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# SecIGD2

**(Contract Number: 323260)**

# Master Deployment Plan and Joint Activities Outlines 2013

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| **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 | | | |
|---|---|---|---|
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| **Version 1** | Emission for consultation EG 10 | Andra | 29/01/2013 |
| **Version 2** | Emission for approval EG11 | Andra | 05/06/2013 |
| **Version 3** | Version Approved by EG 11 | Andra | 30/06/2013 |
| | | | |

***Reviewed by***

EG 11 members, Ray Kowe, Marjatta Palmu, Philippe Lalieux

***Approved by***

EG members on EG meeting June 19, 2013

# D1.5 MASTER DEPLOYMENT PLAN and JOINT ACTIVITIES OUTLINES 2013

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

# Table of contents

# 1 Executive summary

The Strategic Research Agenda (SRA) identified and prioritized the 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 37 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 results expected from the activities contributing to new RD&D knowledge in geological disposal during the next years [or years to come].

Each SRA Topic under a specific Key Topic was classified accordingly into this deployment scheme as one of the 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.

This document presents an update of the Master Deployment Plan and the activity outlines for the individual Joint Activities as at the end of 2012.

Both the Master Deployment Plan and the activity outlines constitute a management tool for the IGD-TP and they are intended to be updated annually.

# 2 Introduction

In the IGD-TP's SRA, RD&D issues identified by implementers as important to their programme and which are 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 for achieving RD&D results needed 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) were 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 meeting the Vision 2025.

The SRA is in turn supported by a Deployment Plan (DP) for the Joint Activities to be carried out by the Technology Platform with 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, which 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).

This document presents the update of the Master Deployment Plan for the IGD-TP and the activity outlines of the Joint Activities giving the status of the implementation stage of SRA implementation at the end of 2012.

# 3 IGD-TP's Strategic Documentation

## 3.1 Report status at the end of 2012

| 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 |

## 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.

Under the Key Topics, Topics were derived describing RD&D issues in more detail: A total number of 36 Topics. Their regrouping was performed by taking into account the level of importance of each of the Topics under a Key Topic and the requested date of the availability of the needed results by the WMOs and the need for the related solutions in each EG member organisation.

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 needed end-date for achieving the results and level of importance was also agreed upon. The results are presented in Table 3-1.

[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:

1. Organizational Working Group (ORWG): This is a working group with the specific purpose of development of a scientific or technical Topic, to carry out preparatory work on a Topic to generate a possible Technical Project. Its work focuses on either the strategic or practical organisational approaches around the respective SRA Topic (e.g. organizing peer reviews or benchmarking) more than on detailing the technical matters related to a technical or scientific Topic itself.
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.
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.

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

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 project 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.

# 4 Implementation and deployment management

The DP addresses the Joint Activities that derive from the SRA's Topics which are taking place or shall start during 2011-2016.

Therefore, this DP published in 2012 was a starting point and the intention of the Master Deployment Plan (and the associated activity outlines) is to provide a follow up tool that will be continuously updated by the EG with the assistance of the Secretariat.

## 4.1 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 activity outlines are presented at EG meetings (for example the latest group of Joint Activities were considered in the EG meeting in November 2012 and further activities to be started will be considered in future EG meetings).
- The EG members decide on their respective participation. 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 in 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 a given Joint Activity is voluntary

## 4.2 Revision of the Deployment Plan and the Master Deployment Plan

The key information in the DP consists of the first Master Deployment Plan (2011-2016) presented in a timetable and decision-making format. This Master Deployment Plan is updated by the Secretary General according to the deployment decisions made by the IGD-TP's Executive Group during the Executive Group meetings (3 times a year). The EG also reviews any proposed Joint Activities and the status of existing Joint Activities during these meetings.

For the period 2012-2015 it is planned to upgrade the Master Deployment Plan and the Joint Activity outline at the end of each year, taking into account Exchange Forum discussions and outcomes.

Since the DP depends on the strategy defined in the IGD-TP's SRA, when a new SRA is produced, the Deployment Plan document also needs to be updated. A new working group is then decided upon by the EG to carry out the update of the SRA and the corresponding DP.

# 5 Master Deployment Plan of the SRA 2012-2016

*Table 5-1: Master Deployment Plan*

| JA | Joint Activity | EURATOM FP7 Project | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | On-going Activity |
|---|---|---|---|---|---|---|---|---|---|
| JA1 | Waste forms and their behaviour | First-Nuclides Start date 2012- 01-01 Duration 36 months<br>REDUPP Start date 2011-04-01 Duration 36 months | | | | | | | |
| JA2 | Full scale demonstration of Plugging and Sealing | DOPAS Start date 2012- 09-01 Duration 48 months | | | | | | | |
| JA3 | Waste forms and their behaviour – C-14 | *CAST In Preparation* | | | | | | | Generation of C14 Species from radioactive waste- project to be submitted November 2012 |
| JA4 | Monitoring the Environmental Reference State | | | | | | | | Guidelines submitted to the EG : in 2012 needs and Strategy |
| JA5 | Safety of constructions and operations | | | | | | | | Working Group with 7 Partners - Pilot Project on needs and common interest ground |

| JA | Joint Activity | EURATOM FP7 Project | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | On-going Activity |
|---|---|---|---|---|---|---|---|---|---|
| JA6 | Confidence increased in safety codes : Materials interactions | PEBS Start date 2010- 03-01 Duration 48 months<br>New Project? | | | | | | | Design of the overall system of engineered barriers (EBS) (incl. sealing/backfilling) and the evaluation of its long-term performance<br>Concrete project? |
| JA7 | Monitoring programme | MoDeRn Start date 2009- 05-01 Duration 54 months | | | | | | | Activity will start after the completion of the MoDeRn project |
| JA8 | Safety Case Peer review | | | | | | | | Questionnaire on current practices |
| JA9 | Safety Case – Process model benchmarking | | | | | | | | Proposal on a future benchmarking project on integrated models |
| JA10 | Long-term stability of bentonite in crystalline environments | BELBaR Start date 2012-03-01 Duration 48 months | | | | | | | |

| JA | Joint Activity | EURATOM FP7 Project | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | On-going Activity |
|---|---|---|---|---|---|---|---|---|---|
| JA11 | 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 | | | | | | | | Activity postponed in 2013 |
| JA13 | IEP on communicating results from RD&D | SecIGD2 Start date 2013-01 Duration 36 months | | | | | | | JA supported by Secretariat SecIGD2 Project organization of public events in 2014 and 2015 |
| JA14 | Competence, Maintenance, Education and Training (CMET) | SecIGD2 Start date 2013-01 Duration 36 months | | | | | | | JA supported by Secretariat SecIGD2; ToR of the WG approved in 2012 |
| JA15 | Nuclear Knowledge Management | | | | | | | | JA launched in 2012 |
| JA16 | IEP on WMO Programme Specific issues | | | | | | | | JA on Stand-by |


The time needed for the respective working groups to conclude may differ from one project to another.

