IGD-TP

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Implementing Geological Disposal of Radioactive Waste Technology Platform

Deployment Plan 2011–2016

June 2012

EURATOM

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Contents

1 Executive summary

In the field of radioactive waste management, the major challenge is to have the geological repositories implemented to dispose of spent fuel, high-level and other long-lived wastes. As a joint effort, the waste management organisations of several European countries launched in November 2009, with the support of the European Commission, the IGD-TP technology platform. The common vision of this technology platform was described in the Vision Report, which is the founding document of the IGD-TP:

"*Our vision is that by 2025, the first geological disposal facilities for spent fuel, high-level waste, and other long-lived radioactive waste will be operating safely in Europe.*"

This shared vision, the "Vision 2025", among European implementers of waste management programmes was a key issue to further identify and analyse the remaining research, development and demonstration (RD&D) needs for the future geological disposal projects. The three countries closest to licensing i.e. Finland, France and Sweden, plan to commission their respective geological repositories at latest by 2025. Other countries with programmes further from licensing will benefit from the experience gained by these programmes and will contribute to further developments and thus get prepared for the work needed in their own programme by accumulating shared experience and knowledge from the IGD-TP's Joint Activities.

The Strategic Research Agenda (SRA) identified and prioritized the RD&D issues that could be pursued together in Europe to achieve the IGD-TP's vision. The SRA was published in July 2011. The strategy for the joint RD&D interest was organised in 7 Key Topics comprising of a total of 37 individual Topics. The majority of the Topics concentrates on the "Technical feasibility and long-term performance of repository components" reflecting the maturity of the repository development in the waste management programmes closest to licensing. 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 SRA document also describes the background of the SRA work, the framework and methodology for developing the SRA and the way forward to deploy the SRA.

The goal of the deployment of the activities flowing from the SRA is to assist the IGD-TP Executive Group members and participants in achieving the vision and the desired results by joint RD&D activities during the next years. The IGD-TP's Vision Report states that the main objectives of the IGD-TP are to initiate and carry out European strategic initiatives to facilitate the stepwise implementation of safe, deep geological disposal of spent fuel, high-level waste, and other long-lived radioactive waste by solving the scientific, technological and social challenges, and to support the waste management programmes in the Member States. The platform intends to constitute means to further build confidence in the solutions, to reduce overlapping work, to produce savings in total costs of research and implementation, and to make better use of existing competence and research infrastructures. This is to be done e.g. by pooling critical resources and preparing co-ordination of future projects, and also by pooling resources for other types of Joint Activities.

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 Organisational Working Group (ORWG): This is a working group with the specific purpose for organising around a Topic. Its activity focuses on either the strategic or practical organisational approaches around the respective SRA Topic (e.g. organising peer reviews or benchmarking) more than on detailing the technical matters related to a technical or scientific Topic itself.

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. Within this activity sufficient level detail for preparing a project plan and launching a joint project is made. This type of work may include e.g. 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 would provide for organised forums of exchange between the IGD-TP members and the other participants. It allows for discussion on programmatic choices made and on technical options to discuss and highlight differences and to learn from the experience of others.

4 Technical Project (TEP): This type of activity covers technical or scientific work on a specific SRA Topic. A TEP can either be immediately launched or needs very minor clarification before a detailed project plan and project agreement between the project parties can be produced before launching 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.

Each SRA Topic was classified according to this scheme 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 Topics that should be pursued first. The first Master Deployment Plan is presented in an appendix to this document. The Joint Activities included in the Master Deployment Plan are described in Activity Outlines, also detailed as an appendix to the document.

Both, the Master Deployment Plan and the Activity Outlines constitute a real management tool for the IGD-TP. Updates of the Master Deployment Plan and of the activity outlines will be undertaken as the Joint Activities progress[1].

[1] The updates of the Deployment Plan itself are linked to those of the SRA (see section 5.1.3).

2 Introduction

The Implementing Geological Disposal of Radioactive Waste Technology Platform (IGD-TP) was established to initiate and carry out Joint Activities in Europe to facilitate the stepwise implementation of safe, deep geological disposal of spent fuel, high-level waste, and other long-lived radioactive waste. It seeks to solve the remaining scientific, technological and social challenges, and thereby to support the waste management programmes in the Member States. The platform intends to enhance confidence in the solutions, reduce overlapping work, produce savings in total costs of research and implementation, and make better use of existing competences and research infrastructures.

The European Commission has been instrumental since 2002 in the establishing of Technology Platforms (TPs) as forums to improve cooperation within European R&D sectors, especially where a more strategic analysis is needed and industry needs to play a greater role. In 2011 this approach has been complemented in the field of radioactive waste management by the adoption by the EU member states of the European Council Directive 2011/70/EURATOM on establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (NWD), alongside with the existing forums of the European Nuclear Energy Forum (ENEF), European Nuclear Safety Regulators Group (ENSREG) and the technological platforms (SNETP, IGD-TP and MELODI). A central aspect to all TPs is the development of a common vision and Strategic Research Agenda (SRA) with short- and medium-term objectives, combined with implementation by appropriate deployment plans[2].

The "Implementing Geological Disposal of Radioactive Waste Technology Platform" (IGD-TP) Vision Report[3] was prepared by a group of major European waste management organisations in consultation with the wider community. This was the basis for the formal launch of the TP on November 12, 2009.

The ambition of the IGD-TP is to bring together RD&D stakeholders with various backgrounds who would develop a research and development strategy in areas of research needed to realise the Vision 2025. In June 2012 the IGD-TP had about 90 participating organisations representing a wide range of backgrounds e.g. waste management organisations (WMOs), industry, research institutes, research centres, and the academic community (the structure of the organisation is described in Appendix 4).

The IGD-TP vision (Vision 2025) is:

Our vision *is that by 2025, the first geological disposal facilities for spent fuel, high-level waste, and other long-lived radioactive waste will be operating safely in Europe.*

Our commitment is to:

- *Build confidence in the safety of geological disposal solutions among European citizens and decision-makers.*
- *Encourage the establishment of waste management programmes that integrate geological disposal as the accepted option for the safe long-term management of long-lived and/or high-level waste.*
- *Facilitate access to expertise and technology and maintain competences in the field of geological disposal for the benefit of Member States.*

The IGD-TP aims to offer benefits to all of its participants irrespective of the differences in timescales of waste management programmes in Europe. For small waste management programmes and programmes in their initial stages, the IGD-TP offers possibilities for knowledge and experience development.

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[2] For general information on Technology platforms see http://cordis.europa.eu/technology-platforms/home_en.html.

[3] IGD-TP 2009. Implementing Geological Disposal of Radioactive Waste Technology Platform. Vision Report. Published as EC special report EUR 24160 EN.

The Strategic Research Agenda (SRA) of the IGD-TP was published[4] in July 2011 and outlines a roadmap for the planning of the remaining research, development and demonstration (RD&D) activities needed to reach Vision 2025.

The SRA was developed by a working group consisting of representatives from IGD-TP's Executive Group's member organisations. The SRA working group adopted a unique, systematic and structured strategy for the development of the SRA, illustrated in Figure 2-1.

The RD&D issues to be included in the SRA were identified by the implementers in the working group. The main criteria for selection of these was the importance in their respective waste management programmes. This lead to the creation of seven thematic areas called Key Topics for RD&D defined as:

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.
7. Governance and Stakeholder involvement.

Complementary four areas for 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.

