. Andersson johan.andersson@skb.se

ORWG Content of the activities

Explanation of the contents of the activity:
The goal of the activity is to keep open different options of the geological repository at the stage of its licensing. To get the license, demonstration that safety will be achieved needs to be provided. This is based on available knowledge, methodologies and technologies. However, the options used when applying for the license must be kept open, provided performance of better solutions would also have to be demonstrated before getting licensed. The idea here is that successive improvements can be foreseen during the lifetime of the facility and can be implemented.

ORWG Description

Short description of project:
The work will be organised through an ORWG to prepare a roadmap for further exchanges. The suggested first task through the SRA is to identify the components of the repository system that through adaptation and optimization would potentially reduce over-conservatism, improving quality and simplifying the design, construction and operations. The approach can be split in 3 directions:

- Methodologies of demonstration and related improvements.
- New scientific information, its integration and consequences on the safety case as well as on the technological solutions.
- Technical solutions which could be implemented.

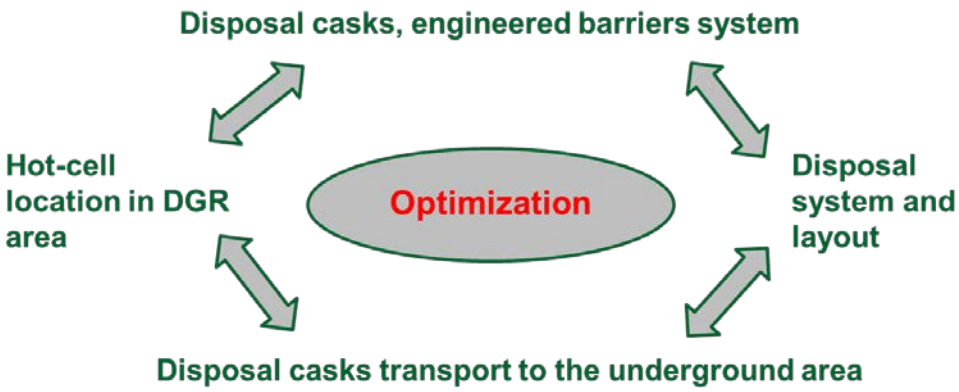
ORWG Proposal (EF3 Nov 2012)

DGR design optimization

Radioactive Waste Repository Authority

Marketa Dvorakova

29th November 2012, Paris



2

Disposal casks, engineered barriers system

Optimization

- **Material tests** (verification of material properties in DGR expected conditions, irradiation and temperature degradation)
- **Verification thermo-technical calculations** (to specify and proove the amount of SNF placed into the cask, the thickness of backfill)
- **Strength calculations** (verification of swelling pressure of bentonite to cask´s surface, shear stress due to movement of rock blocks at possible tectonic events)
- **Long-term safety verification** (in the case of modification)

Disposal casks transport to the underground

Shaft	Incline drift
• Smaller amount of excavated rock	• Higher operational safety
• Smaller expensiveness of transport	• Less complicated clearing away of accident impacts

Optimization

In dependence on cask´s construction to check:

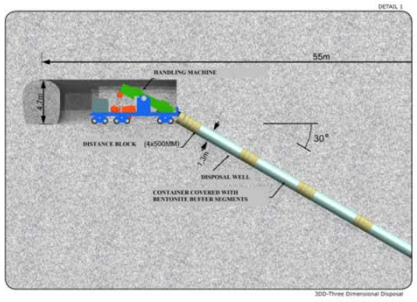
- **Operational safety protection** (especially in the case of shaft transport to the undergroud area)
- **Possibilities of safe accident impacts removing, evaluation of impacts**

4

Disposal system and layout

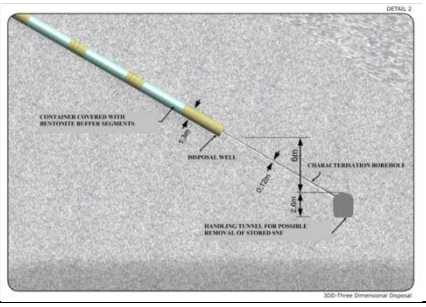
Horizontal		Vertical	
pros	cons	pros	cons
• Need of smaler area	• More demanding manipulation with casks and bentonite blocks *(long disposal drifts)*	• More simple manipulation with casks and bentonite *(1 cask´s boreholes)*	• Need of large area
• Smaller amount of excavated rock	• Geological survey can give more restriction *(craks x long disposal drifts)*	• More flexible application of geological survey *(cracks)*	• Bigger amount of excavated rock

Combination?



Disposal system and layout (cont.)

INCLINE SYSTEM



Way Forward
Discussion on the proposal to be carried out

Updated Information: EG9 - November 30, 2012

6.20 JA13: IEP on communicating result from RD&D

JA13: IEP on communicating result from RD&D		
SRA Cross cutting Activities Communication		**Type of activity:** IEP
Joint Activity leader:	**RWM/** R. Kowe raymond.kowe@nda.gov.uk	

Product/Result from the activity:

Scientific dissemination associated with WP2 of FP7 project SecIGD2

On-going activity: FP7 project SecIGD2 WP2

Time table: current activity 2013-2015, permanent

IEP on communication

Interested EG members

Andra	Anabelle Comte anabelle.comte@andra.fr	**Nagra**	Lawrence Johnson lawrence.johnson@nagra.ch
BMWi	Walter Steininger walter.steininger@kit.edu	**ONDRAF**	M. Van Geet m.vangeet@nirond.be
RWM	Jon Martin jonathan.martin@nda.gov.uk ; Ray Kowe raymond.kowe@nda.gov.uk	**SURAO**	Jiri Slovak slovak@SURAO.cz
Posiva	K Kuisma kanerva.kuisma@Posiva.fi	**PURAM**	Balazs Molnar molnar.balazs@rhk.hu
SKB	Anna Wahlsteen, Anna.Wahlsteen@skb.se	**COVRA**	Ewoud Verhoef Ewoud.verhoef@covra.nl

Other interested participants

EC, Belgium; Nidia Scientific Services, Italy; Institute for Nuclear Research, Romania; Lithuanian Energy Institute, Lithuania; JRC, Germany; JAVYS, Slovakia; Amphos 21, Spain; Regional Environmental Center, Slovenia; MCM, Switzerland; Fund for the decommissioning of the Krsko NPP, Croatia; University of Pisa, Italy

TEP SecIGD2 WP2 description

The Work Package 2 (WP2) "Support for networking, structuring and developing RD&D competences in countries with less advanced geological disposal programmes" is led by Radioactive Waste Management Limited (RWM)**.**

It focuses on looking at different ways of transferring strategic knowledge on how to set up and manage waste management programmes from waste management programmes closer to licencing to Member States who are not planning to submit license applications within the "Vision 2025".