# 6 Joint Activities and activity outlines

## 6.1 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 (Topics 3.6, 3.10 and 3.14,) | Yes /TEP DOPAS |
| 3 | Waste forms and their behaviour: TSWG on C14 (Topic 2.2) | Yes/TEP CAST |
| 4 | Monitoring the Environmental Reference State: TSWG (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 | “Benchmarking” for confidence in LT safety in Safety Cases: 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) | Yes / SecIGD2 project (WP3) |
| 15 | Nuclear Knowledge Management: ORWG NKM (CC3) | Yes |
| 16 | WMOs IEP (WMO 1-6) | No |

## 6.2 JA1: Waste Forms and their behaviour

| **JA1: Waste Forms and their behaviour** | | |
|---|---|---|
| **SRA Key Topic: 2**<br>Waste forms and their behaviour | | **Type of activity:**<br>TEP for 2.1<br>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) | **SKB/Peter Wikberg:** peter.wikberg@skb.se | |

**SRA Topic:**

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

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

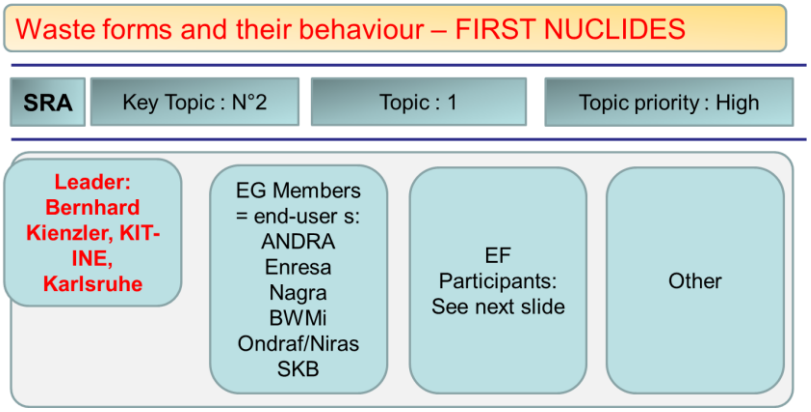
**Time table:** As from 2012 to 2020

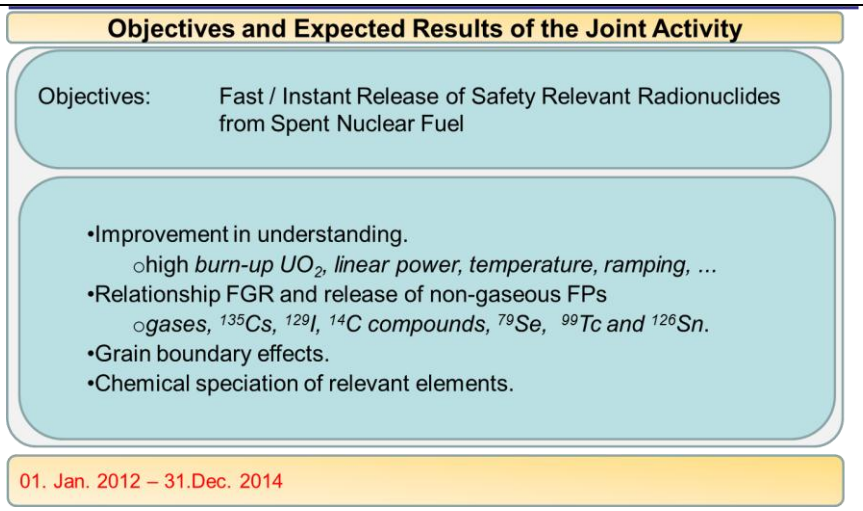
**TSWG**

**Interested EG members**

| | | | |
|---|---|---|---|
| **Andra** | Stephan Schumacher<br>stephan.schumacher@andra.fr | **BMWi** | Bernhard Kienzler (*FIRST Nuclides)*<br>bernhard.kienzler@kit.edu |
| **Nagra** | Lawrence Johnson<br>lawrence.johnson@nagra.ch | **NDA** | Cristiano Padovani<br>cristiano.padovani@nda.gov.uk |
| **ONDRAF** | Danièle Boulanger (end user group)<br>d.boulanger@nirond.be | **Posiva** | Piia Juhola<br>piia.juhola@Posiva.fi |
| **RAWRA** | Antonin Vokal<br>vokal@rawra.cz | **SKB** | ***Kastriot Spahiu, Peter Wikberg***<br>**peter.wikberg@skb.se** |

**TEP - FP7 project FIRST Nuclides**






**The consortium FIRST Nuclides**

***1. Partners / Beneficiaries***

KIT, AMPHOS 21, ITU, JÜLICH, PAUL SCHERRER INSTITUT 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: EF 3 - November 29, 2012**

## 6.3 JA2: Full scale demonstration of plugging and sealing

| **JA2: Full scale demonstration of plugging and sealing** | | |
|---|---|---|
| **SRA Key Topic: 3**<br>Technical feasibility and long-term performance of repository components | | **Type of activity:**<br>TEP for 3.6<br>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<br>Jean-Michel.Bosgiraud@andra.fr | **BMWi** | André Rübel<br>andre.ruebel@grs.de |
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| **ONDRAF** | Philippe van Marcke<br>p.vanmarcke@nirond.be | **Posiva** | **Johanna Hansen**<br>**Johanna.Hansen@Posiva.fi** |
| **RAWRA** | Marketa Dvorakova<br>dvorakova@rawra.cz | **SKB** | Erik Thurner<br>erik.thurner@skb.se |

**TSWG Content of the activities**

**Topic 3.6**
After having produced technical design specifications of the sealing components, large scale tests in underground laboratories are envisaged both in crystalline and in clay environments. Individual tests will be performed on various Topics (construction of bentonite seals, construction of grooves filled with bentonite, performance tests…) prior to building a full 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 takes 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<br>Jean-Michel.Bosgiraud@andra.fr | **BMWi** | André Rübel<br>andre.ruebel@grs.de |
| **Nagra** | Hanspeter Weber<br>hanspeter.weber@nagra.ch | **NDA** | Chris Finch<br>Chris.finch@nda.gov.uk |
| **Posiva** | **Johanna Hansen**<br>**Johanna.Hansen@Posiva.fi** | **RAWRA** | Marketa Dvorakova dvorakova@rawra.cz |
| **SKB** | Erik Thurner<br>erik.thurner@skb.se | | |

**TEP- FP7 project DOPAS**

**Objectives of the Joint Activity**

DOPAS aims to improve the adequacy and consistency regarding industrial feasibility of plugs and seals, the measurement of their characteristics, the control of their behavior over time in repository conditions and also their hydraulic performance acceptable with respect to the safety objectives. This DOPAS project addresses the design basis, reference designs and strategies to demonstrate the compliance of the reference designs to the design basis, for plugs and seals in geological disposal facilities.

**Schedule and Milestones: 1st September 2012- 31st August 2016, 48 months**

**Expected Results of the Joint Activity**

Five different demonstration experiments are part of the project and will take place in France, Czech Republic , Sweden, Finland, and Germany. They are in different states of development. The Swedish demonstrator is constructed prior to start of the DOPAS project and will basically provide experience on demonstration of compliance of reference design to the design basis. German demonstrator will be installed after the DOPAS project and will focus on demonstration of suitability by performance assessment. The French, Finnish, Swedish, Czech and German experiments will address developments in all phases of design basis, reference designs and strategies to demonstrate compliance of reference designs to design basis. The studied concepts will be developed in the DOPAS's five thematic scientific/technological work packages, which each integrate the results of the individual experiments.