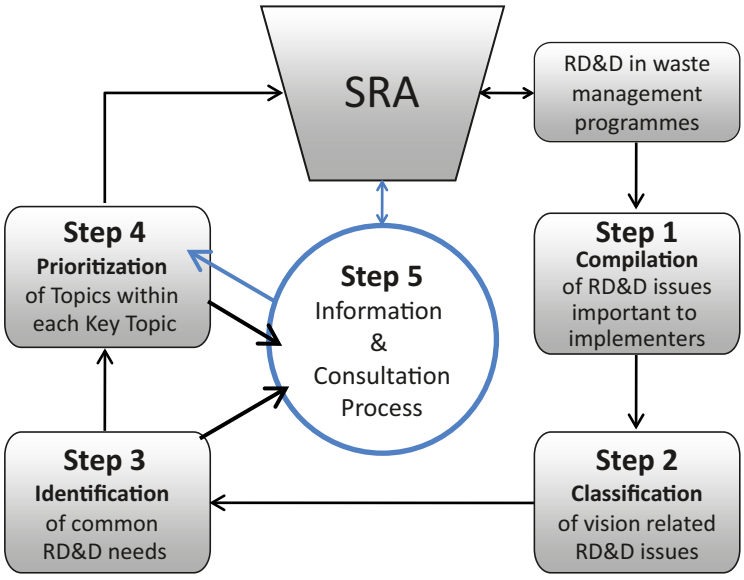

Figure 2-1. *Systematic and stepwise approach for developing the IGD-TP's SRA.*

[4] IGD-TP 2011. Strategic Research Agenda 2011. Implementing Geological Disposal of Radioactive Waste Technology Platform. ISBN 978-91-979786-0-6, see www.igdtp.eu.

Cross-Cutting Activities are needed for fulfilling the vision of the IGD-TP. They are also important for acceptance, licensing and operation of geological repositories.

The group then identified the RD&D needs they had in common within each Key Topic. These needs were formulated into Topics. A priority for these Topics was then defined based on their priority in the radioactive waste disposal programmes, their timeliness for the 2025 vision and priority for the safety case.

The final step in the process was the information and consultation process to build confidence in the coverage of the Key Topics. IGD-TP participants were consulted first at a SRA seminar in June 2010 and were asked to comment first on a preview document of the SRA in November 2010. From December 2010 to the end of February 2011 an open public consultation on the draft SRA document was performed. The input from the information and consultation processes was transferred into the document. It mirrored the level of interest and support from IGD-TP's participants and RD&D stakeholders.

The SRA is an important document for communicating the implementation oriented RD&D needs and shows opportunities for RD&D to stakeholders in the waste management community. Moreover, it is also an instrument for creating synergies, co-operation, and co-ordination with activities taking place in other technology platforms and within other international cooperation forums.

The SRA is in turn supported by a Deployment Plan (DP) for the activities and joint work to be carried out by the Technology Platform and its members and participants. This document presents the Deployment Plan for the IGD-TP giving general guidance to how the SRA could be implemented in practice. The members of the DP working group can be seen in Appendix 5.

3 The general vision of the SRA's deployment

3.1 Introduction to the purpose of the Deployment Plan

The goal of the deployment of the IGD-TP's activities is described in this chapter of the Deployment Plan in a generic way. It focuses on the general approaches needed for deploying the most important and urgent activities derived and developed from the IGD-TP's Strategic Research Agenda. The emphasis in this chapter is on "How" the IGD-TP can assist its members and participants in achieving the vision and the desired results by joint RD&D activities during the next years (2011–2016).

The IGD-TP's Vision Report states that the main objectives of the Implementing Geological Disposal of Radioactive Waste Technology Platform (IGD-TP) are to initiate and carry out European strategic initiatives to facilitate the stepwise implementation of safe, deep geological disposal of spent fuel, high-level waste, and other long-lived radioactive waste by solving the scientific, technological and social challenges, and to support the waste management programmes in the Member States.

The platform intends to constitute means to further build confidence in the solutions, to reduce overlapping work, to produce savings in total costs of research and implementation, and to make better use of existing competence and research infrastructures. This is done by making best use of existing knowledge within Member States and elsewhere e.g. by pooling critical resources and preparing co-ordination of future projects, and also by pooling resources for other types of Joint Activities as described in more detail in Chapter 4 especially Information Exchange Platforms IEPs and Technical Transfer schemes.

Furthermore, the Vision Report outlines benefits that are expected from the joint work and reduction of overlapping RD&D tasks in using the existing competence and research infrastructures.

The background factors influencing the need to initiate joint RD&D activities by the WMO's and responsible organisations themselves have been outlined in the FP6 CARD feasibility study:

- Exchange of information and experience on RD&D planning and management.
- Co-ordinated utilistaion of Europe-wide RD&D resources & assets.
- Effective utilisation of your own or national RD&D resources or assets.
- Sharing of RD&D planning (e.g. identification of goals and topics)
- Sharing of RD&D information and results
- Networking among RD&D funders, managers and stakeholders.
- Identifying centres of competence and excellence in given topics.
- Influence on own national RD&D programmes.
- Influence on EC RD&D programmes.
- Open process of identifying joint research priorities.
- Up-stream co-ordination (longer-term forward planning.

Background factors have also been outlined in the public consultation process for the forthcoming EC-Framework Programme *"Horison 2020 – the Framework Programme for Research and Innovation"*[5].

The IGD-TP's vision states further as an objective the mobilisation of public and private funds from the platform members and from other funding sources to finance implementation of the agreed strategic initiatives.

[5] http://ec.europa.eu/research/horison2020/index_en.cfm?pg=home for the documentation on the consultation: Green Paper on a Common Strategic Framework for EU Research and Innovation Funding. Analysis of public consultation, p. 3.

However, the role of public funding sources to the IGD-TP's activities is only complementary to the funding of the industry and the waste management agencies. The CARD[6] project study already indicated that 95% of the RD&D in geological disposal comes from the WMO's and other responsible organisations' budgets. This was further confirmed e.g. by a recent study produced by a Committee for Nuclear Energy Competence in Finland[7] chaired by the Ministry of Employment and the Economy, TEM in Finland.

Therefore the funding by EC's Framework Programmes contributes as an incentive for networking between organisations in Europe and some organisations from countries outside Europe. It also helps in knowledge transfer via learning in projects for all organisations but mostly for those countries whose programmes have longer implementation timeframes or are at early phases of site selection and disposal concept development.

Besides this, there are constraints when participating in the EC Framework Programme for Research and Innovation. Indeed, the public consultation[8] for the horison 2020 (2014-2020) point to the challenges concerning the speed of starting Joint Activities. The lead time from the original identification of a need for an RD&D activity to the start of the actual project and furthermore to the acquisition of the project results is often too long with regards to needs of the waste management programmes closest to licensing. The consultation also identified the need for the EC support to address all stages of the innovation chain, not merely research. Further the contractual requirements of the EC funding (including ineligibility) pose additional burden to the organisations working in the projects.

As a result of these constraints, in some cases it may be advantageous for the waste management programmes closest to licensing to set up Joint Activities that can potentially save both time and funds with respect to their objectives.

On the other hand, it should be acknowledged that Joint Activities outside the EC framework also imply coordination compromises for the activity participants, which must not exceed the benefits associated with pooling resources and saving costs. The commitment to ensure that this is not the case has already been demonstrated by the IGD-TP's members in the process of producing the SRA.

In the end the continued contribution of the EC EURATOM Framework Programme in Fission in the funding of European activities remains crucial and essential. This is needed to ensure a strong Euratom added value in research as well as the timely uptake of the recently adopted EU nuclear waste directive[9].

3.2 The foreseen roles of the IGD-TP's RD&D stakeholders in deployment

Due to the closeness of the licensing stage in some waste management programmes a clear consensus on the objectives for RD&D needs to be complemented with a solid governance framework for implementing different Joint Activities, if the members and participants of the IGD-TP wish to produce results together.

[6] CARD Project. A Co-ordination Action on Research, Development and Demonstration Priorities and Strategies for Geological Disposal. Final Report May 2008.

[7] TEM 2012.Report of the Committee for Nuclear Energy Competence in Finland. Publications of the Ministry of Employment and the Economy, Energy and the Climate 14/2012. ISSN (print) 1797-3554, ISSN (electronic) 1787-3562, ISBN (print) 978-952-227-599-8, ISBN (electronic) 978-952-227-600-1.