This WP is specifically set up to foster the networking and structuring RD&D in countries with less advanced programmes in order to meet the requirements of the "Waste Directive". Its intention is mainly to provide support and opportunities for learning for the personnel from such Member States and at the same time support in the organisation of Information Exchange Forums where knowledge can be transferred from more experienced experts. The public events would present RD&D strategies and capabilities to be transferred or adapted to other contexts.

A Working Group will be set up in order to gather representatives of less advanced programmes and the interested EF participants (academics, TSOs and other organisations willing to contribute actively in the work) of these countries to discuss and add to the content of the joint activities outline and to (i) identify the specific needs of the less advanced programmes; analyse how they could be taken into account in the joint activities; (ii) Identify key open specific documentation accessible on specific topics established already and used by more advanced countries as a reference or state of the art, (iii) Prepare proposals to implement these needs in the existing TS/ORWG already established in the TP; (iv) Identify areas of possible TT through specific agreements between more and less advanced programmes. However, this support action is not intended to substitute for Joint Activities that can take place under the Joint Activity Technological Transfer (TT) as identified in the IGD-TP's Deployment Plan.
This Work Package aims to:

- Providing specific support to a Working Group (WG) in charge of networking, structuring and developing RD&D competences in countries with less advanced geological disposal programmes.
- Providing the management guidelines for Joint Activities dealing with this WG.
- Supporting the organisation for two international conferences for disseminating the public scientific and technical information and results derived from the IGD-TP's Joint Activities and from other RD&D efforts in the field of geological disposal. Specifically providing support to members of countries with less advanced programme and developing the means to better take into account their attempt towards the platform.
- Enabling the further evolution of the IGD-TP's SRA.

Experience from international and bilateral cooperation will be used as a basis for developing the methods to ensure effective resource utilization in the knowledge transfer. This Work Package shall also address the use of proprietary or accumulated background, and foreground created in Joint Activities and other intellectual property rights when actual knowledge transfer is performed. The IGD-TP Management Guidelines will help with this issue and will be updated taking into account the experience gained in this work.

Way Forward
Launch of the project Jan 2013 : SecIGD2 WP2

Project progress
The following details the progress on the specific aims of the work package i.e. to:

- To set up a Working Group (WG) to support the networking, structuring and developing RD&D competences in countries with less advanced geological disposal programmes.
- Update the Management Guidelines for Joint Activities.
- Develop a draft guidance document in support of RD&D planning needs of National Programmes for geological disposal of radioactive waste.
- Organise two international conferences (2014, 2015) for disseminating the public scientific and technical information and results derived from the IGD-TP's Joint Activities and from other RD&D efforts in the field of geological disposal.

The Geodisposal conference was hosted by the University of Manchester 24-26 June 2014. It had 280 delegates from 24 countries, with 57 presentations and over 100 posters. A special edition of the Mineralogical Society Magazine containing 40 publications from the conference proceedings will be published in October 2015.

The Management Guidelines document was updated to include:

- Introduction and conclusions adding text relating to SecIGD2.
- Update table of examples of Joint activities with extensive text on WP2 SecIGD2, JOPRAD, CEBAMA and Environmental monitoring.

The Executive Group reviewed the updated document over November 2014 – December 2014. Minor changes were addressed. The EG approved the publication of the Management guidelines (D2.1) in EG 16 March 2015.

3 Meetings took place of the SecIGD2 Working Group 'Support for networking, structuring and developing RD&D competences in countries with less advanced geological disposal programmes'. The working group meetings were attended by 22 participants from 17 organisations representing 15 European countries including representatives from Italy, Slovenia, Romania, Netherlands, Slovakia, Croatia, Lithuania and Hungary. The WG have:

- Evaluated questionnaire responses to gather understanding of current RD&D needs.
- Drafted the RD&D Guide with the first draft made available to EG15 October 2014.
- Produced a poster for Exchange Forum 5 28, 29 October 2014, Kalmar.
- The Guide underwent EG review during November 2014 – February 2015.
- The revised draft of the Guide was approved for submission to the PLANDIS at EG16 March 2015.
- Draft document issued for external review April – early May 2015 to obtain feedback on Guide usability, content and identify improvements /additional information. It was reviewed by target users (i.e. programme owners and managers working within or on behalf of waste management organisations), questionnaire responders. It was issued on Project Place for additional feedback by the IGD-TP community.
- A staged presentation of guide took place at a 1 day IGD-TP R&D dissemination event (PLANDIS), 26 May 2015 at the Institute for Nuclear Research (ICN), Romania, after which the guide was updated.
- The final issue of the Guide was be submitted at EG17 June 2015 for approval for publication.

The workshop (PLANning geological DISposal of radioactive waste in Europe – PLANDIS) was aimed at road testing the Guide, and to:

- End user feedback used to update the Guide and prepare for publication as an IGD-TP deliverable (D2.3) (EG17 meeting 24-25 June 2015).
- Communicate and road test the Guide at 1-day PLANDIS event (PLANning geological DISposal of radioactive waste in Europe – PLANDIS).
- Opportunity for end users to gain practical experience of using the Guide content and obtain training in RD&D prioritisation to aid development of their own plans.
- Bring together Member States with different pace and degree of advancement in implementation of their respective National Programmes for Geological Disposal of Nuclear Waste.