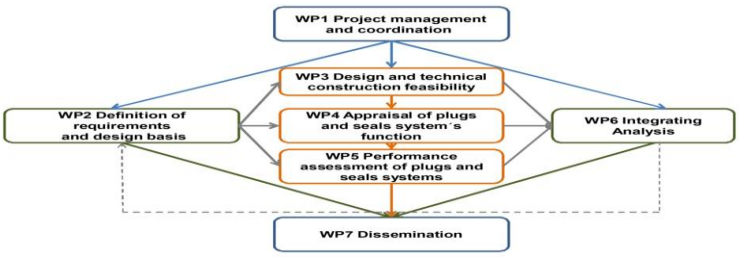
**The consortium DOPAS**

**DOPAS Consortium**

**DOPAS Associated Groups**

BMWi and COVRA

**DOPAS Work Packages and Demonstration experiments:**




**Updated Information: Johanna Hansen - April 2, 2013**

## 6.4 JA3: Waste forms and their behaviour C14

| **JA3: Waste forms and their behaviour C14** | | |
|---|---|---|
| **SRA Key Topic: 2**<br>Waste form and their behaviours | | **Type of activity:**<br>TEP<br>TSWG |
| **Joint Activity leader:** | NDA/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:**
TEP proposal submitted as "CAST" Project to Euratom FP7-2012-Fission call
Report to Executive Group by the JA Leader

**Time table:**
As from 2012 to 2016

**TEP**

**Interested EG members**

| | | | |
|---|---|---|---|
| **Andra** | Stephan Schumacher<br>stephan.schumacher@andra.fr | **BMWi** | Ulrich Noseck<br>Ulrich.Noseck@grs.de |
| **COVRA** | Erika Neeft<br>Erika.Neeft@covra.nl (Ewoud Verhoeft) | **ENRESA** | Jose Luis Leganes<br>jlen@enresa.es |
| **Nagra** | Lawrence Johnson<br>lawrence.johnson@nagra.ch | **NDA** | **Steve Williams**<br>**Steve.Williams@nda.gov.uk** |
| **ONDRAF** | Danièle Boulanger<br>d.boulanger@nirond.be | **RAWRA** | Antonin Vokal<br>vokal@rawra.cz |
| **SKB** | Borje Torstenfeldt; K. Källstöm<br>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

**TSWG Content of the activities**

***C 14 Problem***

- Carbon-14 release identified as possible issue in many countries.
- Range of C14 containing wastes.
- Lack of information on release rates and speciation of C14.
- Better understanding of source term of benefit to all.

Questionnaire was sent to interested parties earlier this year asking for information on:

- Description of national wastes containing C14.
- C14 in contexts of national programmes.
- Research related to generation of C14 species and results.

- National on-going or planned research into C14.
- How the international project could contribute to information needs on the generation of C14 over the coming years.

CArbon-14 Source Term (CAST).

Submission of the CAST Project November 13th 2012

**TEP- FP7 project proposal CAST (Submitted)**

**CArbon-14 Source Term**

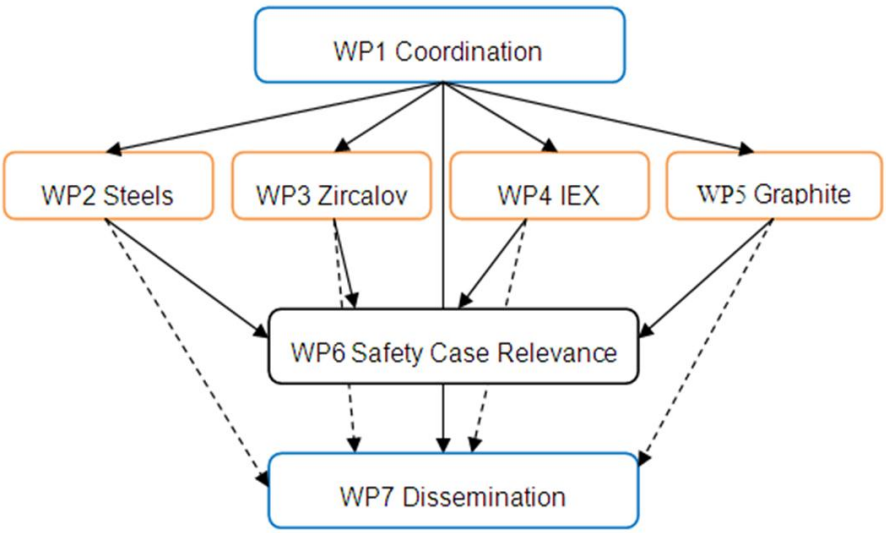
**The consortium CAST**

## CAST Partners

| Partner | Country | Partner | Country | Partner | Country |
|---|---|---|---|---|---|
| NDA RWMD | UK | FZJ | Germany | SKB | Sweden |
| Nagra | Switzerland | ITU | Germany | CNRS/IN2P3 | France |
| Andra | France | UJV | Czech Republic | Amec | UK |
| CEA | France | Enresa | Spain | Ciemat | Spain |
| Ondraf/Niras | Belgium | NRG | Netherlands | Areva | France |
| Covra | Netherlands | VTT | Finland | EdF | France |
| INR | Romania | Fortum | Finland | | |
| GRS | Germany | LEI | Lithuania | | |
| PSI | Switzerland | SI IEG NASU | Ukraine | | |
| SCK.CEN | Belgium | Subatech | France | | |
| KIT | Germany | FNAG | Germany | | |
| ENEA | Italy | IFIN-HH | Romania | | |
| RWMC | Japan | Rawra | Czech Republic | | |

**CAST Work Packages:**

# Cast work packages




- WP1 Coordination - NDA
- WP2 Steels - Nagra
- WP3 Zircaloy - Andra
- WP4 Ion-exchange resins - CEA
- WP5 Graphite - NDA
- WP6 Safety case relevance - Ondraf/Niras
- WP7 Dissemination - Covra

**Updated Information: EF 3 - November 29, 2012**

## 6.5 JA4: Monitoring of the environmental reference state

| **JA4: Monitoring of the environmental reference state** | | |
|---|---|---|
| **SRA Key Topic: 6**<br>Monitoring | | **Type of activity:**<br>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:**
TSWG Report Issued in June 2012 by the JA Leader
Potential guidelines prepared and submitted to the WG

**Time table:** As from 2011 to 2016

**TSWG**

**Interested EG members**

| | | | |
|---|---|---|---|
| **Andra** | **Elisabeth Leclerc**<br>elisabeth.leclerc@andra.fr | **ENRESA** | J.C. Mayor<br>jmaz@enresa.es |
| **Nagra** | Herwig Müller<br>herwig.mueller@nagra.ch | **NDA** | Mark Gough<br>mark.gough@nda.gov.uk |
| **ONDRAF** | C.Depaus<br>c.depaus@nirond.be | **Posiva** | Jere Lahdenperä<br>Jere.Lahdenpera@Posiva.fi |
| **RAWRA** | Jitka Miksova<br>miksova@rawra.cz | **SKB** | Susanna Andrén<br>susanna.andren@skb.se |

**Other interested participants**
ENEA: Alfredo Luce (alfredo.luce@enea.it)

**TSWG Content of the activities**

***Explanation of the contents of the activity:***
The aim of this Topic is to define a reference state of the environment before the beginning of construction of the geological repository. The reference state will also be useful for further monitoring during operations and even after, thus keeping a baseline record of the original environmental state. However, depending on the sensitivities, different types and levels of requirements can be requested from a place to another. In order to avoid huge discrepancies and successive requests by comparing the situations between countries, a common baseline definition of what is data is required will be defined. It will then be the basis for further recommendations**.**

Proposition to create a WG at EF 4

**TSWG – Proposal to EF**

**Objectives**

- The goal of this topic is to get a reference state of the environment before the beginning the construction works for the geological repository.
- The reference state will also be useful for further monitoring during operations and beyond, thus keeping a record of the original environmental state.