[8] This feedback is available on the cordis site (see http://cordis.europa.eu/technology-platforms/home_en.html).

[9] 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.

A further intention of the IGD-TP is that the activities that are initiated can be funded jointly by the Executive Group member organisations themselves. Having this in mind, the role of the IGD-TP's participants is to contribute to these activities by co-funding either in cash or in-kind, to act as competent suppliers to concrete technical projects, to work on the identification of new activities related directly to the SRA's Key Topics and lastly to assist in formulating the identified priority Topics into projects (the different types of projects are listed in section 4.2).

3.3 Common frameworks that need to be developed for the deployment

There are currently only limited common models and governance instruments for such activities emerging outside the EC Research Framework grant and consortium agreement models.

Within the EC FP7 Secretariat project, SecIGD, a survey of the IGD-TP's member WMOs and about the experiences of other Technological platforms was carried out. According to this survey, the governance framework for co-operation concepts and contracts should aim to have an agreement in advance at least on the following items when applicable to the specific Joint Activity (this list must be used more as a checklist than as an imposed list of requirements):

- Business plan or deployment plan for projects.
- Formulation of basic agreements and rules of co-operation, legal frameworks applied, liabilities.
- Time steps/timetable for Joint Activities derived from the SRA.
- Financing rules of Joint Activities.
- General principles on rights to use the products and know-how, handling of property rights and intellectual property rights (IPR) and principles of confidentiality on foreground and background.
- Rules of procurement and subcontracting.
- Definition of the various roles of IGD-TP members and participants (ToR[10]) and other stakeholders in deployment and Joint Activities.
- Support to IGD-TP (Secretariat).
- Relation to other stakeholders and public relation.

For the *Project Management* of the individual activities a common model(s) of project management should be developed following the Integrated Management Systems (including e.g. ISO 9001) of the WMO's and the guidelines derived from ISO 10006 (2003). The generic list of project management items for the Joint Activity management is given in Appendix 3 and in the IGD-TP's Management Guidelines v.1 available at www.igdtp.eu.

The governance framework and the project management models need to include enough flexibility to take into account the needs of the different types of activities identified for the deployment of the SRA. This is addressed in Chapter 5.2.3 and described in Appendix 3. The guidelines need to be used in a flexible manner taking into account that neither are all activities strictly implemented as the types of Joint Activities defined in Chapter 4 nor are all items of the produced checklist applicable to each Joint Activity.

[10] ToR: Terms of Reference. IGD-TP's Terms of Reference are available at www.igdtp.eu.

4 Grouping of the SRA contents for their deployment

4.1 Revisiting the contents of the SRA

The Strategic Research Agenda (SRA) of the IGD-TP was published in July 2011, eighteen months after the Vision Report. The initial input for the SRA's content was derived from the RD&D priorities of organisations either being responsible for implementing a waste management programme or being formally responsible for the RD&D programme needed for implementation i.e. the IGD-TP's Executive Group.

With the SRA it was intended:

- To address the remaining scientific, technical and social challenges in the perspective of preparing for license applications for the industrial operations to fulfil the vision that in 2025 (Vision 2025), the first geological disposal facilities for spent-fuel, high-level waste, and other long-lived radioactive waste will be safely operating in Europe.
- To improve and build up their knowledge base on the task related to the staged repository development that still lies ahead for the waste management programmes beyond the Vision 2025.

Inputs and comments from the participants and other stakeholders of the IGD-TP have been incorporated in the SRA as a result of consultation processes.

The outcomes from the deployment mainly result from the launch of coordinated RD&D activities derived from the common SRA in support of the above mentioned goals. In parallel to this, coordinated Joint Activities and their generated results can also benefit programmes with later implementation dates, including also knowledge and technological transfers where relevant.

In the SRA seven Key Topics were identified. Additionally Cross-Cutting Activities (CC) and Waste Management programme specific activities (WMS) are also identified. The list of the Key Topics with their contents[11] is given below in Table 4-1. The Cross-Cutting and Waste Management programme specific activities are given in Table 4-2.

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

Each of the Topics was characterised 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 4-1.

[11] 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 the work directed to 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 4-1. List of the Key Topics and related Topics* with their foreseen start and outcome – dates, and an indication of their priority (H: high, M: medium, L: low).

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

* Based on the contents of the SRA.

** The SRA text describing a Topic can differ from the one in the Table 4.1. The content in the table has been reformulated for improved clarity.

Table 4-2. List of the Cross-Cutting Activities (CC) and of the Waste Management programme Specific activities (WMS).

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

4.2 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 types of Joint Activities that should be used to help the implementation for 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.

The types of Joint Activities identified are the following (the order is based on the Figure 5-2).

- Organisational Working Group (ORWG).
- Technical/Scientific Working Group (TSWG).
- Information Exchange Platform (IEP).
- Technical Project (TEP).
- Technological Transfer (TT).

The types of Joint Activities are not intended to be strict categories and a given Joint Activity will evolve in its nature over time, e.g. what starts out as a Technical/Scientific Working Group will in most cases become a Technical Project.

In fact, as shown by Figure 5-2, the belief is that in general, a working group (either ORWG or TSWG), will help detail what is expected of the TEP that will follow (or to a lesser extent the IEP or TT that will follow). However, this Figure 5-2 shows the most likely routes from one activity to another but theoretically other possibilities exist (e.g. starting a TEP or an IEP without the initial planning Working Group step).

To supply operational guidelines to the Joint Activity partners it seems adequate to describe these different types for Joint Activities knowing that the descriptions made are intended to be a starting point for looking at the deployment alternatives for the different Topics and Cross-Cutting Activities. Abbreviations of the type of Joint Activities are used instead of their full names in the text, tables and appendices of this document. The more specific generic content of each type of Joint Activity is described in the following. Detailed pilots employing these types of Joint Activities are described in section 4.3 and Appendix 1.

An Organisational Working group (ORWG)

Approach in this type of activity

This Joint Activity consists of a working group coming together for the specific procedural purpose for organising around a Topic. Its activity focuses on either the strategic or practical organisational approaches around the respective SRA Topic (e.g. organising peer reviews or benchmarking) more than on detailing the technical matters related to a technical or scientific Topic itself. The Organisational Working Group aims to have a task and a time specific focus compared to an Information Exchange Platform (IEP), which can address several Topics during its lifetime. The outcomes of an ORWG can also provide for more permanent infrastructures e.g. in the case of organising expert pools for peer reviews or improvements in organisational efficiency at the participant organisations via benchmarking practices. The ORWG can also define what parts of the Topic could be covered in an IEP or a TT.

Organisation of the ORWG

The ORWG is organised as a working group consisting of experts with knowledge, skills and competence in a specific Topic area. The cost contributions for the participation in this type of activity depend on the type of activity. The group does not engage directly in scientific or technical work related to addressing an issue, even though the group is task and time specific in its focus and has a fixed lifetime as a working group.

Main distinguishing features defining an ORWG are:

- This Joint Activity type is well suited for working together when there is a need to initiate peer reviews, hotlines or expert pools on a specific area related to the Key Topics and Topics.
- ORWGs are also appropriate in the case of identifying standards, and other types of reference documents, or for improving existing documentation.
- Also such an activity can focus on evaluating the impact of new specific activities and in preparing roadmaps for the future.

The Topics suited for this type of activity for example are at this stage (numbering of the listed Topics refers to the SRA Key Topic and to its related Topic):

- Safety case communication on the short-term, transient and long-term aspects of geological disposal (Topic 1.2).
- Construction of underground facilities: Confirmation of rock properties for final detailed repository design is required (Topic 3.3).
- Repository layout design including operational safety, reversibility and retrievability (Topic 3.4).
- Competence maintenance, education and training (CMET) (Crosscutting Activity no 2).
- Knowledge management (NKM) (Crosscutting Activity No 3).