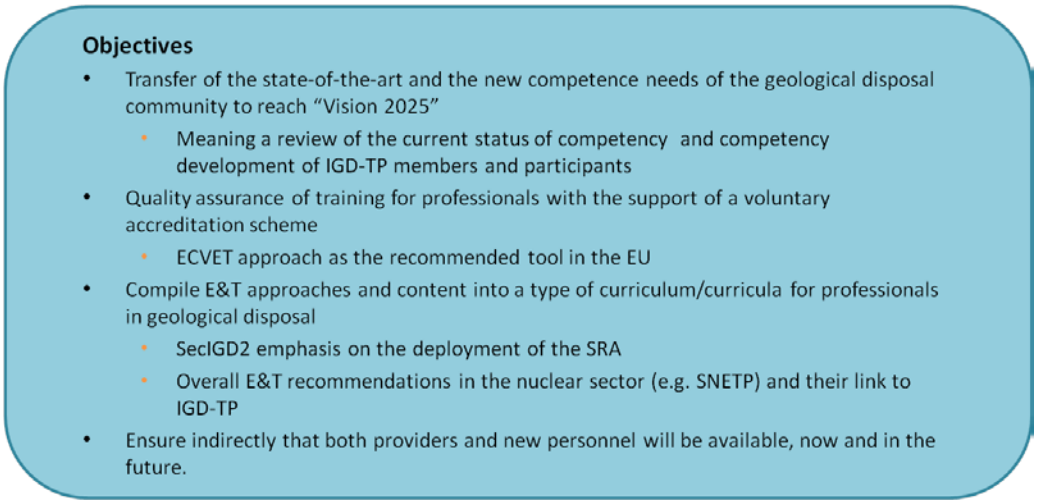
Update: Ray Kowe, May 19, 2015

6.21 JA14: Competence Maintenance, Education and Training

JA14: Competence Maintenance, Education and Training		
SRA Cross-cutting Activity: CC2		**Type of Activity:** IEP
Joint Activity leader:	**Posiva Oy, Finland** Marjatta Palmu (marjatta.palmu@posiva.fi)	
Cross-cutting Activity: Competence Maintenance, Education and Training		

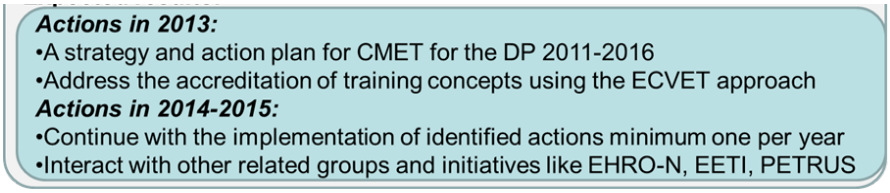
Competence Maintenance, Education and Training Working Group CMET (IEP)

Objectives of CMET working group



The CMET Working Group (CMET) is a permanent Working Group of the IGD-TP formed in 2012. The current actions towards the CMET group's objectives are carried out with the financial support of the EURATOM FP7 and the IGD-TP's EG with the assistance of the SecIGD2 project, that organises work defined in the project's Work Package 3 (2013-2015). This assistance includes organisation of at least two work group meetings of the CMET annually, compiling a strategy and action plan for the group and reporting the feasibility study of an accreditation scheme that could apply the ECVET approach.

Expected results as defined in the SecIGD2 work plan



On-going work in 2015

- The CMET group continues to meet according to its annual meeting plan. Fifth CMET meeting took place in April 2015 in Lisbon, Portugal and it included a special training session by Cheryl Contee from Fission Strategy to the members of the group. One more meeting under the SecIGD2 is to be scheduled in 2015 for the group members and takes place in the Czech Republic in December.

- A StrAP editing workshop was arranged on the 2 June 2014 in Delft Holland and the new content was presented to the EG for comments in the EG no14 meeting in June 2014. The work to produce the CMET Strategy and Action Plan (StrAP) continues with some delays.
- The identification of other actions for the CMET is on-going and as the 2015 action a prioritisation of identified CMET action opportunities took place in the CMET no 5 meeting in Lisbon. This prioritisation identified further the 2016 activity/activities. The plan is to continue the CMET's activity during the first half of 2016 with the cooperation of the Petrus III project.
- Dissemination about the IGD-TP CMET group's activities continues in the relevant venues and cooperation forums and projects like with ENEN, Petrus III and CINCH.
- The StrAP and feasibility study reports are scheduled for completing in 2015.

Major achievements during 2014 and 2015

- A special walkabout session was held to the EF5 participants in Kalmar, Sweden to collect the views and inputs of the IGD-TP on the feasibility of a voluntary accreditation scheme. This session was organised by the CMET members within the SecIGD2 project and with additional support from Petrus3 project and ENEN association.
- Four CMET working group meetings were organised, CMET meeting no 3 was split into two meetings: 3A in Cardiff, United Kingdom and 3B in Delft, Holland, both hosted at the universities. CMET no 4 meeting was held in Paris in November 2014 to collect the outputs from the EF5 walkabout and CMET no 5 meeting was held in Lisbon in April 2015.
- Projectplace folder for the group has been continuously used for material sharing; set-up of a LinkedIn CMET group for discussions was done, but it is not as active; the update of JA14 page of the www.igdtp.eu website for public announcements is in use, too. CMET related announcements of European events have been actively submitted for distribution and published by the Secretariat in the www.igtp.eu calendar for wide outreach.
- IGD-TP and especially CMET continues to be represented in the EHRO-N SAG and its meetings, interactions with the PETRUS III project. The membership of the ENEN association in the CMET working group was agreed in March 2015 at the ENEN General Assembly in Finland. IGD-TP endorsement for the ENEN coordinated H2020 proposal ANNETTE was provided, unfortunately the project proposal remained on the reserve list of the first H2020 call.
- Ecole des Mines de Nantes joined the CMET working group in April 2015.