- Depending on the sensitivities, different types and levels of requirements can be requested from one place to another.
- In order to avoid huge discrepancies and successive requests at later stages a common input baseline of what is required will be defined by comparing the situations between countries..
- This will then be the basis for further recommendations

**Short description of the work to be done**

- Since it is a new area of work, a detailed discussion is needed among the parties to define precisely the scope of the project, the way of doing it, and the detailed outputs.
- At first, a roadmap will be issued defining the above requirements. The idea being to launch a technical project in 2014 to produce a reference book and relevant guidelines.
- Further technical and/or scientific developments to answer specific requirements may also be required.

**Main scientific and technical topics to be dealt with**

- The area to be observed and monitored (scoping, scales of data collection?)
- The compartments of the biosphere that should be monitored
- The choice of the markers: biomarkers, biodiversity, quality of the environment…
- The way the selection of the monitoring systems for the repository environment will be made (scientific, and technical criteria, social requirements)
- The definition of actions that should be adopted in order to contribute to the preservation of the environment
- The evaluation of the perturbations that could be induced during the investigation, excavation and construction phases (?)
- The links of the repository environment monitoring system with other environmental observatories/ observatories' systems
- The necessity (or not) to have a reference area

***Additional "strategic" topics***

- The involvement of the local associations (for example, environmental preservation groups, fishing and hunting associations, farmers unions…)
- The level of information and consultation
- The commitment of the WMO in more general aspects of environmental monitoring and preservation
- The interfaces with other environmental scientific programs (national, international) e.g. local vs. global change
- The potential conservation of samples from the biological and physical compartments of the environment

**Possible industrial and operational objectives**

- Establish a representative INITIAL STATE of the site and its environment before construction
- Establish environmental and socioeconomic criteria in order to facilitate the selection of the zones on which the surface facilities will be installed
- Contribute to the definition of the potential ENVIRONMENTAL COMPENSATORY MEASURES
- Prepare the future ENVIRONMENTAL MONITORING PROGRAM of the nuclear facility site/s
- Identify and explain the origin of any disturbance of the environment or the presence of pollutants prior the beginning of the construction measures

**Updated Information: EF 3 - November 29, 2012**

## 6.6 JA5: Safety of construction and operations

**JA5: Safety of construction and operations**

| | | |
|---|---|---|
| **SRA Key Topic: 5**<br>Safety of construction and operations | | **Type of activity:**<br>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** | Sylvie Voinis<br>Sylvie.Voinis@andra.fr<br>Myriam Rabardy<br>myriam.rabardy@andra.fr | **BMWi** | W. Bollingerfehr<br>Bollingerfehr@dbe.de |
| **COVRA** | Erika Neeft<br>Erika.Neeft@covra.nl (Ewoud Verhoeft) | **Nagra** | **P. Zuidema**<br>**Piet.Zuidema@nagra.ch** |
| **NDA** | Steve Barlow<br>Steve.BARLOW@nda.gov.uk | **ONDRAF** | Philippe van Marcke<br>p.vanmarcke@nirond.be |
| **Posiva** | 5.1 & (5.2) Vesa Ruuska<br>Vesa.Ruuska@Posiva.fi & E . Palonen<br>Erkki.Palonen@Posiva.fi | **RAWRA** | Ilona Pospiskova<br>pospiskova@rawra.cz |
| **SKB** | Jan-Olof Stal<br>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 incl. 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, also operational procedures will 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 (interest expressed immediately on getting notice)
  - Belgium, ONDRAF-NIRAS
  - Finland, POSIVA
  - Germany, BMWi/DBE
  - UK, NDA RWMD
  - Netherlands, COVRA
  - Sweden, SKB
  - Switzerland, Nagra

  France, Andra

**Preliminary Questionnaire**

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

**ORWG Way forward**

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

**Updated Information: Piet Zuidema - June 6, 2013**

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

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

| | | |
|---|---|---|
| **SRA Key Topic: 1**<br>Safety case | | **Type of activity:**<br>TSWG |
| **Joint Activity leader:** | **Piet Zuidema** Piet.Zuidema@nagra.ch | |

**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:**
ORWG
Report to Executive Group by the JA Leader

**Time table:** As from 2012 to 2020

**ORWG**

**Interested EG members**

| | | | |
|---|---|---|---|
| **Andra** | Guillaume Pepin<br>guillaume.pepin@andra.fr | **Nagra** | **Piet Zuidema**<br>**Piet.Zuidema@nagra.ch** |
| **NDA** | Steve Barlow<br>Steve.BARLOW@nda.gov.uk | **ONDRAF** | M.Capouet<br>m.capouet@nirond.be |
| **Posiva** | Kari Koskinen<br>Kari.Koskinen@Posiva.fi | **PURAM** | Attila Baksay |
| **RAWRA** | Dmitrij Lukin<br>lukin@rawra.cz | **SKB** | Patrick Sellin<br>patrik.sellin@skb.se |

**TSWG Content of the activities**

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

## TSWG UP DATE Pilot Project

**Pilot project on material interaction**

- Aim: check feasibility of a study to check the appropriateness for future joint studies and/or experiments
- Participants: only those that actively work on the design of the overall engineered barrier system (EBS) (incl. sealing/backfilling) and the evaluation of its long-term performance (not only on selected elements)
- Elements of pilot project
    - Overview on systems investigated (repository types, cementitious/clay based concepts/other concepts)
    - Materials used in EBS (and backfill/sealing systems)
    - Phenomena considered with respect to interaction of different materials → impact on long-term evolution
    - Overview on judgement of importance of different interactions for overall safety
    - Overview on judgement of maturity of understanding / our ability to estimate/bound consequences
    - Reports available? (confidential, open)
    - Interest in sharing information (and how information will be used)?
- First: find out who is interested and has experience, and if sufficient overlap exists in areas of interest

**Some background**

- Broad categories of interest and priorities are defined in the SRA and Deployment Plan under
    - Key Topic 2
    - Key Topic 3
- Various categories of interactions of repository materials are outlined in following overheads as a basis to explore common interests
- The focus is materials interactions as a basis for understanding long-term performance rather than technology demonstration

***SF / HLW repositories*** *(clay based systems)*

- Type of interaction The general theme is impacts on barrier performance (chemical, microstructural, hydraulic and mechanical interactions
- Near field
    - Rock – liner
        - Interaction of cementitious (or metal) liner with host rock
    - Liner – backfill
        - Interaction of cementitious (or metal) liner with bentonite or clay-based backfill
    - Backfill – canister
        - Interaction of clay-based or cement-based backfill on canister corrosion and of corrosion products on backfill
    - Waste container – waste form
        - Interaction of corrosion products on HLW glass or SF dissolution
- Sealing (backfill) system