A technical and/or scientific working group (TSWG)

Approach in this type of activity

This is a working group with the specific purpose of developing a scientifical or technical Topic. It conducts preparatory work on a Topic to generate a possible technical project (TEP). The activity's primary aim is preparing a project plan for the TEP. This type of work may include e.g. 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. The outcome of the work can be the establishment of a technical project or transmitting the Topic e.g. for further exchange to an Information Exchange Platform or for Technological Transfer. The lifetime of this activity is limited according to its defined task.

Organisation of a TSWG

In this type of Joint Activity, each party sends members to be engaged in the work of the group and covers their own costs of participation, and offers to organise the group meetings on a rotating basis. Such type of working group activities have long existed among the IGD-TP members and have also involved the organisation of dissemination workshops to introduce the results. For a Topic of a narrower scope, organising a joint workshop of experts may also address the Topic sufficiently.

Main distinguishing features for defining a TSWG

The activity is suited to be initiated on a Topic, when the Topic's subject needs to be analysed by a group of experts prior to being turned into a Technical Project (TEP). The analysis done in the TSWG can concern the exact technical/scientific scope of the project, the description of a project plan or, more generally, a mix of both. The TSWG can also define what parts of the Topic could be covered in an IEP or a TT.

The Topics suited for this type of activity are for example at this stage (numbering of the listed Topics refers to the SRA Key Topic and to its related Topic):

- Increase the confidence in testing and further refinement of the tools used in safety assessments (Topic 1.1).
- Increase confidence in and refinement of sensitivity and uncertainty analyses (Topic 1.3).
- High burn-up fuels: rapid release fraction and matrix dissolution (Topic 2.1).

Information exchange platform (IEP)

Approach in this type of activity

This type of activity would provide for organised forums of exchange between the IGD-TP members and the other participants. It can be that one part of the participants in the IEP is in possession of some specific expertise, infrastructure or knowledge that the other participants are interested in knowing for their programme or organisation for moving ahead to the next stage of their repository development[12] or the exchange subject is common and benchmarking is looked for. The participants of the IEP agree to share the information among them voluntarily.

Organisation of the IEP

Information Exchange Platforms are commonly used within the activities of the IAEA[13], where each platform consists of a network of partners and participants. The organisation of an IEP is based on some form of mutual understanding between partners (it could be a memorandum of understanding or information exchange agreements on a non-commercial basis). Each party to the platform covers their own costs of participation and offer to organise the platform meetings in turns.

Main distinguishing features defining an IEP

The following distinguishing features related to the work needed to deploy an activity can be reasons that indicate that IEP structure would be applicable for the Joint Activities set- up:

- Organisations participating are willing to share information on a generic subject related to geological disposal for all to benefit.
- The scope is defined in the Terms of Reference (ToR).
- The exchange within the activity is non-commercial in its nature[14].
- The exchange can be public or retained within the group based on the agreement between the organisations engaged in the activity.
- Members of the IEP agree to pool the knowledge for all to benefit.

The aim in the deployment and in its operations is that it should remain simple and informal to agree and operate and it should be acceptable to the foreseen participants in the activity (each covers his costs, simple MOU[15] or information exchange agreement).

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[12] The lifetime of such an IEP need not necessarily be limited to the lifetime of a specific SRA Topic.

[13] International Atomic Energy Agency (e.g. http:www.iaea.org/OurWork/ST/NE/NEFW/wts_URF_homepage.html).

[14] Meaning that money does not generally change hands.

[15] MOU: Memorandum Of Understanding.

The activities suited for an IEP are for example at this stage following:

- Dialogue with the regulators (CC1).
- Communication (CC4).
- Transportation (WMS2).

A Technical Project (TEP)

Approach in this type of activity

This is an activity that covers technical or scientific work on a specific SRA Topic. A TEP can either be immediately launched or needs very minor clarification before a detailed project plan and project agreement between the project parties can be produced before launching the technical or scientific project.

The focus of this activity is more on technical and scientific actions needed to deliver a technical project.

Organisation of the TEP

The sharing of the costs of this type of activity can consist of different funding models like shared (direct) payments by the partners either via the project leader or to potential subcontractors and co-financing sources can come e.g. from public grants. The cost division for the project implementation and various rights to the project results needs to be agreed in advance between the engaged parties according to the IGD-TP's governance guidelines.

Main distinguishing features of defining a TEP are:

- A clear RD&D problem definition has been carried out for the formulation of a project management plan including a budget that is shared in an agreement between the different participants of the project.
- Leader and main participants for the activity are agreed.
- The activity can be initiated within six months from the problem definition (that is a project plan can be prepared and approved by the participants).

The Topics suited for this type of activity are for example at this stage (numbering of the listed Topics refers to the SRA Key Topic and to its related Topic):

- Release from ILW and their detailed characterisation (Topic 2.2).
- Full-scale demonstration of HLW container (from manufacturing to emplacement) (Topic 3.1).
- Full-scale plugging and sealing experiments and demonstrations (Topic 3.6).
- Buffer and backfill emplacement (Topic 3.2).

Technological transfer (TT)

Approach in the type of activity

The transfers can be for example based on agreements of transfer of previously acquired results or knowledge on a commercial basis, agreements on cooperation on technical projects, and in-kind contributions. The scope of the transfer in alignment with the IGD-TP vision should address the transfer of results that contribute to the licensing needs or the stages of repository development to be addressed to provide a license application of the recipient organisation or organisations.

This activity has been added for completeness and is likely to be implemented on a bilateral basis.

Organisation of the TT

The sharing of the costs of this type of activity can consist of direct payments of the associated costs either via the project leader or to potential subcontractors. The cost division for the project implementation and various rights to the project results needs to be agreed in advance between the engaged parties according to the IGD-TP's governance guidelines.

The main distinguishing features defining TT are:

- If there is a clear indication that the knowledge is held by one group on the one hand and that there is clear interest in this knowledge by another group on the other hand.
- Exchanges or transfers of information that one member or participant already possesses takes place or is wished for by other parties.
- May include consulting activities at own cost or on commercial basis paid by the recipient.
- Focuses on a specific task or Topic needed by a (group of) IGD-TP member(s) and/or participant(s).

At the time of the preparation of the Deployment Plan, there was no Topic identified for the Technological Transfer type of activity (TT), but the possibility is kept open should one appear.

Table of Joint Activities

The deployment of an individual Joint Activity may require IGD-TP members and participants to engage themselves into several of these activities one after another to proceed with the deployment of the Topic and to achieve the products or results needed to meet the maturity for licensing.

The table giving the types for all Joint Activities is the following (Table 4-3):

Table 4-3. Regrouping of Topics from the SRA.

Number from the SRA	Title	Activity	Line (see table in Appendix 1)
1.1	Increase confidence in, and testing and further refinement of the tools (concepts, definition of scenarios and computer codes) used in safety assessments.	TSWG	6
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.	ORWG	9
1.3	Increase confidence in and further refinement of methods to make sensitivity and uncertainty analyses.	TSWG	8
2.1	High burn-up fuels: rapid release fraction and matrix dissolution.	TSWG	1
2.2	Release from ILW and their detailed characterisation.	TEP	3
2.3	MOX fuel: relation between structure and dissolution: Improve the data & understanding of the behaviour of spent MOX fuel.	Low priority or distant in time	
2.4	High burn-up fuels and criticality.	TSWG	1
2.5	Improved data on vitrified HLW.	TSWG	1
3.1	Full-scale demonstration of HLW container (from manufacturing to emplacement).	TEP	11
3.2	Buffer and backfill emplacement: Demonstration of the full Buffer and backfill emplacement process and its supply chain.	TSWG*	11
3.3	Construction of underground facilities: Confirmation of rock properties for final detailed repository design is required.	ORWG	11
3.4	Repository layout design including operational safety, reversibility and retrievability concerns.	ORWG	11
3.5	Pilot demonstration of repository operation.	TSWG	11
3.6	Full-scale plugging and sealing experiments and demonstrations.	TEP	2
3.7	Non-destructive testing information exchange: Knowledge compilation on non-destructive testing (NDT) and related requirements on repository components.	Low priority or distant in time	
3.8	Knowledge preservation: Knowledge preservation related to retrievability.	Low priority or distant in time	
3.9	Long-term stability of bentonite in crystalline environments.	TEP	10
3.10	Long-term behaviour of plugs and seals.	TEP	2
3.11	Evolution of cement-based seals.	TEP	6
3.12	Interaction of cement with clays.	TEP	6
3.13	Optimisation of low PH cements.	Low priority or distant in time	
3.14	Salt backfill.	TEP	2
3.15	Iron-bentonite interaction.	TEP	6
3.16	Sharing of knowledge on HLW container materials behaviour.	TSWG	11
3.17	Thermal effects of bentonite – waste container contact performance at above 100°C.	TEP	6