CMET Competence Maintenance, Education and Training Working Group

Joint Activity participants

9 organisations from 14 European Member States have volunteered for the CMET activity. They represent six different types of organisations active in the geological disposal community. CMET is continuously open for new volunteers into the group. Expressions of interest can be sent directly to the CMET chair with a copy to the Secretary General of the IGD-TP.

EG participants

ANDRA	Christine Trentesaux- Hamamdjian christine.trentesaux-hamamdjian@andra.fr; Marie Garcia, (Secretariat)	**BMWi**	BGR, S. Fahland Sandra.fahland@bgr.de, KIT /Walter Steininger walter.steininger@kit.edu
ENRESA	J.Farias jfas@enresa.es	**Nagra**	Ingo Blechschmidt Ingo.blechschmidt@nagra.ch; Andrew Martin Andrew.Martin@nagra.ch
RWM	Robert Winsley robert.winsley@nda.gov.uk	**Posiva**	**Marjatta Palmu Marjatta.Palmu@Posiva.fi**
SURAO	Marketa Dvorakova / Irena Hanusová dvorakova@surao.cz; hanusova@surao.cz	**SKB**	Lotta Rubio Lind Lotta.Rubio.Lind@skb.se

Posiva, RWM and Andra are also supporting the activity through the SecIGD2 project.

EF participants volunteered for the activity

Czech Technical University, CTU (CZ), Jaroslav Pacovsky and Radek Vasicek
Aalto University (FI), Jussi Leveinen
Université Lorraine- Mines Nancy (FR), Behrooz Bazargan-Sabet
Université de Versailles St. Quentin-en-Yvelines (FR), W. Eberhard Falck
BGR[5] (DE), Sandra Fahland
Steinbeis-Center for Simulation in Technology (DE), Gabriel Wittum
TU Clausthal, IELF (DE), Klaus Röhlig
JRC - ITU (EC), Concetta Fazio and Gunnar Buckau
CIRTEN[6] - University of Pisa (IT), Rosa Lo Frano
University of Milan (IT), Marie Claire Cantone
Nidia srl. (FR/IT), Claudia Vivalda
TU Delft (NL), Phil Vardon
Instituto Superior Técnico/ Nuclear and Technological Center (PT), Isabel Paiva and Mario Reis
ARAO (SI),Bojan Hertl
UPM[7] (ES), Francisco Javier Elorza
STUBA[8] (SK), Vladimir Slugen
REC[9] (SI), Nadja Zeleznik
ENEN Association[10] (FR), Pedro Dieguez Porras

[5] Bundesanstalt für Geowissenschaften und Rohstoffe
[6] Inter-University Consortium for Nuclear Technological Research
[7] Universidad Politechnica de Madrid
[8] Slovak University of Technology in Bratislava
[9] Regional Environmental Centre for Central and Eastern Europe REC Hungary
[10] European Nuclear Education Network Association registered in France (www.enen-assoc.org)

Ecole de Mines Nantes EMN (FR), Abdesselam Abdelouas

Other interested participants

former TU Braunschweig (DE), Wernt Brewitz
former Stockholm University, Department of Physics (SE), Antonio Pereira

Description of the drivers for the activity in 2012 when it was kicked-off::

The CMET activity is supported by the IGD-TP Secretariat via the EURATOM FP7 SecIGD2's **Work Package 3** (WP3) ***"Support for the development, implementation and coordination of Competence Maintenance, Education and Training (CMET) activities in geological disposal in Europe".*** The WP3 and this activity are led by **Posiva Oy**. The background information for the activity is described in the following based on the SecIGD2 project plan and on some recent updates from 2013-2014 activities.

The IGD-TP has identified in its SRA[11] the need for Competence Maintenance, Education and Training (CMET) as one of its Cross-Cutting Activities that supports the Vision 2025[12] of the IGD-TP, especially in facilitating access to expertise and technology and maintaining competence for the benefit of Member States.

The IGD-TP's SRA 2011 identified the state-of-the-art within this Cross-Cutting Activity CMET. It acknowledges that geological disposal community is a fairly small community in its size compared e.g. with the rest of the nuclear sector. In the community a very broad range of qualifications, competence and expertise are needed for a wide range of scientific and technical disciplines and of humanities (especially economics, communication and competence development). The multidisciplinary character of geological disposal forces the waste management community to attract work force in competition with a large variety of industries and research organisations to meet the personnel demands. Working together on this Cross-cutting Topic assists in pooling a mass of potential participants large enough to make the CMET activities happen and to help in pooling human resources also in the future to address the knowledge maintenance challenges created by the retirement of experts.

The recognition of a person's learning outcomes and also gaining a qualification can be achieved independently of the way the learning has been acquired in compliance with the qualification levels defined in the European Qualification Framework (EQF[13]) and by taking advantage of the ECVET approach. Thus the accreditation of the learning outcomes opens opportunities to define and assess the learning outcomes of any training concept or scheme developed within the waste management community. The European wide credit systems in the future not only serve the outcomes of university education but also more informal training activities. The development of such accreditation schemes requires common actions and agreement by the stakeholders in question that is not necessarily self-evident in the Member States, where qualifications are subject to national educational policies and related legal frameworks (subsidiarity).

The European cooperative training concepts (or schemes) feasibility in geological disposal has been studied and tested on various EFTS[14] and national projects. One practical long-term issue is maintaining the sustainability of such concepts after the end of the projects. A mutually accepted accreditation of individual

[11] IGD-TP 2011. Strategic Research Agenda 2011 (SRA 2011) www.igdtp.eu
[12] IGD-TP 2009. Implementing Geological Disposal of Radioactive Waste Technology Platform. Vision Report. EUR 24160 EN or http://www.igdtp.eu
[13] European Qualification Framework (EQF) and European credit system for vocational education and training or VET (ECVET)
[14] European Fission Training Scheme (EFTS)

training concepts for quality assurance, mutual recognition and mutual acknowledgement of learners learning outcomes would help promote the status of such training concepts in the eyes of the end-users and potential students and thus contribute to their sustainability.