- Cementitious seal – rock
- Clay-based seal – cement
- Clay-based seal – rock

***L/ILW repositories (cementitious systems)***

- Type of interaction - the general theme is impacts on barrier performance (chemical, microstructural, hydraulic and mechanical interactions)
- Near field
  - Rock – liner
    - Interaction of cementitious liner / shotcrete / steel with host rock
  - Liner – backfill – canister
    - Interaction of liner, clay-based or cement-based backfill on waste packages (canisters for L/ILW), such as canister corrosion and of corrosion products on backfill
  - Backfill – canister –waste form
    - Interaction of corrosion products with cement and waste form (metallic waste, organic waste and cement)
- Far field
    - Cementitious seal – rock
    - Clay-based seal – cement
    - Clay-based seal – rock

**Next Steps:** Submission of a questionnaire**.**

**Updated Information: EG8 - June 20, 2012**

## 6.8 JA7: Monitoring programme

**JA7: Monitoring programme**

| | | |
|---|---|---|
| **SRA Key Topic: 6**<br>Monitoring | | **Type of activity:**<br>TSWG |
| **Joint Activity leader:** | **To be decided** | |

**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** | Stéphane Buschaert<br>stephane.buschaert@andra.fr | **BMWi** | M. Jobmann jobmann@dbe.de<br>W.Steininger walter.steininger@kit.edu |
| **ENRESA** | J.C. Mayor jmaz@enresa.es ;<br>Jose Luis Fuentes | **Nagra** | Bernd Frieg<br>bernd.frieg@nagra.ch |
| **NDA** | Chris Finch<br>Chris.finch@nda.gov.uk | **ONDRAF** | M. Van Geet<br>m.vangeet@nirond.be |
| **Posiva** | Jere Lahdenperä<br>Jere.Lahdenpera@Posiva.fi | **RAWRA** | Jitka Miksova<br>miksova@rawra.cz |

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

**TSWG Content of the activities**

***Explanation of the contents of the activity*:**
IAEA-Glossary on performance confirmation (PC): "Tests carried out at a repository, usually after waste emplacement but prior to license termination, to confirm that the repository is performing as anticipated when emplacement of waste was authorized."
PC-monitoring is a subject of a comprising monitoring strategy and focuses mainly at the operational phase of a repository. Therefore, the programme and all the related activities to test / check the performance are to be started and completed as far as possible during this stage of the repository evolution. This could be based upon a given, often national waste management programme specific, approach and may reduce the requirements for monitoring in general.
The activity should also address the availability of techniques and comprises a compilation, thorough analysis, and evaluation. Based upon this, the necessity and appropriateness of potential new approaches or adaptation of consisting ones should be clarified, as a basis for further decisions.
Applicability of techniques for performance monitoring and for pre-closure management, e.g. decision making processes.
Identification of the possibilities for monitoring the EBS (behaviour, integrity, surveillance, input for safety evaluations) in the operational stage. Development of adequate monitoring procedures and techniques

| **TSWG** |
|---|
| ***Short description of activity:***<br>• Expert review and evaluation of available results and acquired knowledge on monitoring with regard to performance confirmation (e.g. literature survey, MoDeRn-Project, other activities) and for underground applications<br>• Compilation of national monitoring approaches/strategies and their evaluation regarding performance confirmation<br>• Overview of the technical requirements that will need to be addressed when developing, selecting and implementing monitoring technologies applicable during the operational phase and the early post-closure phase<br>• General requirements for using monitoring techniques for decision making processes during the operational phase until final closure.<br>• Check the state-of-the-art of existing performance confirmation strategies and programmes (basic rules, regulatory requirements)<br>• Answering the questions: which processes and parameters are to be monitored, how and by which means (e.g. test plans), when is monitoring required (staged, continuously), who is responsible for what (performing the task, regulatory issues), how is stakeholder involvement possible, what are national/concept specific issues (e.g. pilot repository concept) or general issues<br>• Standards for performance confirmation and influencing issues (regulatory boundaries, scientific boundaries, uncertainties, technological advancements or restraints)<br>• Comparison of the potential monitoring needs with the available options and techniques thus highlighting gaps in knowledge of monitoring techniques that still need to be addressed<br>• Consequences for confirmation programmes: scientific-technological (open questions, continuous R&D, targeted R&D), social aspects, tests, experiments, analyses; benchmarking), check against license conditions<br>• Types of parameters (reduced set, general set, concept specific set, key parameters): thermal, hydraulic, (radio)chemical, rock (geo) mechanical, others (operational safety conditions and safeguard issues)<br>• Decision on which further activities to fill knowledge gaps (if necessary by targeted R&D), or required (TSWG, TEP): update of strategies, refinement and/or adaptation of programmes, formalization of approaches |
| ***TSWG Way forward***<br>• EC FP 7-Project "Monitoring Developments for safe Repository operation and staged closure (MoDeRn)<br>• Organisation on a WG during EF4 on the way forward after completion of the modern Project<br>• Definition of the scope of a potential targeted R&D and demonstration project on the current technology gaps identified by MoDeRn (Intl. Conference, March 20-21, 2013):<br>– Sensing technologies<br>– Data transmission systems<br>– Long term power supply systems<br>– Durability of electronics, fibre optics and associated materials<br>• Influence of radiation |
| **Updated Information: Juan-Carlos Mayor - April 24, 2013** |

## 6.9 JA8: Safety Case benchmarking

| **JA8: Safety case benchmarking** | | |
|---|---|---|
| **SRA Key Topic: 1**<br>Safety Case | | **Type of activity:**<br>ORWG |
| **Joint Activity leader:** | **GRS/Andre Rübel** andre.ruebel@grs.de | |
| **Joint Activity leader contact in IGD-TP EG**<br>(if not leader) | **BMWi/KIT Walter Steininger**<br>walter.steininger@kit.edu | |

**SRA Topics:**

| N° | SRA Topic | Priority |
|---|---|---|
| 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:** As from 2013 to 2016

**TSWG**

**Interested EG members**

| | | | |
|---|---|---|---|
| **Andra** | Guillaume Pepin<br>guillaume.pepin@andra.fr | **BMWi** | **André Rübel**<br>andre.ruebel@grs.de |
| **ENRESA** | Miguel Angel Cunado<br>mcup@enresa.es | **Nagra** | Jûrg Schneider<br>Juerg.Schneider@nagra.ch |
| **NDA** | Lucy Bailey<br>lucy.bailey@nda.gov.uk | **ONDRAF** | M.Capouet<br>m.capouet@nirond.be |
| **Posiva** | Lasse Koskinen<br>Lasse.koskinen@Posiva.fi | **RAWRA** | Antonin Vokal<br>vokal@rawra.cz |
| **SKB** | Allan Hedin<br>allan.hedin@skb.se | | |

**TSWG Content of the activities**

Explanation of the contents of the activity:

1. Setting the base line: compilation of principles and methods for obtaining confidence in the long-term safety of geological disposal.
2. Summary of the scientific basis for performance (PA) and safety assessment (SA) (data, models and computer codes) from Topic 1.1
3. Compilation of evolution scenarios for geological repositories and their application in the safety case approaches in the individual WM programmes.
4. Evaluation of the results of sensitivity analyses with identification of existing uncertainties and proof of repository system robustness.
5. Strategy for further refinement of the PA/SA methods used by the individual WM programmes.