Number from the SRA	Title	Activity	Line (see table in Appendix 1)
4.1	Methodologies for adaptation and optimisation during the operational phase.	ORWG	12
5.1	Improved methodology, approaches and documentation on risk assessment, risk management, further documentation for reporting operational safety issues.	ORWG	5
5.2	Strategies to evaluate the impact of operational safety issues on the disposal system (long-term safety, design, costs…).	ORWG	5
6.1	Monitoring strategies and programmes for performance confirmation.	TSWG	7
6.2	Monitoring technologies and techniques.	TSWG	7
6.3	Monitoring of the environmental reference state.	TSWG	4
6.4	Monitoring of engineered barrier systems.	TSWG	7
7.1	Governance of decision making processes: methods for the integration of technical, social and economic information.	ORWG	11
7.2	Use of research results for open and transparent dialogue with stakeholders (methods, tools, guidance).	Low priority or distant in time	
7.3	Involvement of stakeholders, influence on the work of the researchers and the decision makers.	Low priority or distant in time	
CC1, CC4	Dialogue with regulators. Communications.	IEP	13
CC2, CC3	Competence Maintenance, Education and Training (CMET). Nuclear Knowledge Management (NKM).	ORWG	14, 15
WMO 1-6	Site characterisation, transportation, requirement management system, Waste acceptance, industrial scheme, Economics of funding and planning.	IEP	16

* Should become a TEP in the near future.

4.3 Process of defining the deployment timeline

Using the results of the analysis in the previous section 4.1, the deployment of the SRA´s Key Topics was described in a phased process that produced the so-called “Master Deployment Plan” for the period 2011–2016.

The approach followed is given in Figure 4-1.

The three step process is explained in the following:

1. First step (1 on Figure 4-1): The contents of the SRA were examined to identify the types of activities that could be used to cover the Topics listed, and this led to the identification of five types of activities as described in section 4.2.
2. Second step (2 on Figure 4-1): The Topics from the SRA were listed according to the potential type of activity they would be most appropriately suited for. This is as also described in section 4.2.
3. Third step (3 on Figure 4-1): Using the result of the previous steps, the Master Deployment Plan for this initial deployment was identified:
   a. The priority Topics list as launched by the EG using the planned approach (see section 5.1.1).
   b. For the remaining Topics identified in the SRA, they were added into the Master Deployment Plan, using target launch decisions to be taken by the EG, and based on the start dates given in the SRA.

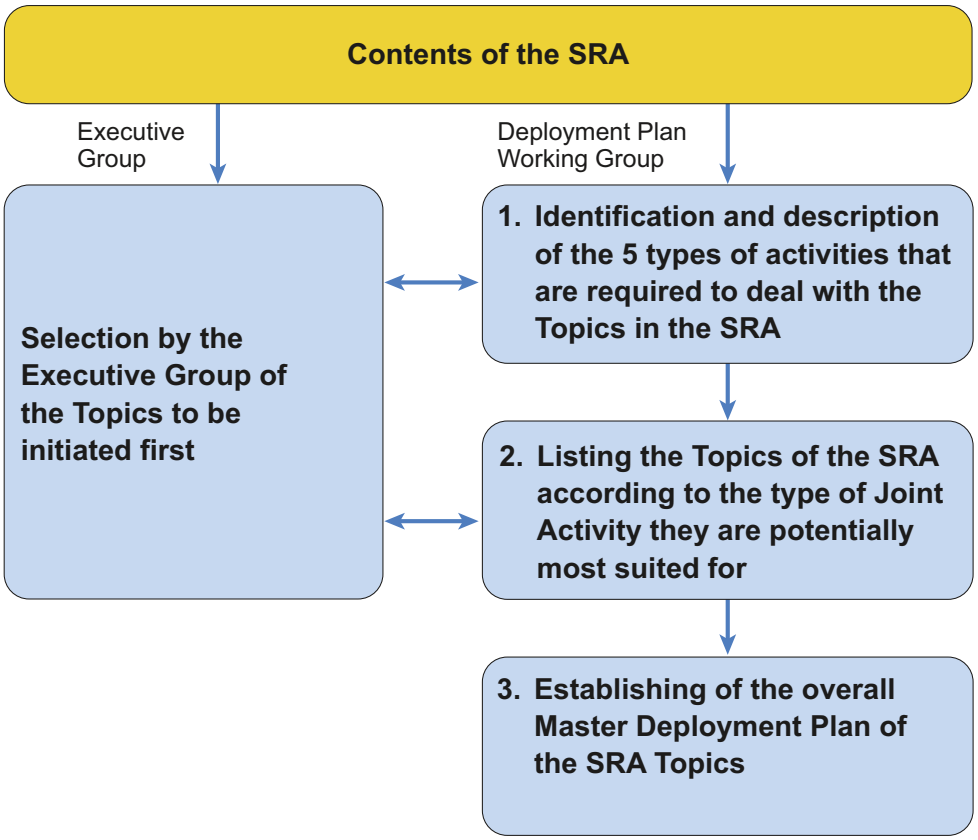


Figure 4-1. *Approach for defining the Master Deployment Plan.*

In parallel (see Figure 4-1), the IGD-TP's Executive Group identified the Topics that were seen as being important to the achievement of the vision and which should be initiated immediately. The following were selected for immediate deployment (the corresponding type of activity was also identified):

1. Full scale demonstration of Plugging & Sealing: TSWG launched in 2011 (Topics 3.6, 3.10 and 3.14).
2. Waste forms and their behaviour: TSWG on C-14 (Topic 2.2, Releases from ILW and their detailed characterisation).
3. Long-term stability of bentonite in crystalline environments: TEP (Topic 3.9).
4. Safety of construction and operations: ORWG (Topics 5.1 and 5.2).

This enabled having a well-organised timetable over the years before 2016 and the results of the overall process is given in the Appendix 1. This appendix contains what has been called the Master Deployment Plan. This is a top level schedule and organises the Joint Activities chronologically, with priorities and also giving their types. It also shows important decision milestones for the Executive Group. Appendix 1 is linked to the Joint Activity outlines (Appendix 2).

The following table (see Table 4-4) shows the links between the Topics as they were listed in the SRA and the Joint Activities as they appear in the Master Deployment Plan.

Table 4-4. Links between SRA Topic and the Joint Activity in the Master Deployment Plan.

