EUROPEAN COMMISSION

Community research

SecIGD2

(Contract Number: 323260)

Master Deployment Plan and Joint Activities Outlines 2014

DELIVERABLE (D-N°:1.5.1)

Author(s): .....

Reporting period: e.g. 01/01/2013 – 30/06/2014

Date of issue of this report: **30/06/2014**

Start date of project: **01/01/2013** Duration: 36 Months

Project co-funded by the European Commission under the Seventh Euratom Framework Programme for Nuclear Research &Training Activities (2007-2011)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (IGD-TP participants by ProjectPlace) including the Commission Services	
RE	Restricted to a group specified by the partners of the SecIGD2 project	
CO	Confidential, only for partners of the SecIGD2 project	

EURATOM

History chart			
Type of revision	**Document name**	**Partner**	**Date**
Version 1.0	Emission for consultation EG 13	Andra	29/01/2014
Version 2.8	Emission for approval EG14	Andra	15/05/2014
Version 3.0	Version approved by EG 14	Andra	30/06/2014

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EG members at EG14 meeting June 04-05, 2014

D1.5.1. MASTER DEPLOYMENT PLAN and JOINT ACTIVITIES OUTLINES 2014

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.

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 is to outline and steer the cooperative actions flowing from the SRA and to assist the IGD-TP Executive Group members and other participants in communicating the progress and providing for opportunities to engage in these Joint Activities. 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 and now in 2014.

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 new Technical Projects are in the pipeline. The deployment of the Joint Activities has reached a stage where the IGD-TP needs to extend the deployment planning horizon beyond the year 2016 in its future 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 will be completed in 2014 in addition to the deployment of the Joint Activities 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 2013. It takes into account the outcomes of the IGD-TP's 4th Exchange Forum held in Prague, October 29-30, 2013 and the decisions taken during the Executive Group meetings EG11, EG 12, in 2013, and EG13 in 2014.

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).

3 IGD-TP's Strategic Documentation

3.1 Report status at the end of 2013

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

3.2 Revisiting the contents of the SRA

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 contents[1] is given below in Table 3-1. The Cross-Cutting and Waste Management programme specific activities are given in Table 3-2.

Each of the Topics was characterized further by its relative importance and its level of urgency to meet the Vision 2025. Importance and urgency were quantified according to that of high, medium or low level of priority within the relevant Key Topic. The foreseen start-date, the necessary end-date for achieving the results and level of importance was also agreed upon. The results are presented in Table 3-1.
In 2014, the Executive Group set up a Working Group aimed at checking the need for an update of the SRA taking into account the current situation of members' organisations, the main scientific achievements since 2010, and the outcomes of the annual Exchange Forums.

[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.

Table 3-1: List of the Key Topics and related Topics[2] with their foreseen start and outcome - dates, and an indication of their priority (H: high, M: medium, L: low)[3].

N°	List and Contents of the Topics for a given Key Topic[4]	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	H
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	H
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

[2] Based on the contents of the SRA
[3] IGD-TP DP2011 - IGD-TP Implementing Geological Radioactive Waste Technology Platform - Deployment Plan 2011-2016
[4] The SRA text describing a Topic may differ from the one given here

N°	List and Contents of the Topics for a given Key Topic[4]	Start date	End date	Priority within the Key Topic
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**			
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	2012	2018	H
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	M
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

Table 3-2: List of the Cross-Cutting Activities (CC) and of the Waste Management programme Specific activities (WMS)[5] *–*

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

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

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[6]:

- 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 2012).
- 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[7] 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.

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

4 Main evolutions of the Master Deployment Plan since MDP 2013

In 2013 one EURATOM FP7 project has been launched. This project is related to the Joint activity JA3 and deals with the generation of C14 species from radioactive Waste (CAST).

In 2014, the Executive group has already decided to support two proposals (on cement and monitoring) to be submitted to the first H2020 call.

4.1 Technical Projects (TEPs)

In 2013, one EURATOM FP7 project "CArbon-14 Source Term" (CAST) was launched. This 4.5 year-long project is related to the Joint Activity JA3 and it deals with the generation of C14 species from radioactive waste.
In 2014, the Executive group has already decided to support two to three proposals (under JA4, JA6, and JA7) that are planned to be submitted to the first Horizon 2020 call.

4.2 Technical and Scientific Working Groups

4.2.1 TSWG specific updates

Four TSWGs had a specific update:

JA4: Monitoring the Environmental Reference State
In EG 11, Andra submitted a paper proposing a set of ideas on what could become guidelines for establishing an environmental reference state. There was some interest from academics shown at the last EF and strong interest expressed by SURAO.
Resulting from EF 4, Andra proposed to start a new TSWG beginning 2014 with Elisabeth Leclerc (Elisabeth.leclerc@andra.fr) as JA leader. Ms Leclerc is the current project leader of the OPE (Environmental monitoring and environmental sampling bank). In EG 12, the scope of the JA was agreed by the EG. The scope of the work is presented in the Joint Activity outlines.

JA 6: Confidence increase in Safety Codes: material interaction.
In 2012, the TSWG on the Cement proposal was set up in order to address a potential proposal for a TEP to be submitted for EC grant. Ideas for a future joint EURATOM project on "Cement-based materials, properties, evolution, barrier functions (CEBAMA)" were first presented at the EF 3meeting in Paris, Nov. 2012.
On February 19, 2013, more details were communicated during the Executive Group meeting. There was a decision to collect the opinions and views of the WMOs on the importance of cementitious material interactions for the long-term safety of their respective repository concepts.
On May 8, 2013 in connection with the Cement Workshop in Ghent, the ideas behind the CEBAMA project and the views of the WMOs were presented to a broader interested community. The minutes of this TSWG meeting also summarized the outcome of the discussions. It was distributed May 15, 2013 to the participants of the meeting and to the IGD-TP. In EF 4, the scope of a potential project to be submitted in the framework of the first Horizon 2020 call was discussed. The scope of the work is presented in the Joint Activity outlines.

JA 7 Monitoring Programme

At the last meeting of the MoDeRn project held in London on May 21-22, 2013 additional time was reserved to discuss future Joint Activities needed on monitoring. This was considered as the kick-off meeting of the TSWG on JA7 (Monitoring programme) of the IGD-TP.

The main outcomes of this meeting were:

- The need for further R&D on different monitoring technologies was identified. This additional R&D work could be addressed through a new collaborative project if the EG so decided.
- The time schedule was approved.

The EG considered that the proposal suggested fits in with SRA priorities, and two of the four topics presented, strategy and stakeholder involvement are of particular interest for the IGD-TP. In EF 4, the scope of a potential project to be submitted in the framework of the first Horizon 2020 call was discussed. The scope of the work is presented in the Joint Activity outlines.

JA8 Safety Case - handling of uncertainties

A group of organisations propose a project that addresses the Topics 1.1, 1.2 and 1.3 of the SRA, which have been identified as important already at an early stage and are addressed in the Master Deployment Plan. The overall goal of this Joint Activity is to increase confidence in the safety case, especially in the treatment of uncertainties, including their communication, and in the numerical safety and performance assessments by improving procedures, methods and techniques for handling and communicating uncertainties.

A group has been formed and consists of WMOs and of other (e.g. research) organisations dealing with performance assessment in Europe and the US (NAGRA, SKB, Posiva, ANDRA, NIRAS/ONDRAF, RWM, ENRESA, GRS, Galson, Sandia National Laboratories, NRG, SURAO, UJV, TUC).

A first group meeting took place on May 21, 2013. All major European WMOs and additional expert organisations attended the meeting and expressed their interest in the proposed activity and its structure. The intention is to initiate a TEP on this Topic.

In EG11 the EG concluded that whilst in line with the SRA, the TSWG's work is not yet at a level of maturity that could led to support for a proposal. The subject should be given further consideration in light of what has already been achieved in other contexts, and how to communicate the Topic towards the regulators. The IGD_TP's chair proposed to continue the discussion in a WG in which some experts may share their best practices on this issue. The chair also proposed to check if the work is already being undertaken by the OECD/NEA Integration Group for Safety Case (IGSC).

The second meeting of organizations interested to participate in JA 8 took place in September 2013 and it was proposed:

- The planning of future activities of the TSWG.
- A new title of the Joint Activity: “Handling of Uncertainties in the Safety Case for Deep Geological Repositories”.

In EG 12, it was agreed to continue co-operation work within a TSWG at its own costs until 2015/2016 with specific sub-groups with common interest and the Topics as identified. The proposed schedule is:

- June 2014: Information exchange on status of sub-groups in the TSWG.
- October 2014: Working Group at IGD-TP EF N°5.
- February 2015: Technical meeting; Presentation of results achieved in the TSWGs; Compilation of the progress; Identification of Topics for further international discussions.
- September 2015: Description of contents for a potential EC project.

At EG13, the EG agreed on the new name for the Joint Activity ("Handling of Uncertainties in the Safety Case for Deep Geological Repositories"). The scope of the work is presented in the Joint Activity outlines.

4.2.2 New TSWG

At EG13 three new TSWG under Joint Activity 6 were decided:

- TSWG JA6a: Cement-organics-radionuclides interactions
- TSWG JA6b: Microbiological issues
- TSWG JA6c: SAFEROCK

TSWG JA6a: Cement-organics-radionuclides interactions
During the discussion on TSWGJA6 CEBAMA project, some topics on radionuclide retention, and degradation of organic and related effects on the radionuclide retention were rated by some of the WMOs to be out of necessary to have research projects to be launched at European level and should therefore rather be covered by individual national programmes.

At EG14, the EG agreed on the setting up of a TSWG lead by B. Kienzler (KIT). The scope of this TSWG will also include the role of microorganisms. This TSWG should remain distinct from the TSWG "CEBAMA".

TSWG JA6b: Microbiological issues
At EF 4 the WG-5 concluded 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.
2. Microbial production and consumption of gases.
3. Microbial migration of radionuclides.

Thus, at EG13, The EG agreed on the setting up of a TSWG led By SKB (Birgitta Kalinowski) and Micans (Karsten Pedersen). This TSWG should prepare a working session for the next EF 5.

TSWG JA6c: SAFEROCK
An initiation process has started for elaborating upon a technical project (TEP) on remaining key issues for the Crystalline Rock Safety Case. A core group led by WMO's (SKB, POSIVA and SURAO) together with key research organizations (especially KIT-INE and JRC-ITU) and organizations focusing on modelling and application to the Safety Case (AMPHOS21 and KEMAKTA) are collecting and structuring topics and associated experimental investigations and modelling applications. The encompassed project "SAFEROCK" combines the near-field, the far-field and the transition between them.
At EG13, EG considered that the project would also be of interest to other repositories than the granitic in the crystalline rocks. Processes related to e.g. bentonite and cement are the same for all programmes. It was also recalled that host-rock specific issues were deliberately set out of the SRA and that therefore the SRA is focussing on transversal issues. Thus the Proposal should not be limited to granitic crystalline host rock environments.