Agreed by a number of WMOs and stakeholders and published by OECD/NEA [7] 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 and system specific safety assessments form an essential part of that combining the assessment basis and the performance assessment of the geological repository. An essential challenge is the safety assessment for long time-scales with the respective uncertainties. In order to increase confidence completeness, consistency and advanced state-of-the-art of the different means and methods used for safety assessments have to be checked and commented.

***Short description of activities:***

- First activity: Check the identification and conceptualisation of safety relevant features, events and processes (FEPs) and scenarios (assessment basis).
- Second activity: Check the appropriate assessment models and their present state as well as the completeness of the required data (how good is good enough).
- Third activity: Check the assessment capability and the quality management for proper application of methods, models and data bases.
- Fourth activity: Evaluate the confidence in the calculated long-term safety.
- Fifth activity: Elaborate a logical framework for all activities required in the course of assessing, evaluating, enhancing and communicating confidence.

**TSWG for formulating a project proposal**

**Proposal for a future benchmarking project on integrated models**

- Integrated models
- Abstraction from process level modelling
- Further develop procedures for UA/SA
- Analyse uncertainties / robustness of models

***Work package A***

Handling of uncertainties in model calculations

- Quantification of uncertainties
  - Development and application of procedures for determination probabilistic density functions (pdfs) treatment of model uncertainties
  - Develop some guidance
- Agreement on common procedures for the benchmark
  - Determination of pdfs
  - Treatment of model uncertainties
  - Treatment of random and epistemic uncertainties

***Work package B***

Benchmarking of safety assessment approaches

- Identify and select recent safety cases to be considered and discuss and document treatment of uncertainties in these safety cases
- Detailed description of the reference cases (and variants)
  - Scenarios
  - Considered processes
  - Models
- Deterministic calculation cases of recent studies (reference cases and variants)
  - Source term

- Repository near field
- Total system

Improvement of understanding of system functionality

- Uncertainty/Sensitivity analysis for selected repository (sub-)systems
  - Source term
  - Repository near field
  - Total system
  - Identify and compare robustness of sub-system models
  - Identify and compare future R&D needs to reduce most relevant uncertainties

***Work package C***

- Application and evaluation of different methods
  - Regression and correlation methods
  - Variance based methods
  - Emulation methods
  - Non-parametric methods
- Application and evaluation of the applicability to
  - Different types of repository models (clay, salt, granite)
  - Different subsystems
- Recommendation of reliable procedures for sensitivity analyses

**TSWG Way forward**

- IGSC topical session on uncertainty/sensitivity analysis (Paris, 09. October 2012)
- Report on the status and open questions in the different countries
- Application in recent safety cases/studies
- Starting point for planning the future work within the IGD-TP
- Found a TSWG to prepare a project / activity in 2013
- Initiate a TEP or other joint activity in 2014

**Updated Information: EG8 - June 20, 2012**

## 6.10 JA9: Safety Case Peer Review

| **JA9: Safety case Peer Review** | | |
|---|---|---|
| **SRA Key Topic: 1**<br>Safety Case | | **Type of activity:**<br>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<br>sylvie.voinis@andra.fr | **BMWi** | Jan Weber jan.weber@bgr.de<br>Ulrich Noseck ulrich.noseck@grs.de |
| **Nagra** | Jûrg Schneider<br>Juerg.Schneider@nagra.ch | **NDA** | Cherry Tweed<br>cherry.tweed@nda.gov.uk |
| **ONDRAF** | C.Depaus<br>c.depaus@nirond.be | **Posiva** | Juhani Vira<br>**Juhani.Vira@Posiva.fi** |
| **RAWRA** | Jiri Slovak<br>slovak@rawra.cz | **SKB** | Allan Hedin<br>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***<br>• Two answers to the questionnaire have been received so far. It is asked in EG 9 if there is still an interest to progress this activity.<br>• At EG 9 EG members decided to put the activity on hold due to the lack of answers and availability of participants<br>• The Secretariat confirmed that the new web site should be used to send out calls for experts |
| **Updated Information: EG9 - November 30, 2012** |

## 6.11 JA10 Long-term stability of bentonite in crystalline environments

| **JA10 Long-term stability of bentonite in crystalline environments** | | |
|---|---|---|
| **SRA Key Topic: 3**<br>Technical feasibility and long-term performance of repository components | | **Type of activity:**<br>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<br>olivier.leupin@nagra.ch | NDA | Lucy Bailey<br>lucy.bailey@nda.gov.uk |
| Posiva | Petri Korkeakoski<br>petri.korkeakoski@Posiva.fi | RAWRA | Irena Hanusova<br>hanusova@rawra.cz |
| SKB | ***Patrik Sellin, P.Wikberg***<br>***peter.wikberg@skb.se*** | | |

**TSWG Content of the activities**

**Explanation of the objectives of the activity:**

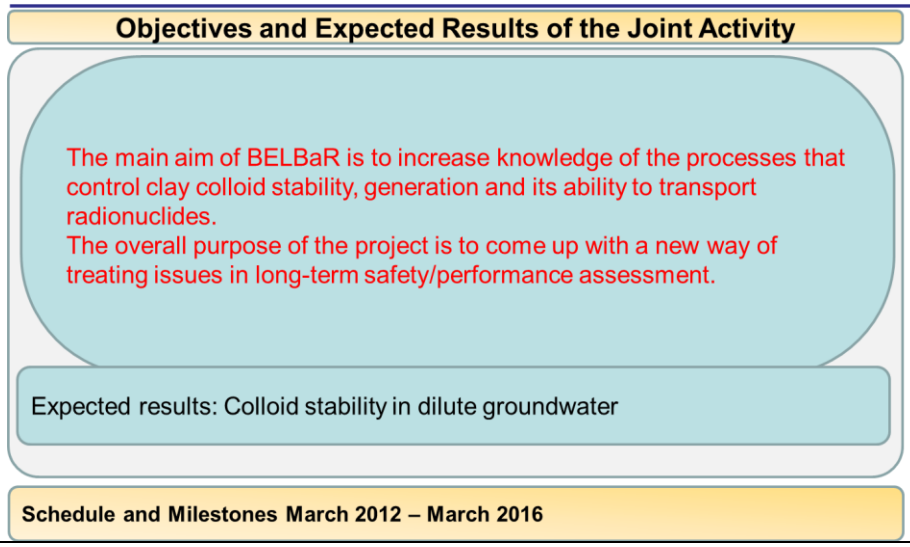
A project could consist of several parts:

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

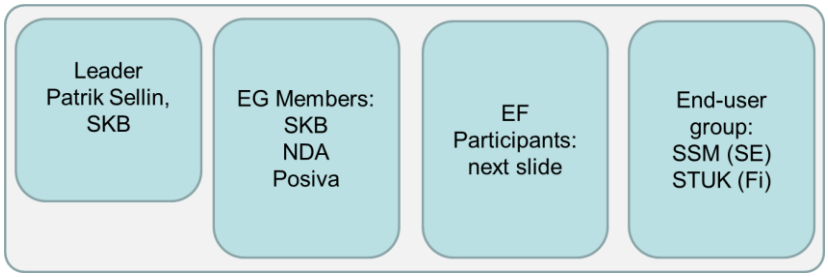
## EC Project BELBaR

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

### BELBaR Objectives




### *BELBaR Consortium*




### *EF Participants*

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

***BELBaR Work Packages***

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

**Updated Information: EG9 - November 30, 2012**

## 6.12 JA11a: Sharing of knowledge on HLW container materials behaviour

| **JA11a: Sharing of knowledge on HLW container materials behaviour** | | |
|---|---|---|
| **SRA Key Topic: 3**<br>Technical feasibility and long-term performance of repository components | | **Type of activity:**<br>ORWG |
| **Joint Activity leader:** | **NDA/** Neil Smart neil.smart@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 by NDA