Lack of funding instruments for running such concepts and funds for a wider international student communities participation into such concepts at the European level is currently one reason for their limited financial viability. The main mobility funding resources are tied to formal degree programmes at universities and other higher education institutions. In addition, the funding is often allotted on an individual basis and not aimed at groups of students and their tutors.

For training concepts depending on participant fees or other direct funding, there is a need to take into account the demand side views of the end-users in the development of the European competence maintenance, education and training activities in alignment with the IGD-TP's vision, SRA and the Deployment Plan, too.

Achieving the "Vision 2025" and deploying the Joint Activities of the IGD-TP are the specific reasons for carrying out the support activities to the CMET under the SecIGD2 project. The CMET work as such is a voluntary commitment of the CMET group members and their background organisations.

The emphasis of the group is to focus on the development, implementation and coordination of the CMET activities. It will not act as a training provider or a training scheme/concept developer in geological disposal, nor does it plan to become one. Because this provision is the task of training and education providers i.e. training is provided by professional training organisations and universities. The IGD-TP's CMET can provide information from the demand side needs (Figure 1) of competence maintenance, E&T to the providers so that they can develop and maintain ways of producing learning outcomes in geological disposal. Most importantly, the CMET can also work as a channel to bring participants to such schemes and thus contribute to their sustainability.

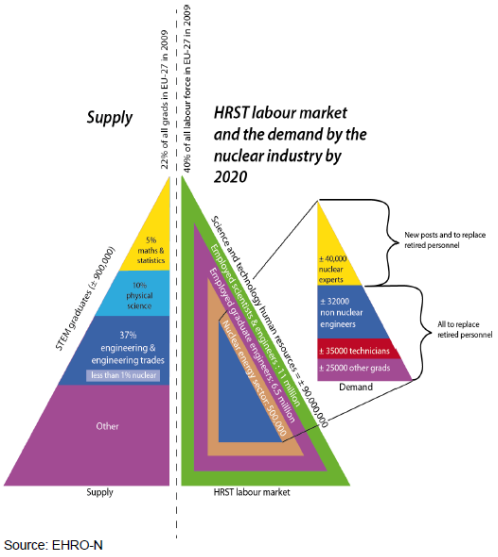


Figure 1: Supply and demand sides of HR resources in nuclear (according to EHRO-N). Supply side is taken care by governments and educational institutes/training providers and the demand side looks at how much HR is needed and in what type of competence areas. The IGD-TP CMET works on the demand side issues in HR but collaborates with the supply side in order for the needs and supply to match. Source of figures: EHRO-N (with permission)

During 2013-2015, the preliminary action plan is that during each of the three years of the SecIGD2 project, the CMET selects (at least) one action from its mandate for implementation with in-kind contributions. The accreditation scheme feasibility study will be the first to be implemented due to its importance. The CMET actions all focus on the development, implementation and coordination of the CMET from the perspective of implementing the IGD-TP's SRA (current and future SRAs). They will be based on a more detailed strategy and action plan of the CMET group.

In Europe, there is very limited specific formal in-depth education leading to a degree in geological disposal. Also the amount of wider educational or training programmes is limited, though their number has increased since the beginning of this century. In geological disposal, learning on the job and in RD&D[15] projects in various ways is the main source of knowledge, skills and competence (KSC[16]) development. In such a setting the use of ECVET approach and mutual recognition of the defined and documented learning outcomes that are acquired by the professionals in such informal ways (e.g. on the job, in projects, on internal or other training courses) are beneficial in HR development and task related knowledge preservation.

In geological disposal, the quality assurance of the learning outcomes currently takes place on the organisational level and for their assessment and recognition by other organisations a very limited scope of mutual recognition applies. New needs for qualification of personnel arise as the implementation of repositories and other related nuclear facilities start operating. The regulators in regard with the licensing of the facilities will also address and require the qualification of personnel, in particular the demonstrated qualification of the operating and other personnel dealing with safety critical tasks,. Quality assurance procedures for mastering the construction and operating procedures (i.e. the learning outcome requirements) need to be developed. The CMET and the IGD-TP with its Secretariat can support the development of suitable procedures. The CMET group's progress in this area will be incorporated into the record documenting the feasibility and the potential development of the accreditation scheme.

The adoption of the new “Waste Directive”[17] in the European Member States was on 23 August 2013. In the Member States closest to licensing, most of the requirements of the directive have already been incorporated into the national legislation and guidelines and a lot of experience dealing with the practical implementation of the requirements exists within the IGD-TP. In addition, the Nuclear Waste Directive (Waste Directive) now states explicitly in its article 8 on "Expertise and skills" that *"Member States shall ensure that the national framework require all parties to make arrangements for education and training for their staff, as well as research and development activities to cover the needs of the national programme for spent fuel and radioactive waste management in order to obtain, maintain and to further develop necessary expertise and skills"*.

The IGD-TP's working group on Competence Maintenance, Education and Training is aware of the various challenges facing competence maintenance, education and training in implementing geological disposal. The CMET is motivated and aims to address these challenges in a coordinated way to the degree, for which resources have and will be provided for the CMET work by the SecIGD2 project and the volunteering organisations. The strategic aim of the work is to ensure that the necessary knowledge, skills and competence in geological disposal are maintained and to further develop opportunities for competence maintenance,

[15] Research, Development and Demonstration
[16] In the ECVET approach, Learning Outcomes (LO) of a unit of learning (i.e. mastery of one task or task component) are verbally defined with Knowledge, Skills and Competence (KSC) components based on a taxonomy that is in a process of development for the nuclear sector
[17] 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.

education and training without becoming an education and training (E&T) provider. Many providers of E&T and EFTS's have already volunteered to participate in the CMET activity and unnecessary overlap with existing activities shall be avoided. The SecIGD2 support for catalysing this Joint Activity (JA14) enables thus support in the form of a European wide a forum of interested voluntary participants.