4.2.3 New IEP

At EG13 the IEP IGD-TP/SNETP has been officially launched. The proposed name is: "Waste form developments – IGD-TP/SNETP Information Exchange Platform"

1 Master Deployment Plan of the SRA 2012-2016

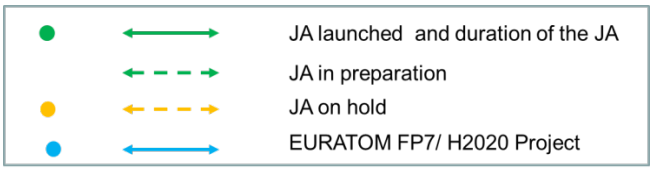
Table 1-1: Master Deployment Plan

JA	Joint Activity	EURATOM FP7 Project	2011	2012	2013	2014	2015	2016	On-going Activity
JA1	Waste forms and their behavior (TSWG)	First-Nuclides Start date 2012- 01-01 Duration 36 months REDUPP Start date 2011-04-01 Duration 36 months							
JA2	Full scale demonstration of Plugging and Sealing (TSWG)	DOPAS Start date 2012- 09-01 Duration 48 months							
JA3	Waste forms and their behaviour – C-14 (TSWG)	CAST Start Date 2013-10-01 Duration 52 months							Generation of C14 Species from radioactive waste - launched in 2013 – end in 2018
JA4	Monitoring the Environmental Reference State (TSWG)	Environmental Monitoring Proposal H2020 Start in 2015?							Decision TSWG in EG 12 Proposal to be submitted for the first H2020 call
JA5	Safety of constructions and operations (ORWG)								Working Group with 7 Partners - Pilot Project on needs and common interest ground

JA	Joint Activity	EURATOM FP7 Project/ H2020 Proposal	2011	2012	2013	2014	2015	2016	On-going Activity
JA6	Confidence increased in safety codes : Materials interactions (TSWG)	PEBS Start date 2010- 03-01 Duration 48 months Cement Proposal H2020 CEBAMA							Proposal to be submitted for the first H2020 call Cement Proposal H2020 CEBAMA
JA6a	Cement-organics-radionuclides interactions (TSWG)								TSWG Started in 2014 (Decision EG 13)
JA6b	Microbiological issues (TSWG)								TSWG Started in 2014 (Decision EG 13)
JA6c	SAFEROCK (TSWG)	SAFEROCK Proposal H2020 Call							TSWG Started in 2014 (Decision EG 13) Proposal to be submitted for the first H2020 call
JA7	Monitoring programme (TSWG)	MoDeRn Start date 2009- 05-01 Duration 54 months							Proposal to be submitted for the first H2020 call Monitoring Proposal H2020

JA	Joint Activity	EURATOM FP7 Project/ H2020 Proposal	2011	2012	2013	2014	2015	2016	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"
JA10	Long-term stability of bentonite in crystalline environments (TEP)	BELBaR Start date 2012-03-01 Duration 48 months							
JA11a	JA 11a: Sharing of knowledge on HLW container materials behaviour								New proposal for a small pilot project in preparation
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

JA	Joint Activity	EURATOM FP7 Project	2011	2012	2013	2014	2015	2016	On-going Activity
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 on Hold
JA16	WMO Programme Specific issues (IEP)								JA on Stand-by
JA	Waste form developments – IGD-TP/SNETP								IEP (Decision EG 13 Continuing EF4)



The time needed for the respective working groups to conclude achieve their objectives may differ differs from one project activity to another.

2 Joint Activities and activity outlines

2.1 Listing of Joint Activities

Important note:
The following activity outlines are draft document that will evolve over time as the projects progress

JA n°	Joint Activity: SRA Topics and their deployment activities	Joint Activity outline /EU Project
1	Waste forms and behaviour: TSWG launched in 2011 (Topics 2.1, 2.4, 2.5)	Yes /TEP FIRST-Nuclides
2	Full scale demonstration of Plugging & Sealing: TSWG launched in 2011 at first during 2011-2012 (Topics 3.6, 3.10 and 3.14,), TEP from 2012-2016	Yes /TEP DOPAS
3	Waste forms and their behaviour: TSWG during 2012-2013 on C14 (Topic 2.2)	Yes/TEP CAST
4	Monitoring the Environmental Reference State: TSWG 2013-2014 (Topic 6.3)	Yes
5	Safety of construction and operations: ORWG (Topics 5.1 and 5.2)	Yes
6	Confidence increase in safety assessment codes (concepts, definition of scenarios and computer codes). Materials interactions: especially cement and clay based interactions. TSWG and TEP (Topics 1.1 - the only TSWG, 3.11, 3.12, 3.15, 3.17)	Yes for 1.1
7	Monitoring programme: TSWG (Topics 6.1, 6.2, 6.4)	Yes
8	Handling of Uncertainties in the Safety Case for Deep Geological Repositories: TSWG (Topic 1.3)	Yes
9	Efficient peer review and related QA processes: ORWG (Topic 1.2).	Yes
10	Long-term stability of bentonite in crystalline environments: TEP (Topic 3.9)	Yes/TEP BELBaR
11	Various Topics belonging to different categories. Topics concern the governance of the decision making and various Topics related to technical feasibility of repository components (Topics 7.1, 3.1, 3.2, 3.3, 3.4, 3.5, and 3.16)	Yes/ proposal on one Topic JA 11a
12	ORWG on Adaptation and optimisation of the repository (Topic 4.1)	Yes
13	Communicating result from RD&D IEP (CC1, CC4),	Yes / SecIGD2 project (WP2)
14	Competence Maintenance, Education and Training: ORWG CMET (CC2), permanent ORWG since 2012	Yes / ORWG supported currently by SecIGD2 project (WP3)
15	Nuclear Knowledge Management: ORWG NKM (CC3)	Yes
16	WMOs IEP (WMO 1-6)	No

2.2 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"

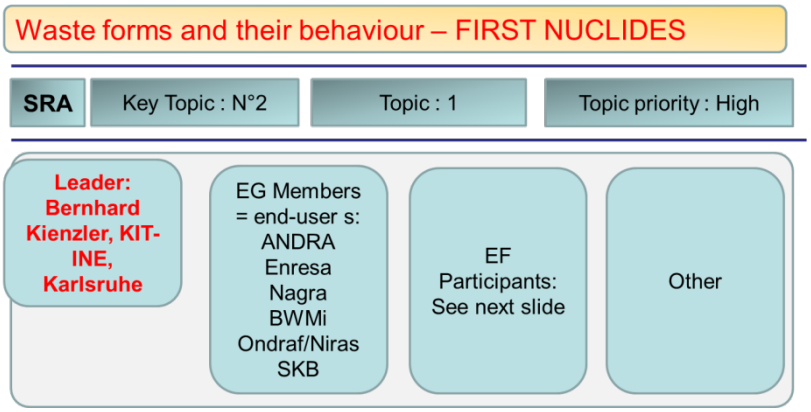
Time table: As from 2012 to 2020

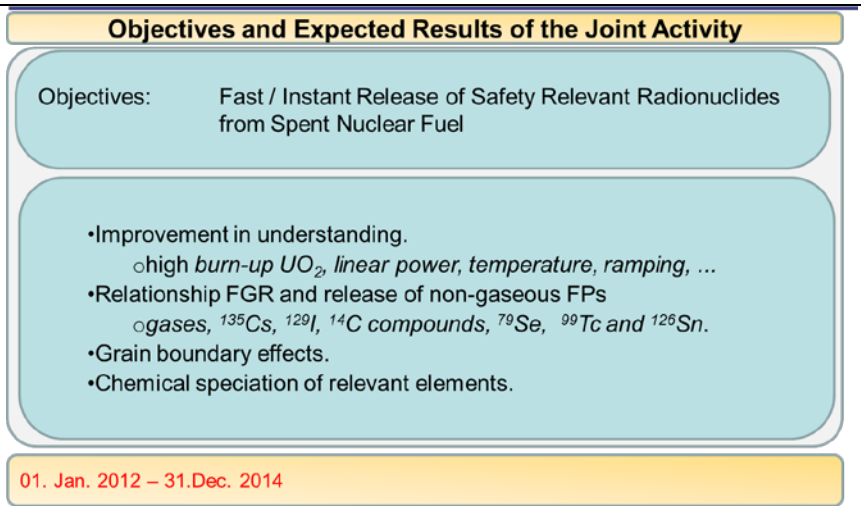
TSWG

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





The consortium FIRST Nuclides

1. Partners / Beneficiaries

KIT, AMPHOS 21, ITU, JÜLICH, PSI, SCK•CEN, Subatech, CTM, Hungarian Academy of Sciences, Centre for Energy Research, Studsvik

2. Associated Groups (AG)

Groups participating at their own costs with specific RTD contributions or particular information exchange functions, or mobility measures (for European AGs only)

Los Alamos National Laboratory, Sandia National Laboratories, CEA, National Nuclear Laboratory, NDA Nuclear Decommissioning Authority, POSIVA, TVO, GRS, University of Cambridge

FIRSTNuclides Project Work Packages:

WP 1: Samples and tools
WP 2: Gas release and rim and grain boundary diffusion
WP 3: Dissolution based release
WP 4: Modelling
WP 5: Knowledge, reporting and training:

Updated Information: April 2014

4.3 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

TSWG

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**	Mark Johnson Mark.Johnson@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 2012 until 2016, 48 months)

Topic 3.10

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

Topic 3.14

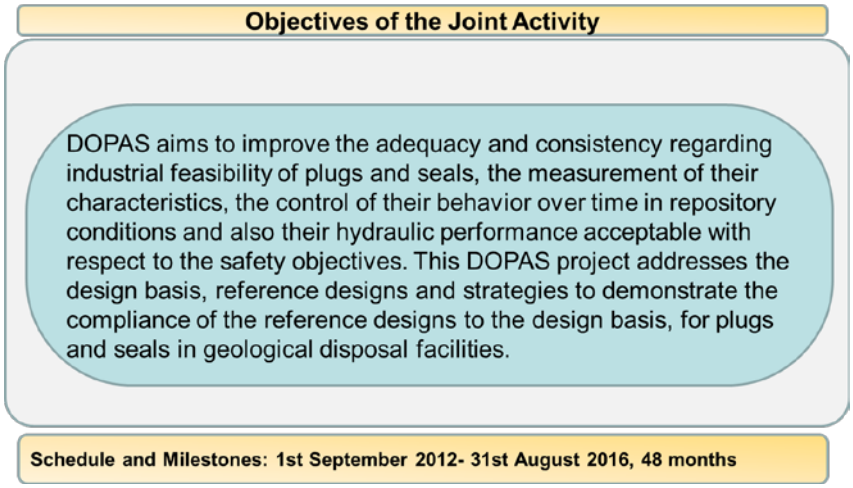
- 2012-2014, lab tests on backfill compaction at different temperature, stress and moisture content, model improvement and calibration.
- 2014, interim report on state of the art, identification of remaining uncertainties
- After 2014, technical working group on the topic