Number from the SRA	Title	Activity	Line in the MDP	Title of the Joint Activity as listed in the Master Deployment Plan (MDP)
2.1	High burn-up fuels: rapid release fraction and matrix dissolution.	TSWG	1	**Waste forms and behaviour (TSWG)**
2.4	High burn-up fuels and criticality.	TSWG	1	
2.5	Improved data on vitrified HLW.	TSWG	1	
3.6	Full-scale plugging and sealing experiments and demonstrations.	TEP	2	**Full scale demonstration of Plugging & Sealing (TSWG at current stage)**
3.10	Long-term behaviour of plugs and seals.	TEP	2	
3.14	Salt backfill.	TEP	2	
2.2	Release from ILW and their detailed characterisation.	TEP	3	**Waste forms and behaviour: TSWG on C-14 (at current stage)**
6.3	Monitoring of the environmental reference state.	TSWG	4	**Monitoring the Environmental reference state (TSWG)**
5.1	Improved methodology, approaches and documentation on risk assessment, risk management, further documentation for reporting operational safety issues.	ORWG	5	**Safety of construction and operations: (ORWG)**
5.2	Strategies to evaluate the impact of operational safety issues on the disposal system (long-term safety, design, costs…).	ORWG	5	
1.1	Increase confidence in, and testing and further refinement of the tools (concepts, definition of scenarios and computer codes) used in safety assessments.	TSWG	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)**
3.11	Evolution of cement-based seals.	TEP	6	
3.12	Interaction of cement with clays.	TEP	6	
3.15	Iron-bentonite interaction.	TEP	6	
3.17	Thermal effects of bentonite – waste container contact performance at above 100°C.	TEP	6	
6.1	Monitoring strategies and programmes for performance confirmation.	TSWG	7	**Monitoring programme (TSWG)**
6.2	Monitoring Technologies and techniques.	TSWG	7	
6.4	Monitoring of engineered barrier systems.	TSWG	7	
1.3	Increase confidence in and further refinement of methods to make sensitivity and uncertainty analyses.	TSWG	8	**“Benchmarking” for confidence in LT safety in Safety Cases (TSWG)**
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.	ORWG	9	**Efficient peer review and related QA processes (ORWG)**
3.9	Long-term stability of bentonite in crystalline environments.	TEP	10	**Long-term stability of bentonite in crystalline environments (TEP)**

Number from the SRA	Title	Activity	Line in the MDP	Title of the Joint Activity as listed in the Master Deployment Plan (MDP)
3.1	Full-scale demonstration of HLW container (from manufacturing to emplacement).	TEP	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**
3.2	Buffer and backfill emplacement: Demonstration of the full Buffer and backfill emplacement process and its supply chain.	TSWG*	11	
3.3	Construction of underground facilities: Confirmation of rock properties for final detailed repository design is required.	ORWG	11	
3.4	Repository layout design including operational safety, reversibility and retrievability concerns.	ORWG	11	
3.5	Pilot demonstration of repository operation.	TSWG	11	
3.16	Sharing of knowledge on HLW container materials behaviour.	TSWG	11	
7.1	Governance of decision making processes: methods for the integration of technical, social and economic information.	ORWG	11	
4.1	Methodologies for adaptation and optimisation during the operational phase.	ORWG	12	**Adaptation and optimisation of the repository (ORWG)**
CC1, CC4	Dialogue with regulators, Communications.	IEP	13	**Communicating result from RD&D (IEP)**
WMO 1-6	Site characterisation, transportation, requirement management system, Waste acceptance, industrial scheme, Economics of funding and planning.	IEP	16	**WMO (IEP)**
CC2, CC3	Competence Maintenance, Education and Training (CMET), Nuclear Knowledge Management (NKM).	ORWG	15, 14	**CMET & NKM (ORWG)**
2.3	MOX fuel: relation between structure and dissolution: Improve the data & understanding of the behaviour of spent MOX fuel	Low priority or required at a later stage (after 2016)		
3.7	Non-destructive testing information exchange: Knowledge compilation on non-destructive testing (NDT) and related requirements on repository components.	Low priority		
3.8	Knowledge preservation: Knowledge preservation related to retrievability	Low priority		
3.13	Optimisation of low PH cements	Low priority or required at a later stage (after 2016)		
7.2	Use of research results for open and transparent dialogue with stakeholders (methods, tools, guidance)	Low priority or required at a later stage (after 2016)		
7.3	Involvement of stakeholders, influence on the work of the researchers and the decision makers	Low priority or required at a later stage (after 2016)		

* Should become a TEP in the near future.

5 Implementation and management of the Joint Activities

This section endeavours to answer the question "By whom are the Joint Activities implemented and how are they managed?" The answer to this question is given for two levels:

1. Implementation and management of the Master Deployment Plan (see Appendix 1). Decisions are taken mainly within the scope of the IGD-TP's Executive Group (EG) with the coordination assistance of the Secretariat. For more information see the Terms of Reference for either the EG or the Secretariat which can be found at the IGD-TP open website www.igdtp.eu.
2. Implementation and management of the individual Joint Activities. This includes the generic issues related to the governance and management of the individual activities, and the detailed project management of those activities that are already decided to be launched by the EG. More detailed information can be found in the management guidelines, see Appendix 3.

5.1 Management of the progress of the overall SRA deployment timeline

The SRA is the fundamental document governing the content of the Deployment Plan (DP) and can be modified only with EG's approval. The SRA will be updated regularly.

This DP addresses the Joint Activities that derive from the SRA's Topics and that are to be launched during 2011–2016.

Therefore this DP is a starting point and the intention is that the Master Deployment Plan (see Appendix 1) and the associated activity outlines (see Appendix 2) are tools to be updated continuously by the EG with the assistance of the Secretariat following the updates of the IGD-TP´s SRA.

5.1.1 Engaging the IGD-TP participants in the Deployment

The methodology for the deployment is the following[16]:

- For each Joint Activity an activity outline based on the standard template (as that used in Appendix 2) is produced. This work is done by the interested members of the EG with the assistance of the Secretariat.
- The activity outlines are presented at EG meetings (for example a batch of Joint Activities were examined and decided in the EG meeting in November 2011 and further batches will be examined and decided in future EG meetings). Activity outlines are given in Appendix 2.
- The EG members decide on their respective participations. A leading organisation for the Joint Activity is designated; it will carry out scoping in a form that can be communicated to *call for volunteers*[17] from the IGD-TP to the Joint Activity. Along with this communication, the call for volunteers, decision on announcement dates and decision on the type of activity are announced on the IGD-TP's intranet. The type of Joint Activity chosen for the Topic already gives an indication of the type of funding required for the activity as described in Table 5-1.
- After the Joint Activity team of participants is formed:
  1. The initial activity outline is discussed and further detailed; it can be modified at this stage.
  2. Further discussions on the financing, on more specific planning and on the Joint Activity schedule take place among the participants under the lead of the selected organisation (in most cases an EG member).
- A given activity's schedule is then included into the Master Deployment Plan and the progress of the activity is monitored along with all the other elements that are listed in this master plan. This is done with the activity team for each activity and the EG and the Secretariat are responsible for including progress on the activity into the master plan. The Secretariat also assists the individual activities by providing the governance and management guidelines and by developing them further as experience on Joint Activity deployment is gained.

[16] The elements that are given here are described in detail in the Terms of Reference for the Executive Group available at the website www.igdtp.eu.

[17] Therefore joining a given Joint Activity is voluntary.

5.1.2 Other work done by the IGD-TP Secretariat

In addition to that in section 5.1.1 the other support activities for the deployment by the Secretariat include:

1. Web site management, including announcement of opportunities calls.
2. Overseeing the Deployment Plan activities, to report on progress and to suggest decisions to the EG (short activity outlines to be produced as those given in Appendix 2).
3. Updating the Deployment Plan taking into account progress of the year, suggestions on modifications in case of delays in deployment.
4. Suggestion to the EG on dissemination activities and their coordination.
5. EG minutes and recording of decisions.
6. Support to activity teams for items listed in section 4.2.
7. Organisation of exchange forums.
8. Coordination/communication with the EC on priorities in the Master Deployment Plan.
9. Support to Joint Activities.

Concerning the Secretariat's second activity as mentioned above, the exchanges between the Secretariat and the Team for a given Joint Activity include those concerning the supply of information for the Deployment Plan, the progress of the Joint Activity and about the status of the activity outcomes to the Secretariat. This information is crucial to upgrade the Master Deployment Plan. The Secretariat will have to be active in obtaining this information.