All organisations working in the nuclear sector work with high safety requirements and with a high awareness of factors influencing safety. This means a need to meet at least a minimum common level of KSC about safety in all of the European Member States despite their national subsidiarity related to educational and other related decisions. The drivers for harmonising the requirements related to the learning outcomes for the personnel working in the field are derived from the implementation of a good safety culture in the organisations.

The ECVET[18] approach is a potential tool for assessing such and other learning outcomes. In the high safety context it has first been piloted in the aeronautics sector. ECVET approach is also complementary to the SAT[19] introduced by the IAEA for HR and training development for nuclear facilities. ECVET piloting is now taking place in the nuclear sector in various European Fission Training Schemes like ENENIII, PETRUS2-3, CINCH1-2, ENETRAP2-3 and in newer schemes. The quality assurance of the learning processes and the validation of the learning outcomes require industry and other end-user involvement. Similar parallel processes are on-going in the nuclear field at e.g. EHRO-N[20] and EETI[21] for the SET-Plan Roadmap on Education and Training[22]. The intention of the CMET is to continue working in an integrated manner with other existing and new initiatives during following years. Key experiences can be transferred and modified to the geological disposal context despite the fact that many of these other initiatives cover the whole nuclear sector. The interaction in CMET can provide future opportunities for piloting such schemes in geological disposal.

Way Forward: See section: On-going work of CMET

Update of Outline Information: Marjatta Palmu April 2015

[18] ECVET = European Credit System for Vocational Education and Training e.g. CEDEFOP. 2013. Monitoring ECVET implementation strategies in Europe. Working paper no 18. http://www.cedefop.europa.eu/EN/Files/6118_en.pdf
[19] SAT = Systematic Approach to Training e.g.in INTERNATIONAL ATOMIC ENERGY AGENCY. 2009. Managing Human Resources in the Field of Nuclear Energy. IAEA Nuclear Energy Series No. NG-G-2.1. Vienna.
[20] European Human Resource Observatory in Nuclear (the operating agency is DG JRC's Institute for Energy and Transport) resulting from ENEF visit: http://ehron.jrc.ec.europa.eu/.
[21] Energy Education and Training Initiative (EETI)
[22] Strategic Energy Technology (SET) Plan Roadmap on Education and Training visit: http://ehron.jrc.ec.europa.eu/news/set-plan-roadmap-education-and-training

6.23 JA15: Nuclear Knowledge Management

JA15: Nuclear Knowledge Management		
SRA Cross cutting Activities		**Type of activity:** ORWG
Joint Activity leader:	**Posiva/ Juhani Vira** juhani.vira@posiva.fi	
SRA Priority Cross cutting Activities CC3		
Product/Result from the activity: **On-going activity:**		
Time table:		

ORWG on Nuclear Knowledge Management

Interested EG members

Andra	Aliouka Chabiron aliouka.chabiron@andra.fr	**BMWi**	Walter Steininger walter.steininger@kit.edu
COVRA	Ewoud Verhoef *Ewoud.Verhoef@covra.nl (E.Neeft)*	**ENRESA**	J.Farias jfas@enresa.es
Nagra	Anne Claudel anne.claudel@nagra.ch	**RWM**	Trevor Walker trevor.walker@nda.gov.uk
ONDRAF	A. Berkcmans a.berckmans@nirond.be	**Posiva**	**Juhani Vira** **Juhani.Vira@Posiva.fi**
SURAO	Jiri Slovak slovak@SURAO.cz		

Other interested participants:
Eberhard Falck eberhard.falck@uvsq.fr; Sarah Watson SarahWatson@quintessa.org

ORWG on Nuclear Knowledge Management Documill

Implementing Geological Disposal of Radioactive Waste Technology Platform

Nuclear Knowledge Management NKM

- Proposal for IGD-TP members:
  Documill – One universal content discovery tool for IGD-TP members web sites into one centralized search service. Crawling and indexing will be done with the member organization permission. Agreed crawling policies ensures that the index is always up to date. The service will be accessed via user id and password.

Proposal Nagra EG 12 October 31 2013

Follow-up of NKM workshop, April 2013

- Work in the field of knowledge transfer and preservation should be continued within the IGD-TP
- No duplication of existing work / Coordination with on-going efforts:
  - NEA RK&M (Records, Knowledge & Memory Preservation across Generations) project, in particular concerning the post-closure period
  - Petrus II EU project (Education and Training on Geological disposal of radioactive wastes)
  - More insight into current activities at IAEA should be gained
- Focus could be on KM on the very short (0-20 years) or short-term (100 years)
  - Immediate concern for all implementing organisations
  - Ageing staff: "RWM Pioneers" have begun to retire
  - Several KM initiatives already ongoing
  - Direct impact on the progress of the repository projects

2 31.10.2013 / Zu/Ole NKM activities nagra.

Proposed general topic for further research

- "Scientific knowledge sharing and transfer in case of discontinuity in knowledge flow"
  (or: "How to ensure sharing and continuity of competences")
- "Discontinuity in knowledge flow" can be caused by
  - Retiring experts, departing staff
  - Downsizing, ceasing activities or changing focus

→ Issue of concern for all organisations

→ A wealth of scientific literature exist

- On knowledge transfer and retention strategies: goals, requirements, priorities, risks associated with knowledge loss, etc.
- On methods: e.g. Codifying knowledge, capturing lessons learned, knowledge handover (describing key processes, projects, information resources, etc.), communities of practice, technical mentoring / job shadowing, knowledge harvesting (interviews), etc.

→ But an overview on use and effectiveness of strategies and methods is missing

3 31.10.2013 / Zu/Cle NKM activities nagra.