TEP DOPAS http://www.posiva.fi/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**	Mark Johnson Mark.Johnson@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



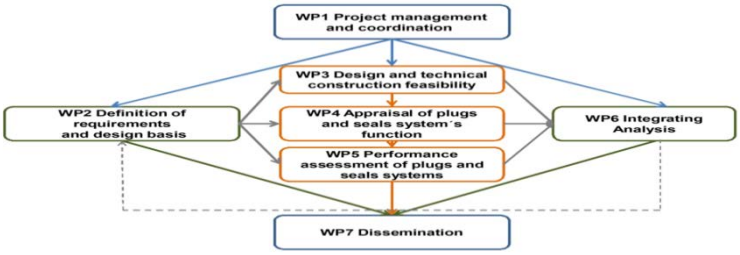
Expected results of the Joint Activity

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 in Autumn 2015, 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 (mid-2016), 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 2, 2013 and May 2014

2.3 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

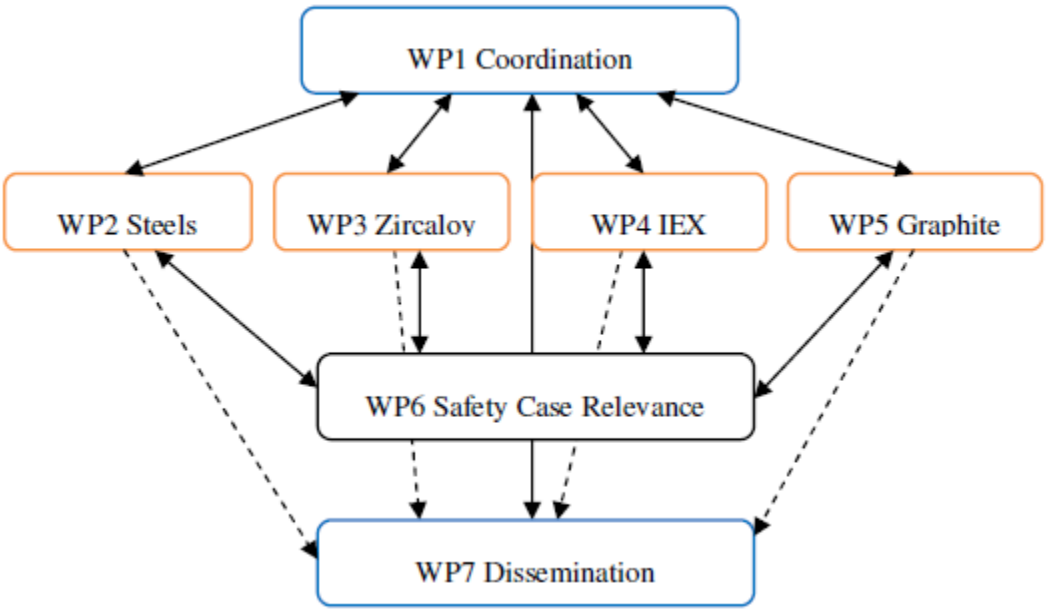
The CAST project (CArbon-14 Source Term) aims to develop understanding of the potential release mechanisms of carbon-14 from radioactive waste materials under conditions relevant to waste packaging and disposal into underground geological disposal facilities. The increased understanding provided through 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

2.4 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

2.5 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
5.1	Improved methodology, approaches and documentation on risk assessment, risk management, further documentation for construction safety issues and operational safety issues	H
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	5.1 & (5.2) Vesa Ruuska Vesa.Ruuska@Posiva.fi & 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

2.6 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:	**Ulrich Noseck** Ulrich.Noseck@grs.de	

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	H

Material interaction, especially cement and clay based interactions.

On-going activity:
TSWG

Time table: As from 2012 to 2020

TSWG

Interested EG members

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BMWi	Ulrich Noseck Ulrich.Noseck@grs.de	**SKB**	Patrik Sellin patrik.sellin@skb.se
SURAO	Dmitrij Lukin lukin@rawra.cz		

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

Background

- At the IGD-TP Exchange Forum in Nov. 2012, a presentation was made regarding interest in a TSWG on cement (CEBAMA).
- The Executive Group of the IGD-TP in Feb. 2013 requested that the WMOs be surveyed to determine their needs regarding studies on cement materials interactions in support of long-term safety.
- Responses were obtained from ANDRA, NDA, SKB, POSIVA, SURAO, NAGRA, ONDRAF/NIRAS
- A further discussion of CEBAMA took place at the Ghent Cement-Waste Workshop. There was broad interest from specialists in initiating a project. From the WMO's perspective, there was no consensus on how to move forward.
- WMO representatives had a further discussion on 11 Sept. 2013 on the question of areas of common interest.

New Structure of Cebama

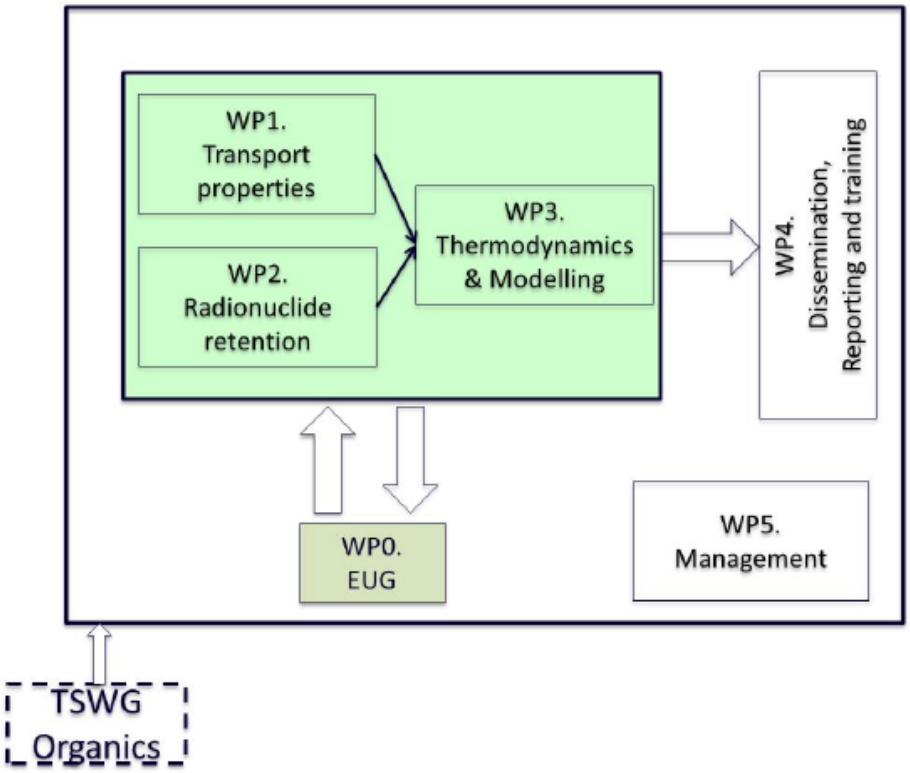
WP No	WP title	Lead Org.
WP 1	Interactions influencing transport properties	PSI (?)
WP 2	Radionuclide retention	KIT
WP 3	Thermodynamics and modeling	Amphos21
WP 4	Knowledge, reporting and training	?
WP 4	Project management	KIT

New TSWG: Review of Organics - radionuclides - cement interaction

- Provide State of the Art Report within the project

Provide Report on Implication of Steel Corrosion on cement and radionuclide behaviour

Possible structure of the project



Next Steps

- Circulate the WMO's reponses to the questionnaire on cement issues to Bernhard.Kienzler@kit.edu
- WMOs formulate questions to be answered in the project
- Potential partners review the information and provide input where to contribute.
- Planning meeting in March 2014 at KIT defining priorities (Representatives from WMOs an R&D Orgs.)
- TSWG meeting on Organics - radionuclides - cement interaction (Representatives from WMOs an R&D Orgs.) (spring 2014)

Implementing Geological Disposal of Radioactive Waste - Technology Platform

Summary of the Cement WG

- Discussions within TSWG and with WMOs on cement issues over the last year resulted in a mature project basis
- Cement working group agreed upon the basis for a potential project covering
  - Interactions influencing transport properties
  - Radionuclide retention
  - Thermodynamics and modeling
- WMOs will formulate questions to be answered in the project
- Potential partners review the information and provide input where to contribute.
- Planning meeting in March 2014 at KIT defining priorities (Representatives from WMOs an R&D Orgs.)
- TSWG meeting on Organics - radionuclides - cement interaction (Representatives from WMOs an R&D Orgs.) (spring 2014)

Implementing Geological Disposal of Radioactive Waste - Technology Platform

Some background

EC H2020 Potential Proposal: CEBAMA

A TSWG on the Cement proposal has been set up in order to address a potential proposal for an EC project.
Ideas for a future joint EC project on "Cement-based materials, properties, evolution, barrier functions (CEBAMA)" were first presented at the IGD-TP Exchange Forum meeting in Paris, Nov. 2012.
On February 19, 2013, more details were communicated by Walter Steininger at the Executive Group meeting 10. The decision was taken to collect the opinions and views of the WMOs on the importance of cementitious material interactions for the long-term safety of their respective repository concepts.

On May 8, 2013 in connection with the Cement Workshop in Ghent, the ideas behind the CEBAMA project and the views of the WMOs were presented to a broader interested community. The minutes of this TSWG meeting also summarized the outcome of the discussions. It was distributed May 15, 2013 to the participants of the meeting and to the IGD-TP.

On June 4, 2013, KIT-INE proposed (i) a first cost estimate based upon preliminary topics of the project, (ii) a tentative work programme, (iii) partners and manpower, and (iv) duration of the project (4 years).