5.1.3 Revision of the Deployment Plan and the Master Deployment Plan

The key information of the DP consists of the first Master Deployment Plan (2011–2016) presented in a timetable and decision-making format in the DP. This Master Deployment Plan is updated by the Secretariat according to the deployment decisions made by the IGD-TP's Executive Group during the Executive Group meetings (2 or 3 times a year). The activity outlines (see Appendix 2) are also created or upgraded according to EG decision making.

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.

5.2 Management and governance of the activities

Regarding the implementation and management of each individual Joint Activity, the questions that must be answered for the five generic types of activities listed in section 4.2 and used to classify Topics are given in Figure 5-1 in the following order:

- What is the Overarching Governance (cooperation concepts and contractual frameworks)?
- What are the Project Management Guidelines for the individual activity (decision making and rules for operating)?

Then the deployment can take place in practice.

5.2.1 First stage ("Overarching Governance")

Before going into the questions around the governance of the project, it is important to recall the paths between the different types of Joint Activities, see Figure 5-2.

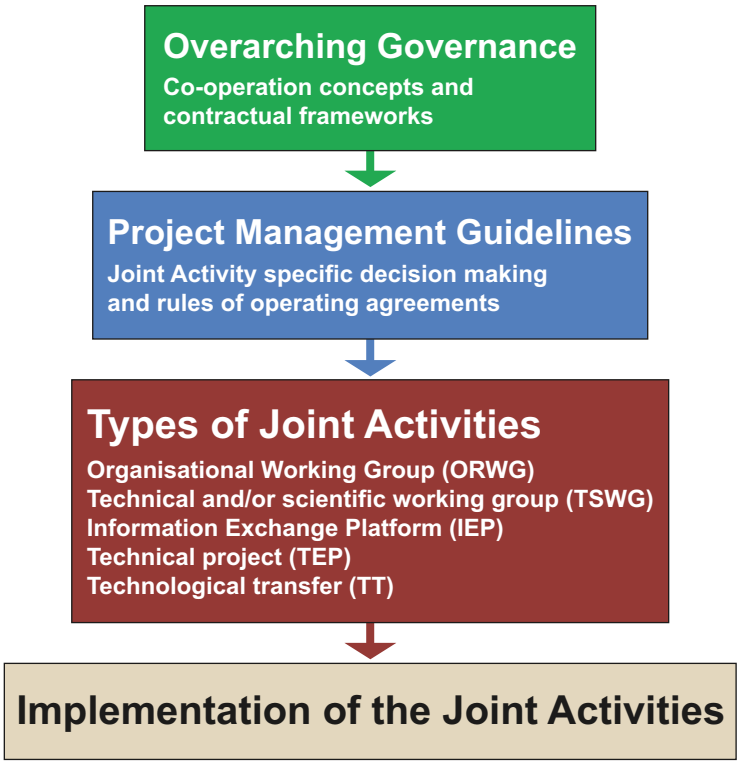


Figure 5-1. *Elements leading to the deployment of a given type of Joint Activity.*

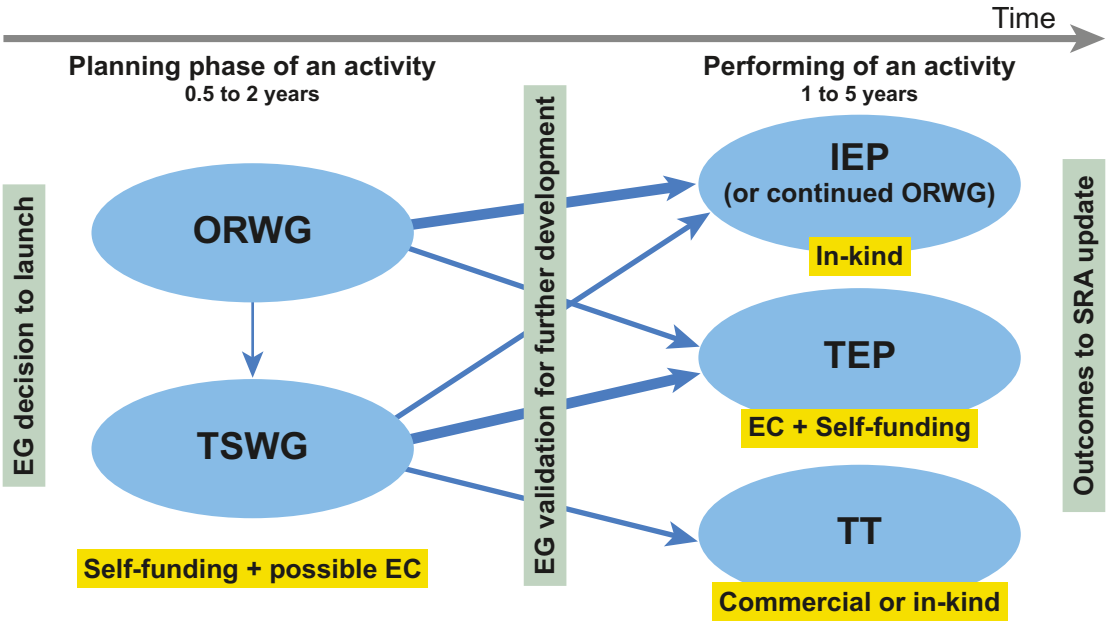


Figure 5-2. *Types of Joint Activities at the planning and performing stages of the implementation work regarding the different SRA Topics.*

The following table proposes some generic principles in governing the different types of Joint Activities. The information given in this table is based in part on approaches given in section 4.2.

Table 5-1. Generic governance alternatives for different types of Joint Activities.

	Organisational Working Group (ORWG)	Technical/ Scientific Working Group (TSWG)	Information Exchange Platform (IEP)	Technical Project (TEP)	Technological Transfer (TT)
Basic rules of cooperation	Working group consisting of experts with knowledge, skills, and competence on a specific Topic area, which requires joint work. Procedural work (organising review work, methodologies …) than scientific work.	Working group consisting of technical/scientific experts for preparing the basis for a Technical Project (TEP).	Shared and voluntary objective to exchange information.	Technical or scientific issue to be answered and delivered by a project team.	Technological transfer on a commercial basis.
Type of partnership and Organisation (ideally described in the ToR)	Multilateral expert group in a specific Topic area. A given ORWG has an organisation leading it (see DP Chapter 5), and ensuring the secretarial work. For the logistics of meetings a rotating basis is possible.	Multilateral expert group in a specific Topic area. A given TSWG has an organisation leading it (see DP Chapter 5), and ensuring the secretarial work. For the logistics of meetings a rotating basis is possible.	Multilateral group. The IEP needs technical secretarial support for its organisation and a mechanism for chairing the IEP (a mechanism "in turns" can be used and for the logistics of meetings. A rotating basis is possible).	Multilateral project group. A given TEP has a nominated lead organisation resulting from a previous working group (either TSWG or ORWG) that structured the future work and organisation. If the TEP is has no preliminary structure (TSWG/ORWG) then the organisation must be clarified by the partners in the Joint Activity as from the beginning.	Generally bilateral but can also be multilateral. The organisation is simple in the case of a bilateral agreement. In the case of a multilateral agreement, then a consortium agreement must be produced.
Governance*	There is a working group leader who manages the group and makes sure that decisions are taken in consensus. Setting up the ToR (or CA**) and the project plan is the first task to be accomplished (an end date is given for the work by the EG).	There is a working group leader who manages the group and makes sure that decisions are taken in consensus. Setting up the ToR (or CA) and the project plan is the first task to be accomplished (an end date is given for the work by the EG).	The decision making rests with each individual IEP members and all decisions made require common agreement due to the voluntary nature of the IEP. Setting up a shared list of exchange themes with end dates is the first task to be accomplished.	Many possibilities exist, the governance and decision making powers are based on a formal agreement between the parties engaged in the technical project.	Given in contract or defined by one party. The others join either as expert consultants or with the intention of learning from the party defining the issue for the transfer. The contracts or agreements are in general on one-to-one basis, even though the transfer may engage several multilateral partners.