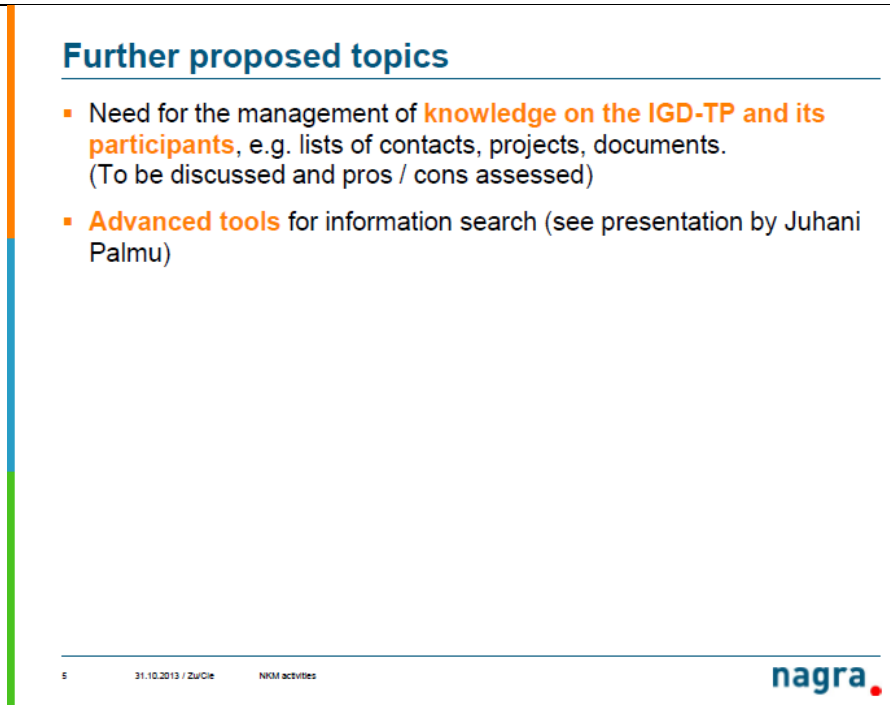
Proposed specific activities

- Focus on retiring experts: How can their know-how and experience be captured, retained and transferred?
- Compile a list of experts in participating organisations who will retire in the next 5 years
- Produce an initial list of KM strategies for capturing and transferring knowledge, based on existing literature (e.g., IAEA publications) and input from participating organisations
- Collect feedback from participants on strategies and methods that have been implemented and discuss best practices (workshop)
- Implement selected method(s) with 2-3 retiring experts (pilot project)

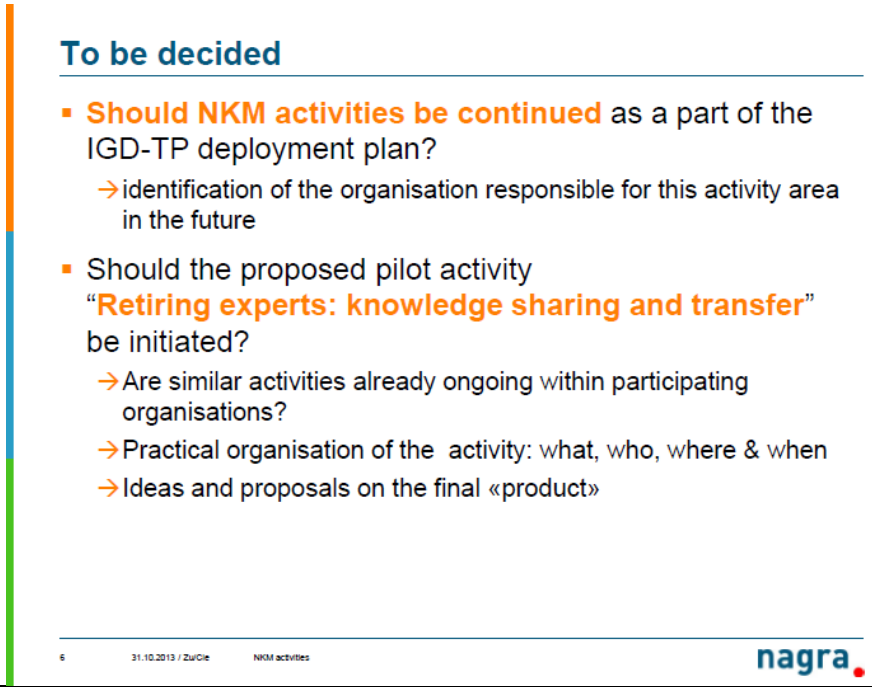
→ Immediate gain: retain valuable technical / scientific knowledge and experience

→ Product: Feedback on implementation of methods from the point of view of the organisation / the experts (summary)

4 31.10.2013 / Zu/Cle NKM activities nagra.



Step Forward



Updated Information: EG12 – October 31, 2013

6.24 IEP: Waste form developments – IGD-TP/SNETP

IEP: Waste form developments – IGD-TP/SNETP		
SRA Key Topic: tbc Waste forms		**Type of activity:** IEP
Joint Activity leader:	**Anders Sjöland**	

SRA Topics:

N°	SRA Topic	Priority

Proposed activity : " Waste form developments – IGD-TP/SNETP Information Exchange Plateform"

Time table: As from 2014 to 2025

IEP

Interested EG members

Andra	Marie-Hélène Lagrange Marie-Helene.Lagrange@andra.fr	**SKB**	Anders Sjöland anders.sjoland@skb.se Hans Forsström
Ondraf	Danièle Boulanger d.boulanger@nirond.be		

IEP Content of the activity

Explanation of the contents of the activity:

Expected changes in waste forms may have implications for geological disposal and needed R&D. The changes expected in waste forms that will need to be disposed of in geological repositories are of primary concern for WMOs. Indeed, the confirmation that this waste will be compatible with the current engineered barrier systems and host rocks may require intensive and decade long R&D. In line with its vision, the issue for IGD-TP concerns primarily changes expected in the coming two decades (e.g. higher burn-ups, change of cladding materials, use of fuel form other than UO2, increased separation and recycling, change in the reprocessing end-product, GenIII reactors…). This includes also the primary and secondary waste that will be generated from the R&D facilities dealing with GenIV and other facilities…

Participants to the WG:

name	last name	ETP	organisation
Marco	Carulli	SNETP	SNETP sec
Jacques	Delay	IGDTP	IGD-TP sec
Dominique	Warin	SNETP	CEA
Antonin	Vokal	SNETP	SURAO
Massimo	Sepielli	SNETP	ENEA
Marie-Hélène	Lagrange	IGDTP	ANDRA
Anders	Sjöland	IGDTP	SKB
Danièle	Boulanger	IGDTP	Ondraf/Niras
Marek	Miklos	SNETP	REZ
Neil	Hyatt		(University of Sheffield)

IEP way forward

Some background

IGDTP_SNETP_EF4, October 29-30, 2013, Praha

WG3 – New Waste Type in collaboration with SNETP

Presentations and speakers:

1- Importance of the waste form from a safety assessment perspective: The SR-Site experience (L. Zetterström Evins, SKB)
2- Results of R&D on future fuel cycle and associated HL waste disposal: the French case (D. Warin, CEA)
3 - RED IMPACT (W. von Lensa, FZJ)
4 - Advanced wasteforms for future nuclear fuel cycles (N. Hyatt, Sheffield U.)
5 - CarboSOLUTIONS: Implementing irradiated-graphite management (G. Laurent, EDF and W. von Lensa, FZJ)
6 - EDF pilot plant and a project for the graphite treatment (G. Laurent, EDF)
7- Management of current and future radwaste for deep geological repository : French approach and articulation with R&D (F. Plas, ANDRA)
8 - Long term behavior of waste forms from Gen IV Reactors towards Geological Disposal (G. De Angelis, A. Dodaro , M. Sepielli, ENEA)

IGDTP_SNETP_EF4, October 29-30, 2013, Praha

WG3 – New Waste Type in collaboration with SNETP

The vision of IGD-TP is Implementation of the first Geological repository for HLW in 2025 and the SRA is formulated based on this vision. Therefore, any waste that is expected to arise after this date is in some way out of the scope for IGD-TP.

However, this future waste (from Gen IV) still needs R&D!
A clear outcome from the discussions was the need for the IGD-TP to look at two different time scales, one more immediate and one more long-term.

Another outcome was the need to set up an effective link, both for the governing boards and for the participating experts, between the two platforms. A common fact sheet is one way to emphasize that this dialogue and link has been initiated. A Coordinated Action was suggested as a more direct route to strengthen the link.

Rapporteurs : Dominique Warin SNETP / CEA
Lena Zetterström Evins IGDTP / SKB

IGDTP_SNETP_EF4, October 29-30, 2013, Praha

WG3 – New Waste Type in collaboration with SNETP

Strategy

The main idea with this WG is to, for the first time, exchange ideas between the different platforms SNE TP and IGD TP regarding future developments, both within the coming 20 years as well as further down the next several decades.

Expected changes in waste forms may have implications for geological disposal and needed R&D. The changes expected in waste forms that will need to be disposed of in geological repositories are of primary concern for WMOs.

The question is to what extent the future waste forms can be accomodated, or not, in the current repository concepts.

Rapporteurs : Dominique Warin SNETP / CEA
Lena Zetterström Evins IGDTP / SKB

IGDTP_SNETP_EF4, October 29-30, 2013, Praha

WG3 – New Waste Type in collaboration with SNETP

The starting point was to discuss, in line with the vision of IGD-TP, primarily changes expected in the coming two decades (e.g. higher burnups, change of cladding materials, use of fuel form other than UO2, increased separation and recycling, change in the reprocessing end-product, GenIII reactors...).
It needs to be pointed out that the focus of the group was not on evolution of existing reactors, eg higher burnup or changes of cladding materials, although it is envisaged that these changes will affect, in some way, the research related to spent nuclear fuel as a waste form.

The focus was rather the primary and secondary waste that will be generated from the R&D facilities dealing with GEN IV and other facilities...An example is about ILW.

Rapporteurs : Dominique Warin SNETP / CEA
Lena Zetterström Evins IGDTP / SKB

Next Steps:

After the discussions held during EF 4/ Working session IGD-TP/SNETP, the Executive Group decided during the EG 12 meeting that the SNETP/IGD-TP working group will continue under the form of an IEP (Information exchange

platform). It was proposed that the first mission of this IEP should be to produce a commonly agreed “fact sheet” stating that geological disposal, whatever the evolution of P&T or new waste forms expected after 2025, will remain the reference case.

The EG proposed that this factsheet should be based on some existing documents provided by other organisations such as EDRAM or in the course of some EU initiatives such as Red Impact. A selection of these documents will be provided by our EG members.

The EG proposed to sum up the views on the existing situation and put them in perspective taking into account progress on P&T and their possible influence on waste disposal. This could be the first document to be produced.

Walter Steininger informed the EG that Wilhelm Bolingerfehr had produced a recent paper on P&T (which is in German). He suggested that Wilhelm could join the group drafting the P&T paper. Hans Forsström was also suggested as a participant to this group.

The Secretariat received a positive answer from the Executive Board of SNETP. The Secretariat is asked to respond to SNETP and initiate a third meeting of the IGD-TP/SNETP IEP.

In addition this IEP will have to prepare a future common discussion in the course of the next EF5.
Philippe Lalieux also proposed that EG members could joint their efforts in reviewing progress in P&T and potential impact on disposal. Most WMOs are drafting on regular basis reports on this topic based on a series of mostly identical documents; it would thus be interesting to share the reviewing efforts. Philippe Lalieux will come with a proposal in EG 14 or 15.

Updated Information: EG13 February 2014