The position of the EG was that:

- The topics fit with the SRA;
- The project must be limited and focused on porosity and permeability changes due to interactions with rock/bentonite;
- The level of preparation give confidence in the ability to establish a proposal that is fit for answering an EC call;
- There is enough interest to promote a project in such area.

The EG asked M. Van Geet to organise a discussion with representatives of WMOs in September or October 2013 to prepare a common position to be presented at the EF4 and at the potential call, and to ensure a limitation of the topics to those which are of highest priority for the IGD-TP.

Next Steps: Submission of a proposal in the framework of H2020 call**.**

Updated Information: EF4 – October 29-30 2013

2.7 JA6a: Cement-organics-radionuclides interactions

JA6a: Cement-organics-radionuclides interactions

SRA Key Topic: 1 Safety case		**Type of activity:** TSWG
Joint Activity leader:	**?**	

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	H

Material interaction, especially cement and clay based interactions.

On-going activity: Proposal : CEBAMA to be submitted in September 2014 – (See JA6)

Proposed 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	B. Kienzler bernhard.kienzler@kit.edu

TSWG Content of the activity : Cement-organics-radionuclides interactions

Explanation of the contents of the activity:

TSWG on Organics-Radionuclides-Cement Interactions

Organic components which may be present in the waste, in cement-based materials or in the host rock can be classified as follows:

• Bitumen: matrix for low and intermediate level radioactive waste

• Waste components: waste produced during operations, maintenance and intervention or decommissioning of the nuclear installations including o ion exchange resins,

o papers, gloves, clothes …

o decontamination detergents

Among others these organics contain celluloses, tensoactives, flocculants, complexing agents (such as EDTA, etc.) but also plastic materials such as polyethylen, PVC, neoprene, hypalon, etc. as well as epoxy resin paints and sealing of waste drums[1].

• Cement/Concrete additives: plasticizers, superplasticisers, accelerators, retarders and waterproofing agents.
• Natural kerogene-type organic material.

Cementitious materials are used for solidification of various wastes, shielding and for support of disposal galleries as well as for sealing and plugging. They result in the generation of high pH (pH 12.5 to 10.5) environment within the disposal system. These conditions promote the chemical degradation of organic materials. The alkaline chemical degradation of organic material generate a range of soluble organic products some of which are able to complex radionuclides. Apart from potentially impacting radionuclide solubility, organics and the degradations products may bias the radionuclide sorption onto the cement phases.

Potential research topics:

• Solubility and aqueous speciation:
☐ Complexation of radionuclides by organics or degradation products. Interactions of radionuclides with some degradation products (e.g. ISA) have been investigated. Studies in combination with cement additives are not available.
☐ Formation and solubility of mixed cation-radionuclide-organic solid phases.
☐ Stabilization of redox conditions in high pH– organic systems.
☐ Effect of calcium (and other cations) in the alkaline – organic system on the stabilization of dissolved radionuclide complexes.
☐ Determination of thermodynamic data on radionuclide solubility and speciation in the high pH–organic systems.

• Sorption:
☐ Few studies have been carried out on organics/solid surface interactions.
☐ Sorption of negatively charged radionuclide-organic complexes are lacking.
☐ Effect of organics and major cations on the sorption properties cement/degraded cement.

• Degradation of organics and formation of gases: Under reducing conditions, thermodynamics results in the formation CnHn+x species.
☐ Kinetic data on the degradation of organics and gases production rates in alkaline environments are lacking.
☐ Effect of alpha (gamma) irradiation on the formation of other smaller organic species.
☐ Effect of microbiology.

• Migration:
☐ Diffusion of radionuclide in presence of organic species.
☐ Impact on porosity/permeability by organic interactions especially close to the cement/host rock contact zone.
It is clear that these potential research topics experience different significance according to the waste forms or the disposal concepts relevant for the different national WMOs. A TSWG on Organics-Radionuclides-Cement Interactions could help to prioritize research topics according to the needs of the WMOs in order to achieve maximum benefits for the European Member States.

[1] Organic content of a painted 200 l drum: ~200 g epoxy resin in the paint and ~200 g ethylene propylene dieme monomer of the sealing.

TSWG UP DATE Pilot Project
Some background Review of Organics - radionuclides - cement interaction Provide State of the Art Report within the project Provide Report on Implication of Steel Corrosion on cement and radionuclide behaviour
Next Steps: TSWG meeting on Organics - radionuclides - cement interaction (Representatives from WMOs an R&D Orgs.) (spring 2014)**.**
Updated Information: B. Kienzler December 2013

2.8 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	H
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.	H

Material interaction, especially cement and clay based interactions.

On-going activity:

Proposal to be submitted for the first Horizon 2020 call

Ackronym for proposal MIND: Microbiology In Nuclear waste Disposal

Time table:

TSWG

Interested EG members

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RWM	Robert Whittleston robert.whittleston@nda.gov.uk		

Potential participants

Karsten Pedersen ; 'abe@micans.se'; Arthur Meieshyn (GRS) 'tuire.haavisto@tvo.fi';

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. WG-5 concluded 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.

MIND Project

The TSWG is preparing a proposal for the first H2020 call.

The proposed work packages are :

- **WP1 on the waste and the potential transformations of the waste by biological processes (mainly degradation of organics in I/LLW)**
  - Organic waste degradation (cellulose, bitumen, resins) in presence of H2 from corrosion
  - Gas generation and consumption and corrosion processes
  - Hyperalkaline conditions
  - Heterogeneity of the waste
  - Nitrate sulphate i.e. electron acceptors gas formation
- **WP2 on the canister and corrosion and the role of bentonite or other buffer material**
  - Sulphide issue and corrosion
  - Bentonite density, swelling pressure, load, compaction, water, porosity,
  - Evolution of interfaces, biofilms, canister/buffer; buffer/host rock
  - Bentonite transformations, ferric/ferrous iron transformations, organic residues degradation
  - Gas generation from anaerobic corrosion
- **WP3 on the biotransformation, biomobilisation, bioimmobilisation of radionuclides and their transport in the buffer/backfill and host-rock**
  - Redox transformation
  - Methylation
  - Impact of ligands and microbial processes
- **WP4 on integration**
  - Performance assessment modelling
  - Conceptualisation
  - Implementation
  - Communication
  - Education outreach
- **WP5 project management**
- **WP6 End user**

The partners are :

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TSWG UP DATE Pilot Project

Conclusion EF 4

WG-5 suggests the formation of a TSWG that can align microbial issues with the strategic agenda. Important issues for this TSWG will be:

- ☐ Review past and present research and models.
- ☐ Understand uncertainties in the safety case caused by microbial processes.
- ☐ Evaluate how knowledge about microbial processes can be merged into present safety models and concepts and the strategic agenda.
- ☐ Identify gaps in knowledge and suggest research needs.
- ☐ Define a scope of a proposal to be submitted to an EC call or a specific project co-financed by the WMOs.

WG-5

Microbiological studies

Presence of microorganisms

- Microbes are everywhere including the underground – the deep biosphere
- Microbial life change chemical equilibria.
- Microorganisms influence and change the geochemical environment, e.g. pH, E_h

BUT

- Microbial processes are missing in the current strategic research agenda (SRA)

WG-5 description

- >27 participants from research and performance assessment – an interdisciplinary group
  - Waste management organisations
  - Technical support organisations
  - Universities
  - Consulting companies
  - National research centers/institutes
- Gender perspective: 50/50
- 9 countries represented
- 9 presentations from 6 countries

Main microbial processes

- Microbially induced degradation
  - Corrosion of metal canisters
  - Degradation of buffer, backfill and cement
- Gases
  - Production –
  - Consumption +
- Migration
  - Mobilisation –
  - Immobilisation +

Migration 1

- Mobilisation –
  - Microbial complex formers
  - Low molecular weight acids
  - Sorption to free-living cells and viruses
- Uncertainty
  - Importance?
  - Impact on the safety case?

The safety case can benefit from:

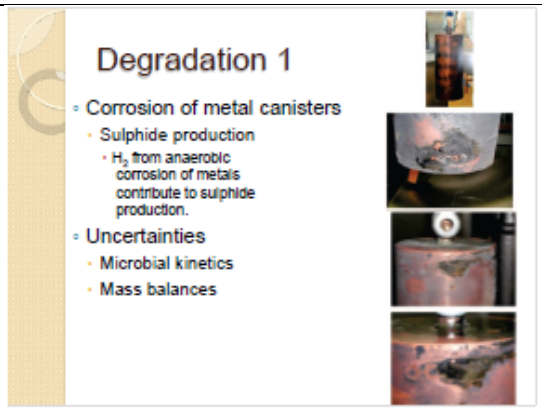
- New knowledge in geomicrobiology and the deep biosphere
- Probing microbial processes using new and advanced genome technologies
- Advances in imaging and spectroscopy

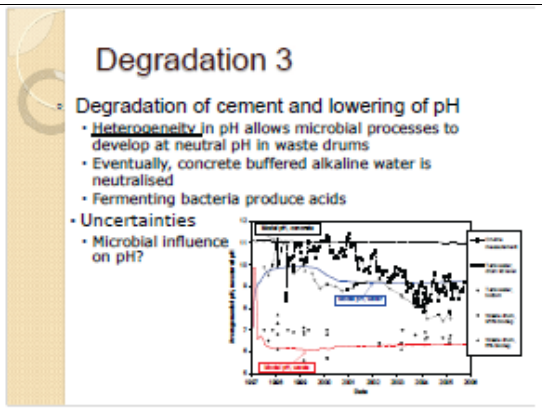
Migration 2

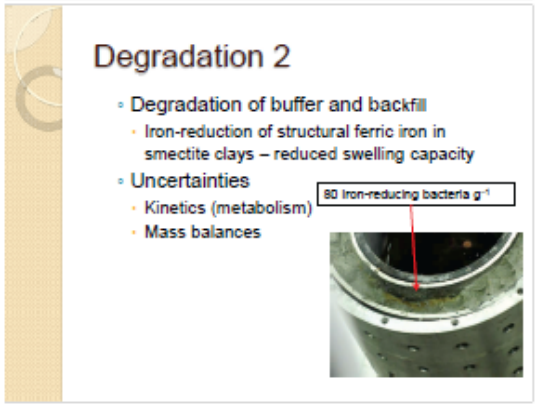
- Immobilisation +
  - Biofilms sorb radionuclides
  - Microbial reduction can immobilize radionuclides, e.g. U, Tc, Np, Se.
  - Degradation of organic complexing agents, e.g. isosaccharinic acids.
  - Coupled processes
- Uncertainty
  - Importance?
  - Impact on the safety case?