**Time table:** As from 2011 to 2017

**TSWG**

**Interested EG members**

| | | | |
|---|---|---|---|
| **Andra** | Didier Crusset<br>didier.crusset@andra.fr | **COVRA** | Erika Neeft<br>*Erika.Neeft@covra.nl (Ewoud Verhoeft)* |
| **Nagra** | Lawrence Johnson<br>lawrence.johnson@nagra.ch | **NDA** | ***Cristiano Padovani***<br>***cristiano.PADOVANI@nda.gov.uk*** |
| **ONDRAF** | M. Van Geet<br>m.vangeet@nirond.be | **Posiva** | Marjut Vähänen<br>Marjut.Vahanen@Posiva.fi |
| **RAWRA** | Ilona Pospiskova<br>pospiskova@rawra.cz | **SKB** | Peter Wikberg<br>peter.wikberg@skb.se |

**Updated Information: EG9 - November 30, 2012**

## 6.13 JA12: ORWG on Adaptation and optimisation of the repository

**JA12: ORWG on Adaptation and optimisation of the repository**

| | | |
|---|---|---|
| **SRA Key Topic: 4**<br>Development Strategy of the repository | | **Type of activity:**<br>ORWG |
| **Joint Activity leader:** | **RAWRA/ J. Slovak** slovak@rawra.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<br>Jean-Michel.Bosgiraud@andra.fr | **BMWi** | Walter Steininger<br>walter.steininger@kit.edu |
| **Nagra** | Thomas Fries<br>thomas.fries@nagra.ch | **NDA** | Sam King<br>Samantha.King@nda.gov.uk |
| **ONDRAF** | M. Van Geet<br>m.vangeet@nirond.be | **PURAM** | Peter Molnar<br>molnar.peter@rhk.hu |
| **RAWRA** | **Jiri Slovak**<br>**slovak@rawra.cz** | **SKB** | Peter Wikberg<br>peter.wikberg@skb.se |

**ORWG Content of the activities**

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

**ORWG Description**

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

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

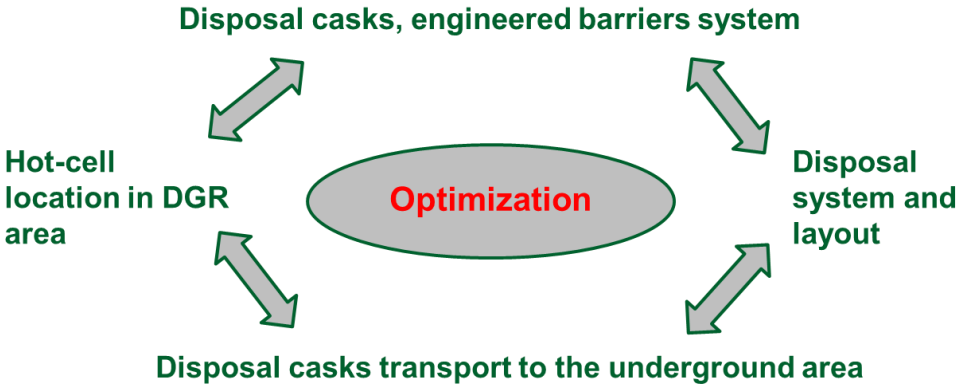
**ORWG Proposal (EF3 Nov 2012)**

## DGR design optimization

Radioactive Waste Repository Authority

Marketa Dvorakova

29th November 2012, Paris



# 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

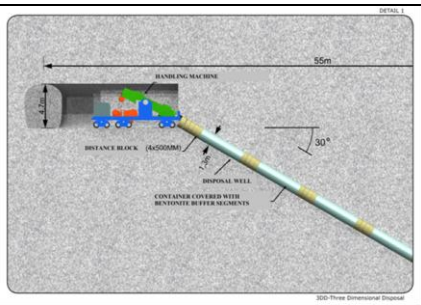
**In dependence on cask´s construction to check:**

- **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

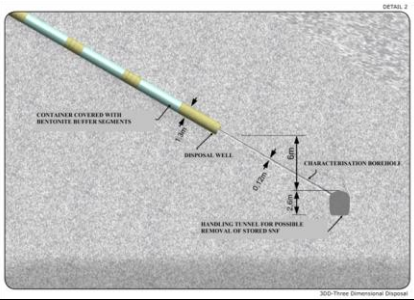
| Horizontal | | Vertical | |
|---|---|---|---|
| pros | cons | pros | cons |
| • Need of smaler area | • More demanding manipulation with casks and bentonite blocks *(long disposal drifts)* | • More simple manipulation with casks and bentonite *(1 cask´s boreholes)* | • Need of large area |
| • Smaller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

## 6.14 JA13: IEP on communicating result from RD&D

| **JA13: IEP on communicating result from RD&D** | | |
|---|---|---|
| **SRA Cross cutting Activities**<br>Communication | | **Type of activity:**<br>IEP |
| **Joint Activity leader:** | **NDA/** R. Kowe raymond.kowe@nda.gov.uk | |
| | | |
| **Product/Result from the activity:**<br><br>Scientific dissemination associated with WP2 of FP7 project SecIGD2<br><br>**On-going activity:** FP7 project SecIGD2 WP2 | | |
| **Time table:** current activity 2013-2015, permanent | | |
| **IEP on communication** | | |
| **Interested EG members** | | |

| | | | |
|---|---|---|---|
| **Andra** | Anabelle Comte<br>anabelle.comte@andra.fr | **Nagra** | Lawrence Johnson<br>lawrence.johnson@nagra.ch |
| **NDA** | Neil Smart<br>neil.smart@nda.gov.uk | **ONDRAF** | M. Van Geet<br>m.vangeet@nirond.be |
| **Posiva** | Timo Seppälä<br>timo.seppala@Posiva.fi | **RAWRA** | Jiri Slovak<br>slovak@rawra.cz |
| **SKB** | Berit Lundqvist<br>berit.lundqvist@skb.se | | |

| **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 NDA.**<br><br>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".<br>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.<br><br>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

**Updated Information: EG9 - May 2013**

## 6.15 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 and link to CMET actions**

**Objectives:**
- Transfer of state-of-the-art, competence needs of GD community for reaching "Vision 2025"
- Quality assurance of training for professionals with voluntary accreditation
- Develop content of training needed for implementation of the SRA
- Ensure indirectly that providers and new personnel will be available.

The CMET actions towards these 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 for carrying out the work defined in the project's Work Package 3 (2013-2015). This assistance includes at least the organisations of 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 foreseen to apply the ECVET approach.