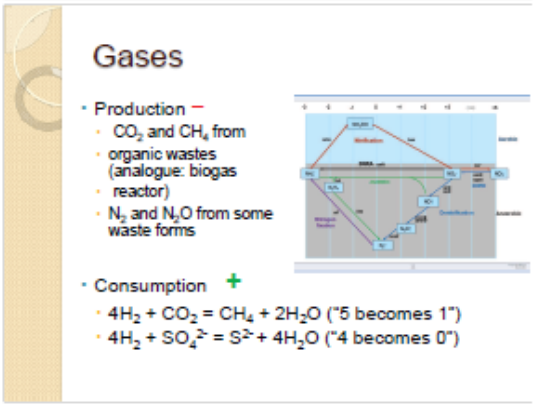
SRA Key topic 1 safety case

- "*The safety case must be able to describe the evolution of the repository in a way that can be seen as a reasonable representation of what might happen and that also gives a clear indication of uncertainties in the description*".
- WG-5 noted that the SRA lacks representation of microbial processes and indication of uncertainties caused by microbial processes.

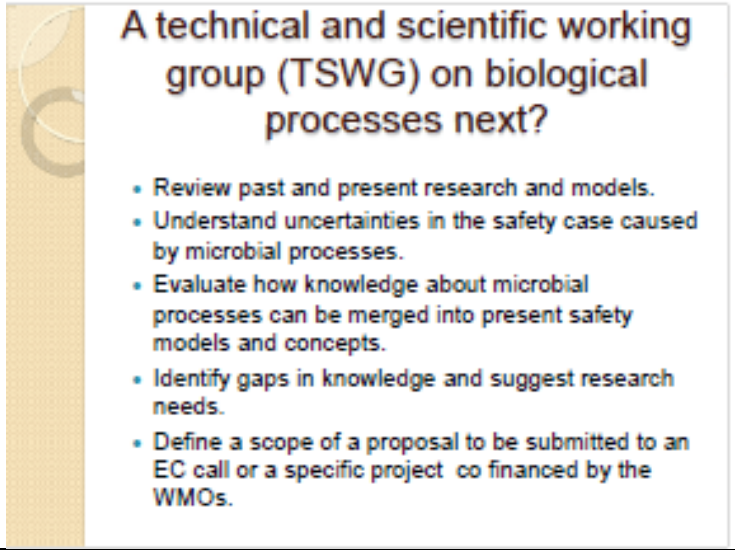








Next Steps:



Updated Information: Birgitta Kalinowski June 2014

2.9 JA6c: SAFEROCK

JA6c: SAFEROCK		
SRA Key Topic: 1 Safety case		**Type of activity:** TSWG
Joint Activity leader:	**Antonin Vokal vokal@SURAO.cz**	

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	H

Material interaction, especially cement and clay based interactions.

Proposed activity : TSWG SAFEROCK

Time table:

TSWG

Interested EG members

SKB	Bjjörn Gyllling bjorn.gylling@skb.se	SURAO	Antonin Vokal vokal@SURAO.cz
BMWi	W. Steininger, walter.steininger@kit.edu, B. Kienzler	Posiva	Marja Vuorio marja.vuorio@posiva.fi

TSWG Content of the activity : SAFEROCK

Explanation of the contents of the activity:

An initiation process has started for elaborating upon a joint research project on remaining key issues for the Crystalline Rock Safety Case. A core group led by WMO's (SKB, POSIVA and SURAO) together with key research organizations (especially KIT-INE and JRC-ITU) and organizations focusing on modelling and application to the Safety Case (AMPHOS21 and KEMAKTA) are collecting and structuring topics and associated experimental investigations and modelling applications. The encompassed project "SAFEROCK" combines the near-field, the far-field and the transition between them.

The list of far-field topics is based on the end-user group recommendations of the recently finalized Collaborative Project "Crystalline Rock Retention Processes" (CROCK). Topics on the near-field and the transition to the far-field focus around needs identified in the on-going assessments of the Swedish and Finish licensing applications.

Consequently, scenarios with compromised integrity of the EBS are included in the discussion. Relevant processes and critical data are obtained from combining a series of lab and URL

experiments. In-situ-experiments at Äspö and/or Onkalo are used to capture relevant transport properties from the spent fuel to the host-rock. Different experimental material, including real spent fuel, is used in the lab. SIMFUEL and/or designed pellets including 233U doped UO2 are under discussion for the in-situ experiments. The composition, structure and burn-up of spent fuel arising in the coming decades are also considered. Modelling for application of knowledge and data for the Safety Case is built around new data arising from SAFEROCK, but also around assessment of existing not yet fully examined data from, for example CROCK. The experimental and modelling programme, as well as time-schedule, dissemination, training and education efforts will evolve upon prioritization and involvement of additional organizations.

TSWG UP DATE Pilot Project

Some background

The initiative looking into the potential for a crystalline rock project was established on an informal basis. It looked into the question whether there are issues important for moving along with the Crystalline Rock Safety Case that would benefit from being implemented under the European instruments presently at hand under the DG RTD "EURATOM indirect action programme". The group came to the conclusion that this is the case, i.e. it would serve the Crystalline Rock Safety Case to have a "SAFEROCK" project.

After providing this information and following the presentation at the EF 4 outlining the benefit of such a project, the initiation group considered that it had achieved its objectives and dissolved itself, asking IGD-TP to consider forming a WG. This WG would have the advantage of having a well-recognized and formalized structure, contrary to the informal nature of the initiation group. It was recommended that these further activities should not be led by someone from a European Commission institution, such as JRC-ITU, but from an organization with a key implementing interest.

Next Steps:

Initiating group is asking the IGD-TP to form a Working Group on this topic

- Verify that there is a benefit from such a joint project
- Bring together interested organizations to form a consortium:
  - Prepare for a project proposal
  - Recommend support of such a project
  - Submit request in response to call

Updated Information: EF4 October 2013

2.11 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	M

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
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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)

TSWG Content of the activities

***Explanation of the contents of the activity*: Conclusions of EF 4 WG**

Taking into account the main conclusions of the EC 'Monitoring developments for safe repository operation and staged closure' (MoDeRn) project, the EF4 working group on monitoring has identified three areas in which further works and research is needed: i) strategic aspects, ii) technology development and iii) repository practical implementation. A fourth item on communication strategies & stakeholder involvement was also considered.

Strategies improvements should be focussed on:

- Establishing links and inter-comparison between monitoring plans, the rationale for these plans, and the safety cases, in order to identify monitoring requirements, including the analysis of test cases to identify critical and non-critical parameters
- Definition of procedures for the analysis of data and management of potential deviations from the expected system evolution, including the consideration of response plans, and the analysis of implications on the safety case and on the repository design and construction (e.g. identification of triggered values and uncertainties)
- Definition of monitoring approaches for the different phases of the repository: analysis of the staged implementation of monitoring activities during the different repository phases, and the potential role of

Underground Rock Laboratory (URL) tests and pilot facilities, to define the monitoring approaches during the whole lifecycle. Feedback to repository design

On technology aspects, six items have been identified and discussed. Only the following items were considered of high importance for a next upcoming project 2015-2017:

- Development and demonstration of sensors and sensing techniques, including geophysics, with particular emphasis on methodologies and systems that do not affect passive safety, and on those which can monitor parameters of key significance to the safety case (e.g. chemical parameters & Fiber optics sensors)
- Wireless communication systems need further development and demonstration for short, medium, and long distance links through solid materials, including non-electric systems, to improve their range of applications and to optimise energy requirements.
- Linked to the previous point, long term power supply need research and demonstration on smart power systems for buried sensors and data transmission equipment, for very long operational periods.
- Assessment of durability and reliability of components and systems used in monitoring systems (sensing devices, electronics, cables, casings, etc.) is of prior importance taking into account the expected operating conditions (e.g., temperature, chemical environment and radiation field) and the current state of the art. Development of quality assurance methodologies that enable the quantitative assessment of the long term performance of monitoring systems and components is also included.

The following two points have been considered of medium importance for the next upcoming project:

- Robotic inspection systems for non-backfilled areas (visual and non destructive methods)
- Development of methodologies for the management and interpretation of data provided by the monitoring systems, taking into account sensor drift and reliability, and including topics such as redundancy, data filtering, data correlation and extrapolation, and data fusion, as well as the database storage and management.

The practical implementation aspects should aim at the:

- Development and design of disposal specific monitoring concepts, based on modelling of natural end engineered systems, and taking into account the spatial heterogeneity, the density and location of measurements, and trigger values for critical parameters and locations
- Integration of monitoring requirements with repository concepts, in order to include them in the technical design of repository facilities for the different geological environments (crystalline rock, clay, rock salt)
- Demonstration of integrated monitoring systems including coupling of new and advanced technologies with well-known technologies in realistic conditions, to solve specific technical issues.

Communication & stakeholder involvement have been considered, in particular on structured stakeholder engagement processes, practical guidance on transparent information exchange, and finally on calibrating expert and stakeholder expectations. These three aspects have to be integrated in all previous areas.

TSWG UPDATE NEW PROJECT ON MONITORING

SRA 2011 - Key Topic 6 "Monitoring"

High importance and urgency topics

1. Monitoring strategies and programmes for Performance Confirmation (including development of tools for decision making on monitored data)
2. Monitoring technologies and techniques (operational phase)
3. Guidelines for monitoring of environmental reference state

Medium importance and urgency topics

4. Monitoring of EBS during operations
5. Post-closure monitoring

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Master Deployment Plan 2013

- Objective: Performance Confirmation
- Focused to operational phase

Scope of a potential targeted R&D and demonstration project on monitoring:

- Sensing technologies
- Data transmission systems
- Long term power supply systems
- Durability of electronics, fibre optics and associated materials
- Influence of radiation

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Starting point: "Call for ideas" exercise

- Carried out among MoDeRn partners
- Inputs from 7 parties received
- Completed on June 2013

OBJECTIVES:

➢Identify specific areas related to repository monitoring in which further research is required, and have strong influence on:

- Strategies
- Repository design
- Repository implementation plans
- Communication strategies (present and future)

➢Serve as starting point for the definition of the objectives and scope of a potential future collaborative project on repository monitoring

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Strategy aspects

	Topic	Priority
1	Identification of monitoring requirements and critical parameters in relation with the safety case	H
2	Identification of triggered values and uncertainties. Development of response plans	H
3	Definition of the monitoring approaches for the different phases of the repository. Role of Pilots and URLs.	H

1. Establishing links and inter-comparison between monitoring plans, the rationale for these plans, and the safety cases, in order to identify monitoring requirements, including the analysis of test cases to identify critical and non-critical parameters

2. Definition of procedures for the analysis of data and management of potential deviations from the expected system evolution, including the consideration of response plans, and the analysis of implications on the safety case and on the repository design and construction (e.g Identification of triggered values and uncertainties)

3. Definition of monitoring approaches : analysis of the staged implementation of monitoring activities during the different repository phases, and the potential role of Underground Rock Laboratory (URL) tests and pilot facilities, to define the monitoring approaches during the whole lifecycle. Feedback to repository design

Technology Development

	Topic	Priority
1	New sensors and sensing technologies	H
2	Wireless communication systems	H
3	Long term power supply methods	H
4	Assessment of durability and reliability of components and systems	H
5	Robotic inspection systems for non-backfilled areas	m
6	Data management methods (interpolation, fusion, storage..)	m

1. Development and demonstration of sensors and sensing techniques, including geophysics, with particular emphasis on methodologies and systems that do not affect passive safety, and on those which can monitor parameters of key significance to the safety case (e.g. chemical parameters & Fiber optics sensors)

2. Further development and demonstration of wireless communication systems for short, medium, and long distance links through solid materials, including non-electric systems, to improve its range of applications and to optimise energy requirements

3. Research and demonstration on smart power supply systems for buried sensors and data transmission equipment, for very long operational periods

4. Development and demonstration of mobile and robotic inspection systems for non-backfilled areas (visual and non destructive methods)

5. Assessment of the long-term behaviour and the durability of the different types of materials and components used in monitoring systems (sensing devices, electronics, cables, casings, etc), taking into account the expected operating conditions (e.g., temperature, chemical environment and radiation field).

6. Development of quality assurance methodologies that enable the quantitative assessment of the long term performance of monitoring systems and components.

   These two previous points have been merged

7. Development of methodologies for the management and interpretation of data provided by the monitoring systems, taking into account sensor drift and reliability, and including topics such as redundancy, data filtering, data correlation and extrapolation, and data fusion, as well as the database storage and management.

Practical Implementation

	Topic	Priority
1	Development of specific monitoring concepts	H
2	Use of data from demonstrators and existing data sets for performance assessment modeling. Feedback to the safety case analysis and to repository design	H
3	Demonstration of integrated monitoring systems	H
4	Integration of monitoring in repository design	m

1. Development and design of disposal specific monitoring concepts, based on modelling of natural end engineered systems, and taking into account the spatial heterogeneity, the density and location of measurements, and trigger values for critical parameters and locations

2. Integration of monitoring requirements with repository concepts, in order to include them in the technical design of repository facilities for the different geological environments (crystalline rock, clay, rock salt)

3. Demonstration of integrated monitoring systems including coupling of new and advanced technologies with well-known technologies in realistic conditions, to solve specific technical issues.

4. Analysis of monitoring data from demonstrators and existing data sets to examine the implications of monitoring results to the safety case, including the potential feedback to performance assessment modelling. Feedback to repository design.

Communication and Stake holde involvement

	Topic	Priority
1	Structured stakeholders engagement processes	H
2	Practical guidance on transparent information exchange	H
3	Calibrating expert and stakeholder expectations	H
4	New tools for communication of monitoring results	m

Research into stakeholder expectations of roles and relationships in relation with monitoring, and development of strategies for the involvement of stakeholders and independent organizations in the different phases of monitoring.

Research into communication processes and development of strategies and methodologies for the communication of monitoring results in an effective and acceptable way in order to contribute to confidence building.

The proposed work would contribute to the development and evaluation of:

- *Structured stakeholder engagement processes*
- *Practical guidance on transparent information exchanges*
- *A practical, learning-based approach to calibrating expert and stakeholder expectations of monitoring*
- *Development of new tools for communications of monitoring results*

Note : These activities have to be integrated in all areas (each main previous points)

TSWG Way forward

Next steps

- Proposal on project scope and objectives to EC
- Building up a consortium of interested parties (Jan- Feb 2014)
- Parties proposing specific activities
- Identifying roles, WPs, and tasks
- Budgeting (medium size project ?)
- Proposal completed by June 2014
- Proposal submission in September 2014
- Project to start in April 2015

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Updated Information: EF 4 29-30 October 2013

2.12 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	H
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	H
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**
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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

2.13 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.	H

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:
Questionnaire sent out.
Posiva leads the survey proposal on current practices, the Secretariat supports the Joint Activity by looking at the database and how it can be implemented.

At EG 9 EG members decided to put the activity on hold due to the lack of answers and availability of participants.

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

Explanation of the objectives of the activity:
1) To create and maintain a resource pool of experts available for reviews of technical and scientific reports.
2) To create a channel for scientific criticism and dialogue on RTD into long-term safety of geological disposal.

ORWG Questionnaire

IGD-TP
ORWG on Peer Review Safety Case
Preparatory Questionnaire for interested parties

General Information
Name
Email
Organisation Country *Are you interested in participating to the ORWG?*
Does your organisation have established practices for peer reviews?

Current requirements
What is the scope of your current peer review practices? Are they based on external requests (e.g., legal or regulatory requirements) or internal decisions? Are they linked to some national or international review institutions (including NEA and IAEA)

Protocols, procedures, instructions
Are the peer reviews defined in your Quality Management System (QMS)?
Are the protocols of the reviews defined in QMS or are they agreed on a case by case basis? Are there general instructions for the peer reviews?
Are the necessary qualifications defined for the review experts? Are the reviews assigned to organisations or individual experts? How are the reviewers selected? Are the reviewers selected separately for each review task or do you have standing review groups? How do you identify suitable review experts? Are learned societies involved in reviews?.
Are the reviews solely based on written communication or can they include meetings and interviews as well?

ToR Practices
Is there always a written agreement on the review task? What are the normal terms of reference specified in the agreement? What are the confidentiality requirements for the information exchanged during the review?

Language of reporting
Does the language of reporting affect the review practices or is the reporting language adapted to review needs (e.g. through translation policies)?

Documentation of reviews
How is the review reported? As annotated review documents or in separate review reports? Can the review include several iterations (after authors' reaction to the first review)? How are possible disagreements handled or resolved? Are the points of disagreement made open for public?
Are the reviews reports open for public?.

Independence requirements
Does a "conflict of interest policy" exist?
Definition of affiliations or activities that could potentially lead to conflicts of interest? Personal involvement from the reviewer?
Formal conflict of interest agreement?.
Payment rules

Comments on the current experience with peer reviews?
TSWG Way forward • Two answers to the questionnaire have been received so far. is the question was asked in EG 9 if there is still an interest to progress this activity. • **At EG 9 EG members decided to put the activity on hold due to the lack of answers and availability of participants.** • The Secretariat confirmed that the new web site should be used to send out calls for experts.
Updated Information: EG9 - November 30, 2012

2.14 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/** P.Wikberg peter.wikberg@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

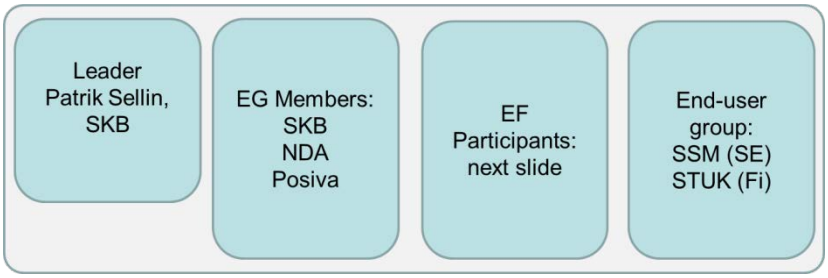
Objectives and Expected Results of the Joint Activity

The main aim of BELBaR is to increase knowledge of the processes that control clay colloid stability, generation and its ability to transport radionuclides.
The overall purpose of the project is to come up with a new way of treating issues in long-term safety/performance assessment.

Expected results: Colloid stability in dilute groundwater

Schedule and Milestones March 2012 – March 2016

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

2.15 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 HLW 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	Lawrence Johnson lawrence.johnson@nagra.ch	**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

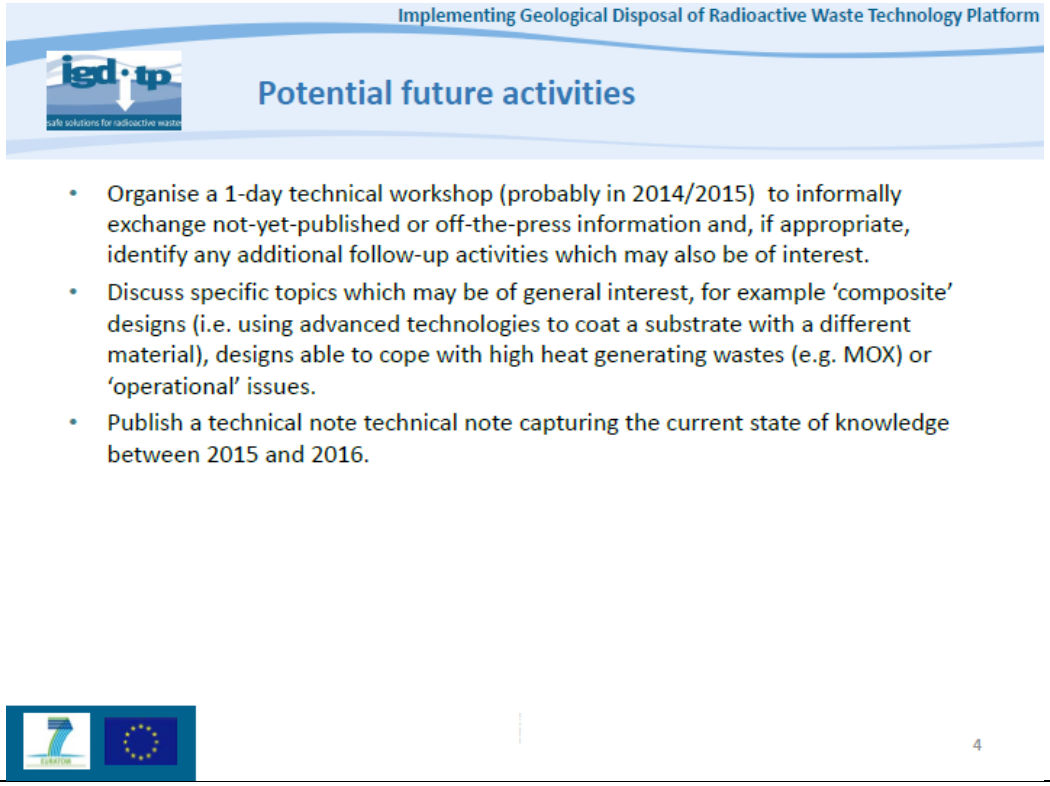
Cristiano Padovani has taken over from Neil as lead for JA 11a and set up a new folder on IGD-TP Projectplace "TSWG (11a)" under "IGD-TP Joint Activities: Projects and Working groups".