**Expected results**

***Actions in 2013:***
- A strategy and action plan for CMET for the DP 2011-2016
- Address the accreditation of training concepts using the ECVET approach

***Actions in 2014-2015:***
- Continue with the implementation of identified actions minimum one per year
- Interact with other related groups and initiatives like EHRO-N, EETI, PETRUS

**On-going work**

- The work on the content outline of the Strategy and Action Plan (StrAP)
- Update of Terms of Reference of CMET (v.2) in final draft phase
- Set up of Projectplace folder for the group to be used for material sharing; set-up of a LinkedIn CMET group for discussions; the use of JA14 page of the www.igdtp.eu website for public announcements and e.g. CMET related announcements of events are published in the www.igtp.eu calendar for wide outreach.
- IGD-TP and especially CMET is represented in the EHRO-N SAG[8] and also representation and input for the the SET-Plan EETI[9] assessment report's working group on Nuclear was provided by its chair.

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

- Second CMET meeting is tentatively taking place in October-November 2013

**Major achievements during 2013**

- Input for the the SET-Plan EETI10 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 Report11 "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".
- First CMET WG meeting held in April 2013 with 15 participants from 13 organisations and 10 European Member States.
- A short survey on the Joint Activities CMETneeds was sent to the IGD-TP activity leaders to collect background information for the first meeting
- The first CMET meeting participants produced data on the current geological disposal education and training programmes in their respective Member States
- Abstracts to Euradwaste 13 and NestET2013 were submitted and NestET2013 abstract approved.

## CMET Competence Maintenance, Education and Training Working Group

**Joint Activity participants**

25 organisations from 12 European Member States have volunteered for the CMET.
CMET is continuously open for new volunteers into the group.

| | | | |
|---|---|---|---|
| **BMWi** | KIT /Walter Steininger<br>walter.steininger@kit.edu | **ENRESA** | J.Farias<br>jfas@enresa.es |
| **Nagra** | Ingo Blechschmidt<br>Ingo.blechschmidt@nagra.ch | **NDA** | Robert Winsley<br>robert.winsley@nda.gov.uk |
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Posiva, NDA and Andra are also supporting the activity through the SecIGD2 project.

**EF participants volunteered for the activity**

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TU Clausthal, IELF (DE), Klaus Röhlig
JRC - ITU (EC), Gunnar Buckau
CIRTEN13 - University of Pisa (IT), Rosa Lo Frano

[10] European Strategic Energy Technology Plan (SET-Plan), Energy Education and Training Initiative, Assessment Report
[11] http://www.eesc.europa.eu/?i=portal.en.events-and-activities-symposium-on-nuclear-fission-papers.26350
[12] Bundesanstalt für Geowissenschaften und Rohstoffe

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**Other interested participants**

TU Braunschweig (DE), Wernt Brewitz

[13] Inter-University Consortium for Nuclear Technological Research
[14] Universidad Politechnica de Madrid
[15] Slovak University of Technology in Bratislava

**Description of the drivers for the activity:**

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 recent updates on 2013 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 also 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

[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)

financial viability. The main mobility funding resources are tied to formal degree programmes at universities and other higher education institutions. In addition, the funding is often allotted on an individual basis and not aimed at groups of students and their tutors.

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

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

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


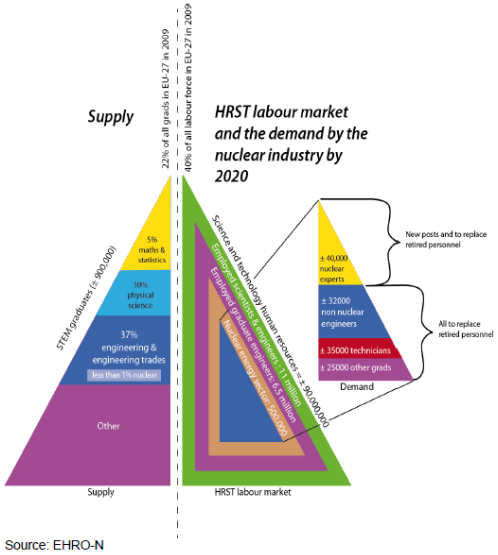


*Figure 1*: Supply and demand sides of HR resources in nuclear (according to EHRO-N). Supply side is taken care by governments and educational institutes/training providers and the demand side looks at how much HR is needed and in what type of competence areas. The IGD-TP CMET works on the demand side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

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

and action plan of the CMET group.

In Europe, there is very limited specific formal in-depth education leading to a degree in geological disposal. Also the amount of wider educational or training programmes is limited, though their number has increased since the beginning of this century. In geological disposal, learning on the job and in RD&D[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 new "Waste Directive"[22] shall be adopted in the European Member States by 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 (NWD) 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

[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.

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

The ECVET[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, CINCH, ENETRAP2 and in the new PETRUS3. 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 E&T Roadmap. 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 May 2013**

[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) for the SET-Plan Education and Training Roadmap Development, An assessment report to be published in Summer 2013 e.g. http://www.setplan2013.ie/dl/session5/14.00-14.20_Gilles_Lequeux.ppt

## 6.16 JA15: Nuclear Knowledge Management

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

**ORWG on Nuclear Knowledge Management**

**Interested EG members**

| | | | |
|---|---|---|---|
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## ORWG on Nuclear Knowledge Management

**Objectives and Expected Results of the Joint Activity**

**Objectives of ORWG**:
- to survey current activities in the area of knowledge management (KM)
- to identify potential interests in cooperation in the area of KM
  - –joint project(s)
  - –regular information exchange
  - –exchange of practices, applications

**Expected results of ORWG**:
Agreement on possible joint actions in the area of Knowledge Management

**Major achievements**

- Meeting in Helsinki 9 October 2012 (summary notes attached)

**Work plan for 2013**

- Workshop on selected Knowledge Management topics in Spring 2013

## Experts Meeting in Helsinki 9 October 2012

### Preferred Definition: Nonaka (1991)

- "Knowledge Management is the discipline of enabling individuals, teams and entire organisations to collectively and systematically create, share and apply knowledge, to better achieve their objectives"

## Status Presentations

- different focuses:
  technical – organisational –social
- different expectations/goals of KM
- different levels:
  data – information – knowledge
- continuous development – specific projects
- scope for international cooperation exists

## Topics (1)

- Data handling and storage
  - Data Bases for R&D, investigations, inventories, logistics
- Information management
  - Document handling and archiving
  - report libraries, search machines
- Structuring of knowledge
  - tracing the data and information processing
  - construction of the safety arguments
  - requirements management systems
  - different end-users have different utilisation needs

## Topics (2)

- Knowledge transfer and maintenance
  - transfer of tacit knowledge and experience
  - social/living memory
  - revisiting the existing information
  - long-term preservation of information
- Competence development
  - validation, metrics
  - coaching, mentoring
  - history projects
- Organisational development
  - safety cultures
  - processes' support

**Discussion**

- the meeting brought up the many facets of knowledge management
  - and the importance of precise terms in this area
- common goals and concerns
  - improvements in clarity and traceability of presentation of RTD results and safety arguments
  - maintenance of organisational memory and competence
  - development of organisational culture and management practices
  - utilisation of up-to-date IT tools

**Step Forward**

- a focused workshop on selected themes proposed and discussed at the meeting
  - description/benchmarking of good practices
  - detailed presentations of some of the technical approaches presented
  - brainstorming: "ten new ways to do our work"
  - agreement on possible further steps
  - clarification of KM definition for appropriate focus in the nuclear waste disposal area
  - identification of possible ways for KM implementation
  - Link with „long-term preservation" activities
- the present ORWG will elaborate the workshop program
  - potential participants?
  - potential date – spring 2013?
  - volunteers for host organisation?

**Updated Information: EG9 - November 30, 012**