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

2.16 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
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SURAO	**Jiri Slovak** **slovak@SURAO.cz**	**SKB**	J. Andersson johan.andersson@skb.se

ORWG Content of the activities

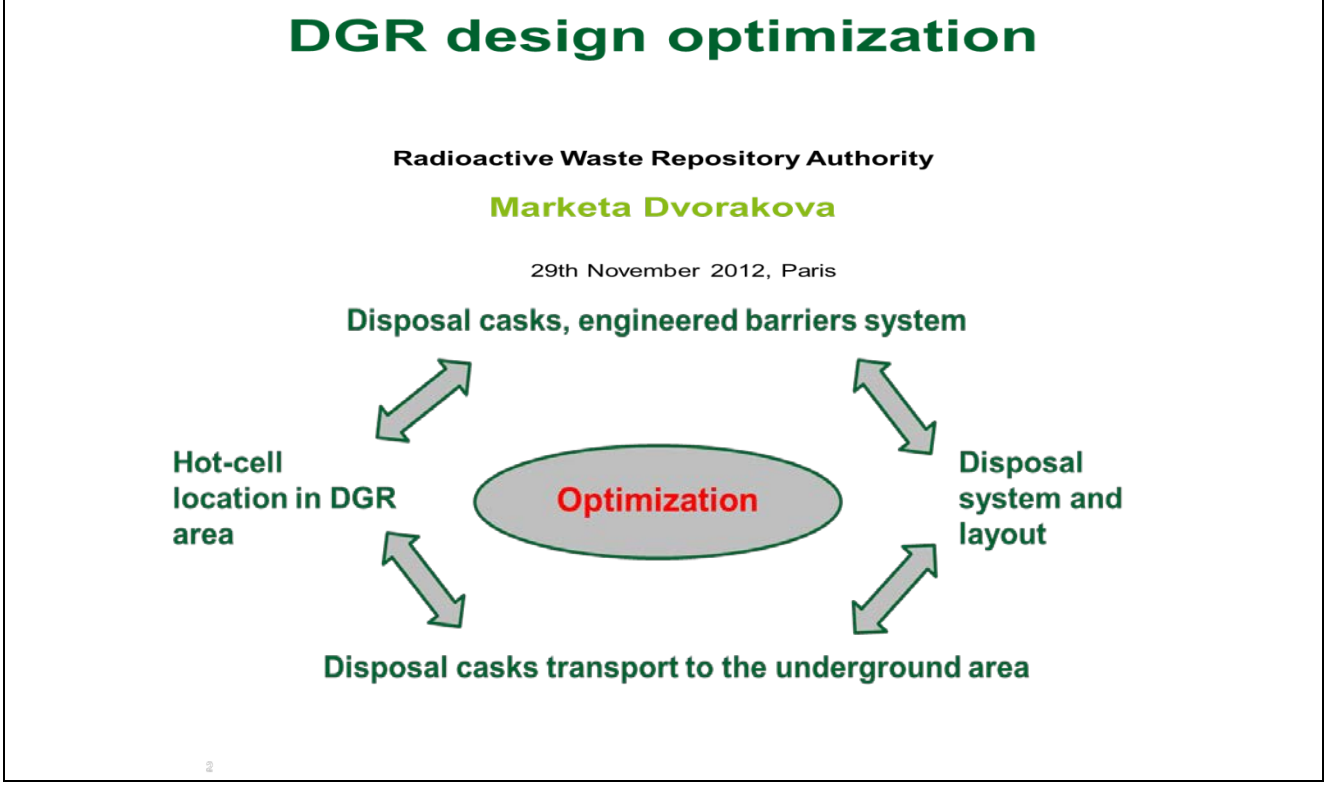
Explanation of the contents of the activity:
The goal of the activity is to keep open different options of the geological repository at the stage of its licensing. To get the license, demonstration that safety will be achieved needs to be provided. This is based on available knowledge, methodologies 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)



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

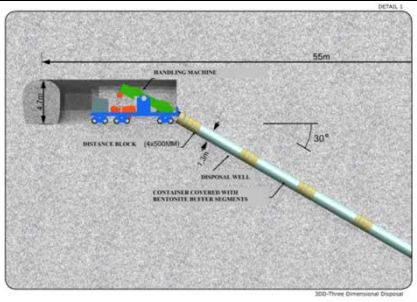
In dependence on cask´s construction to check:

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

Disposal system and layout

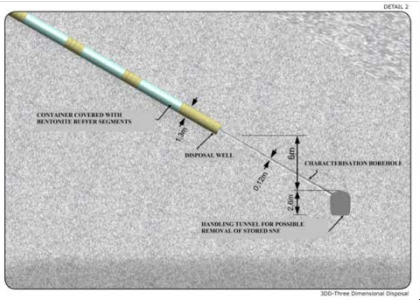
Horizontal		Vertical	
pros	cons	pros	cons
• Need of smaler area	• More demanding manipulation with casks and bentonite blocks *(long disposal drifts)*	• More simple manipulation with casks and bentonite *(1 cask´s boreholes)*	• Need of large area
• Smaller amount of excavated rock	• Geological survey 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

2.17 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 working group has met three times to-date (London, Brussels) specifically to investigate the needs of new member states.The working group has produced a questionnaire and collated responses to identify needs from less advanced programmes. The outcomes of the questionnaire showed that there were three categories of needs, specifically:

- RD&D needs that align with topics in the SRA (e.g. costing, safety case methodology);
- RD&D needs that can be met through other collaboration initiatives such as Newlancer, ERDO, and IAEA (e.g. development of national policy, establishing regulatory controls);
- Programme infrastructure, information and processes required to implement geological disposal and

fulfil EC Directive 2011/70/EURATOM.

The working group will produce a 'mini-roadmap' that is aimed at helping a first response to the RD&D related aspects of the EC Directive. The roadmap will set out the key steps in developing a geological disposal facility programme and strategy based on advanced waste management organisations experience. The roadmap will signpost open documentation and guidelines for specific technical areas.

Some preparatory work could be undertaken to agree the 'storyboard' for the roadmap over the summer 2014 to distribute for comment to the working group. Thereafter a small group of contributors (led byRWM and JRC) would develop a draft guide aiming for a first draft by the October 2014 IGD-TP Exchange Forum meeting (Sweden). The guide could then be reviewed in the period October to December 2014. Thereafter the guide could be updated and prepared for publication with EG agreement by March 2015 and then be presented at the one day event planned as part of work package 2. A venue for the event was discussedwhich could be a back-to-back event with the ENEF meeting in May/June 2015 in Prague, Czech Republic.

A three day conference IGD-TP Geodisposal 2014 has been organised at the University of Manchester 24-26 June, 2014. The conference will focus on:

- Engage the countries with 'less-advanced' programmes and share best practice in geological disposal research and implementation
- Showcase the underpinning science, technology and stakeholder engagement in geological disposal

Updated information about the meeting organisation will be regularly made available on line at the website: **https://www.meeting.co.uk/confercare/geodisposal2014/**

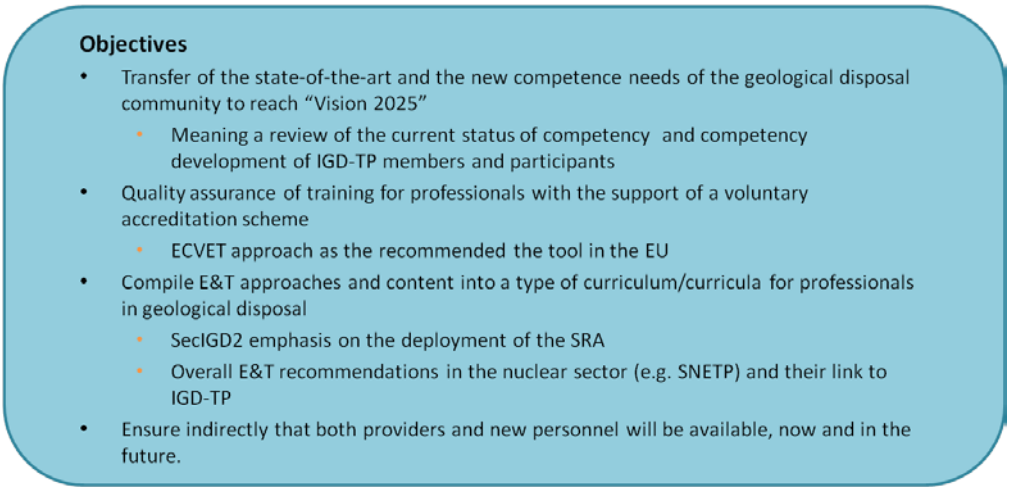
Update: Ray Kowe, April 23, 2014

2.18 JA14: Competence Maintenance, Education and Training

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

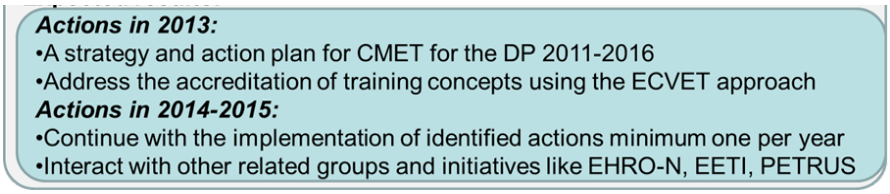
Competence Maintenance, Education and Training Working Group CMET (ORWG)

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 carrying out the 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 2014

- The CMET group continues to meet according to its annual meeting plan. Fourth CMET meeting is tentatively taking place prior the EF no5 in Sweden with the purpose of preparing for the session.
- The work to produce the CMET Strategy and Action Plan (StrAP) for the EG comments and approval is on-going with the aim to publish the StrAP by the Exchange Forum no 5, where a special session of the CMET is included. A StrAP editing workshop will be arranged on the 2 June 2014 in

Delft Holland and the final draft will be presented to the EG for comments in the EG no14 meeting in June 2014.

- The CMET organises a special session for the EF no5 and the focus of the EF no5 session is to collect inputs for the feasibility study on a voluntary accreditation system that looks at both the individual and training programmes as defined in the CMET ToR v.2. This is done in cooperation with the PETRUS III project.
- The identification of other actions for the CMET to undertake in 2015 and in 2016 is on-going as a part of the finalisation of the Strategy and Action Plan.

Major achievements during 2013

- Input for the the SET-Plan EETI8 assessment report's working group on Nuclear was provided by the CMET chair. The assessment reports were used for the SET-Plan E&T Roadmap Development and are published during the summer 2013. The CMET input was also used in the EC's 2012 Interdisciplinary Study Report9 "Benefits and limitations of nuclear fission for a low carbon economy - Defining priorities for Euratom fission research and training (Horizon 2020)" under topic 4 "Education and training and skills". The SET-Plan E&T Roadmap has been published in April 2014 by JRC/IET.
- First CMET WG meeting was held in April 2013 followed by two more meeting of the CMET group: in Madrid (ES, in Nov. 2013,) and the third meeting split into two sessions and held in March-April 2014 in Cardiff (UK) and Delft (NL).
- A short survey on the Joint Activities CMET needs was sent to the IGD-TP activity leaders to collect background information for the first meeting and complemented with interaction with the audience at the Euradwaste 13 conference.
- The first CMET meeting participants produced data on the current geological disposal education and training programmes in their respective Member States that will be included into the StrAP.
- Papers and presentations for Euradwaste 13 and NestET2013 were submitted and presented. The Euradwaste paper presented the overview of CMET and the NestET13 paper focused on the prerequisites of a voluntary accreditation scheme.
- Terms of Reference of CMET (v.2) were finalised and approved.
- Projectplace folder for the group has been set up and is continuosly used for material sharing; set-up of a LinkedIn CMET group for discussions was done; the use of JA14 page of the www.igdtp.eu website for public announcements still requires more updated, but CMET related announcements of 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[10] and its meetings, interactions with the PETRUS III project and the NUSHARE project are continuous including a participation to the NUSAHARE stakeholder workshop in Brussels in March 2014.

[8] European Strategic Energy Technology Plan (SET-Plan), Energy Education and Training Initiative, Assessment Report

[9] http://www.eesc.europa.eu/?i=portal.en.events-and-activities-symposium-on-nuclear-fission-papers.26350

[10] European Human Resource Observatory in Nuclear (the operating agency is DG JRC's Institute for Energy and Transport) resulting from ENEF http://ehron.jrc.ec.europa.eu/ Senior Advisory Group (SAG)

CMET Competence Maintenance, Education and Training Working Group

Joint Activity participants

27 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 send directly to the CMET chair with a copy to the Secretary General of the IGD-TP.

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 dvorakova@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- Ecole des Mines de Nancy (FR), Behrooz Bazargan-Sabet
Université de Versailles St. Quentin-en-Yvelines (FR), W. Eberhard Falck
BGR[11] (DE), Sandra Fahland and Michael Mente
Steinbeis-Center for Simulation in Technology (DE), Gabriel Wittum
TU Clausthal, IELF (DE), Klaus Röhlig
JRC - ITU (EC), Concetta Fazio and Gunnar Buckau
CIRTEN[12] - 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[13] (ES), Francisco Javier Elorza
STUBA[14] (SK), Vladimir Slugen
REC[15] (HU), Nadja Zeleznik

Other interested participants

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

[11] Bundesanstalt für Geowissenschaften und Rohstoffe
[12] Inter-University Consortium for Nuclear Technological Research
[13] Universidad Politechnica de Madrid
[14] Slovak University of Technology in Bratislava
[15] Regional Environmental Centre for Central and Eastern Europe REC Hungary

Description of the drivers for the activity in 2012:

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[16] the need for Competence Maintenance, Education and Training (CMET) as one of its Cross-Cutting Activities that supports the Vision 2025[17] 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[18]) 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[19] 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 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 on 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

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

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.

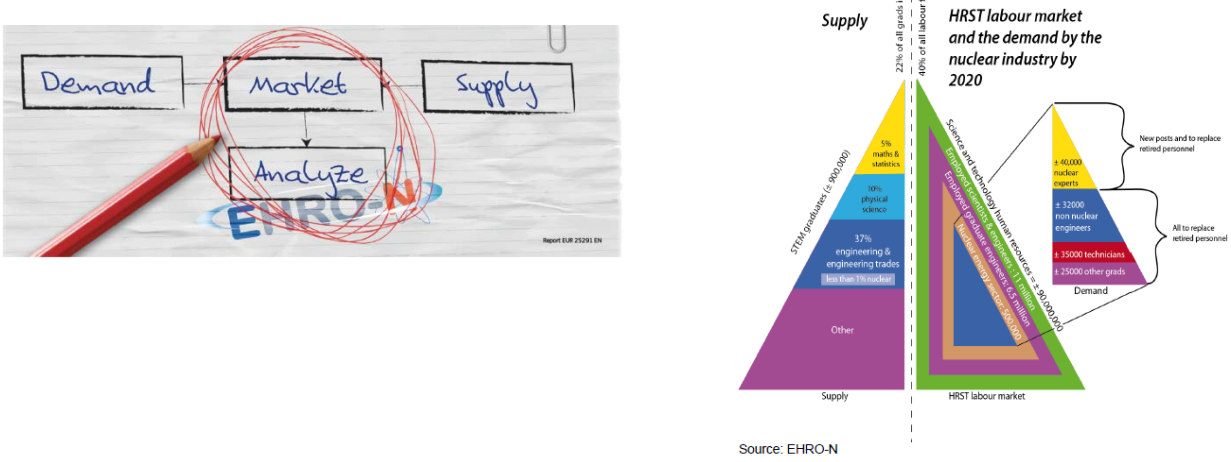


Figure 1: Supply and demand sides of HR resources in nuclear (according to EHRO-N). Supply side is taken care by governments and educational institutes/training providers and the demand side looks at how much HR is needed and in what type of competence areas. The IGD-TP CMET works on the demand side 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[20] projects in various ways is the main source of knowledge, skills and competence (KSC[21]) 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”[22] 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, 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

[20] Research, Development and Demonstration
[21] 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
[22] 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.

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[23] 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[24] 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[25] and EETI[26] for the SET-Plan Roadmap on Education and Training[27]. 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 2014

[23] 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
[24] 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.
[25] 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/.
[26] Energy Education and Training Initiative (EETI)
[27] Strategic Energy Technology (SET) Plan Roadmap on Education and Training visit: http://ehron.jrc.ec.europa.eu/news/set-plan-roadmap-education-and-training

2.20 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.

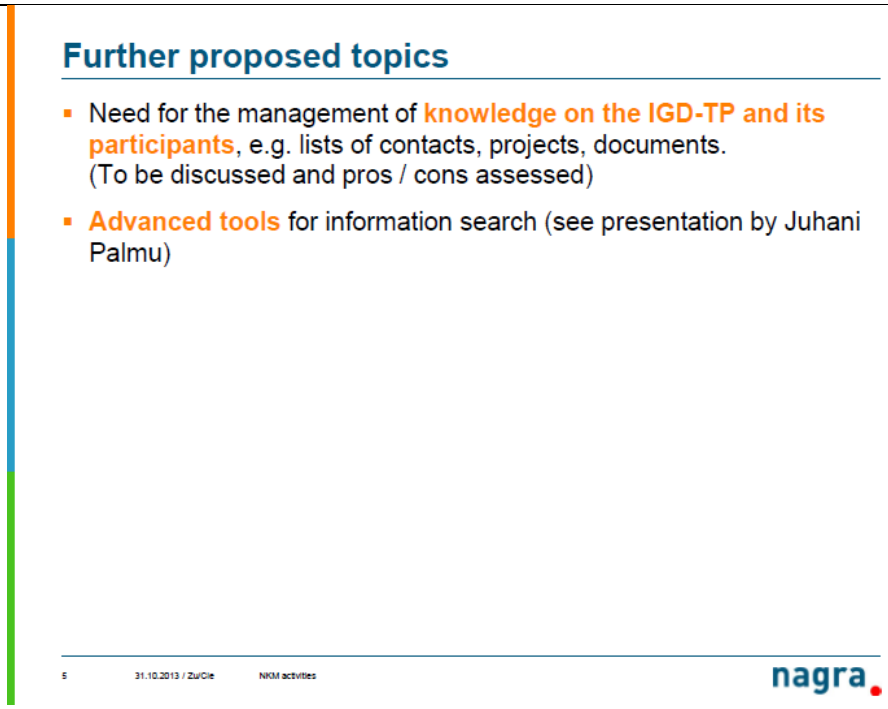
Proposed specific activities

- 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)

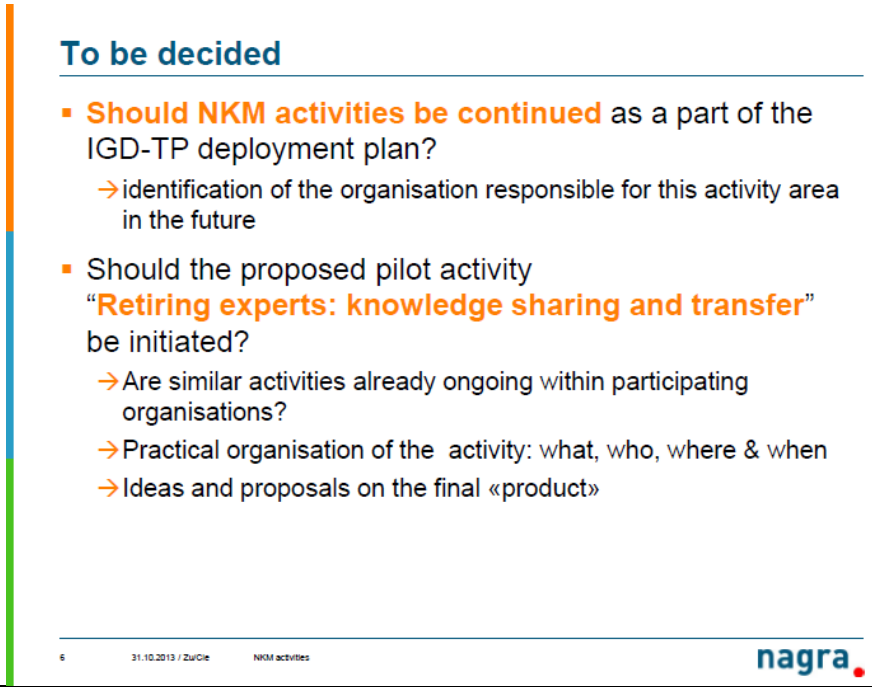
→ Immediate gain: retain valuable **technical / scientific knowledge and experience**

→ 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

2.21 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:	**Lena Z. Evins**	

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**	Lena Z. Evins lena.z.evins@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
Lena	Evins	IGDTP	SKB
Danièle	Boulanger	IGDTP	NIROND
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