	Organisational Working Group (ORWG)	Technical/ Scientific Working Group (TSWG)	Information Exchange Platform (IEP)	Technical Project (TEP)	Technological Transfer (TT)
Funding (see section 5.2.2)	In kind contribution.	In kind contribution.	In kind contribution***.	Several types of financing are possible. One can list for example: – cost sharing between the IGD-TP members. – cofinancing from public RD&D funding sources like the EC or from other national, bilateral or multinational sources. – cofinancing from the IGD-TP participants. – partial co-funding in in-kind work contribution.	Commercial exchange, or work at cost basis (or in-kind contributions in special cases).
Type of contractual Agreement	The ToR document should be sufficient for simple WG's. More sophisticated documents can be written is more complex cases.	The ToR document should be sufficient for simple WG's. More sophisticated documents can be written is more complex cases.	MOU or information exchange agreement on a non-commercial basis between participants. This document addresses the confidentiality issues. Work is based on agreed Terms of Reference (ToR). The IGD-TP's working groups' Terms of Reference can serve as a guiding content skeleton for the ToR.	Many possibilities. Can be a framework agreement based where other parties enter on one-to-one basis or on multilateral basis. Can also be a full consortium agreement including all parties with a lead organisation as the main contracting party.	A procurement contract or formal cooperation agreement enabling invoicing of fees or expenses made on one-to-one basis.

* Overall governance provided by EG.

** CA: Consortium Agreement.

*** And sub-contracting (when needed) funded by a participant.

5.2.2 On the question of funding

The term “in-kind contribution” covers different situations according to whether one is dealing with an ORWG, TSWG or IEP.

In the case of the ORWG, the basic objective is not to exchange information but to establish an approach for a Topic that is not technical. The contribution to the working group is more on methods, standards, etc and therefore the initial information retained by each participant is less of an issue. The cost of taking part in the ORWG is then borne by a given participant.

In the case of the TSWG, the basic objective is not to exchange information but to give existence to a Topic that is technical. In that case the contribution to the working group is technical and therefore the initial information detained by each participant can be of different levels. The leader of the TSWG must take care that this subject is addressed during the initial phases of the TSWG’s existence and look to taking this into account in the agreement between participants. The cost of taking part in the TSWG is then borne by a given participant.

In the case of IEP, the underlying assumption is that each participant has some information to bring to the exchange and each expects to benefit from sharing information with the others (a win/win situation). The cost of taking part in the IEP is then borne by each participant.

In the case of a TEP, as has been stated above in Table 5-1, the funding can be of many different types.

Lastly, in the case of a TT, then we are in most cases looking at a bilateral agreement, were one is paying for knowledge detained by the other.

The funding options are illustrated in Figure 5-2.

5.2.3 Second stage (“Project Management” of an activity)

The deployment principles are derived from the ISO 10006:2003 standard: Guidelines for managing projects. These guidelines form a checklist, which can be adapted for the different types of Joint Activities to the extent they are applicable to it. For the technical projects (TEPs) and for Technological transfers (TT), the guidelines should be applied in their full scope.

For the working groups, the application of these guidelines is not so extensive. For the information exchange platform Terms of Reference should provide sufficient guidance, if confidentiality of exchanged information can otherwise be ensured.

Appendix 3 provides an activity management checklist for all the other activities except the IEP.

6 Conclusions

The goal for the IGD-TP is to reach the Vision that by 2025, the first geological disposal facilities for spent fuel, high-level waste, and other long-lived radioactive waste will be operating safely in Europe.

From that vision, and based on already available information, a first edition of the Strategic Research Agenda (SRA) was prepared and published in July 2011. The SRA was built from a thorough review of the requirements expressed by the implementing organisations of geological repositories. It began by proceeding to a compilation of the results of research and developments performed so far, starting from the early 1980s for most of the waste management programmes. From the continuous assessment of performance and safety of the respective geological repository projects, the remaining research and development areas and the respective Key Topics/Topics were identified. Additional research and development aims at improving design, robustness and safety, or reducing still existing uncertainties. Since the waste management programmes are moving to an industrial phase, a demonstration need was as well identified for some of the Topics.

The goal of the Deployment Plan (DP) is to organise the Topics identified through the SRA in such a way that all are addressed on time according to the requirement. From the work reported in the present document it can be seen from the Master Deployment Plan how the Topics will be implemented and deployed.

From the organisational viewpoint, different types of work were defined. In the framework of a technology platform it was important to define forums where the exchange can take place. The Information Exchange Platform (IEP) was defined to share and exchange information among the programmes. The IEP plays an important role as a vehicle for fostering discussion, information exchange and further cooperation and will also play a key role at the interface between programmes closest to implementation and those at a starting phase the idea being for all to save time and money, by avoiding duplications.

Where a Topic still needs to be worked out before the launch of a research, development or demonstration project (TEP) a Technical and Scientific Working Group (TSWG) is considered to prepare a detailed roadmap and pave the way for a real project. Then the programme is launched through a Technical Project (TEP). In the case of development of methodologies or to organise peer reviews, an Organisational Working Group (ORWG) can be installed. The same Topic can successively move from a method of work to another, depending on its progress. Last, a Technological Transfer (TT) type of activity is defined; it is mostly suited for value exchange, including on a commercial basis.

Whereas the SRA was developed over the timescale 2011–2025 as a strategic tool to reach the "Vision 2025", the DP is an operational management tool and is limited to a 5 year term. Thus the basic Master Deployment Plan needs to be updated continuously by the EG and the Secretariat, either with minor updates or with additional Topics to be considered. At the same time, it can also take account of evolutions in the SRA, which will be updated less frequently.

A few general guidelines were provided at this stage. The first published Management Guidelines for the different Joint Activities will be developed further when the first activities are be launched and experience is gained in the process.

References

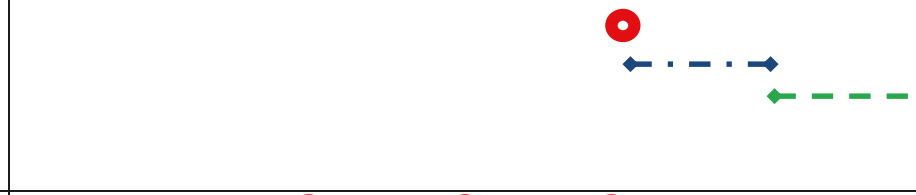
1. For general information on Technology platforms see http://cordis.europa.eu/technology-platforms/home_en.html.
2. IGD-TP 2009. Implementing Geological Disposal of Radioactive Waste Technology Platform. Vision Report. Published as EC special report EUR 24160 EN.
3. IGD-TP 2011. Strategic Research Agenda 2011. ISBN 978-91-979786-0-6.
4. IGD-TP's Terms of Reference available at www.igdtp.eu.
5. ISO 2003. ISO 10006:2003 Guidelines for managing projects.
6. SecIGD/IGD-TP 2011. Management Guidelines v.1 available at www.igdtep.eu.

Appendix 1

Master Deployment Plan of the SRA 2011

Table A1-1. Master Deployment Plan.

	SRA Topics and their deployment activities	2011	2012	2013	2014	2015	2016	Actions on-going or to follow* (an Activity outline is given in Appendix 2 for added details)
1	Waste forms and behaviour: TSWG launched in 2011 (Topics 2.1, 2.4, 2.5)							"FIRST-Nuclide" Technical project for high burn-up fuels. Project started 2012-01-01within EC FP7.
2	Full scale demonstration of Plugging & Sealing: TSWG launched in 2011 at first (Topics 3.6, 3.10 and 3.14)							Work started in the form of a TSWG. Technical Project submitted to the EC in March 2012
3	Waste forms and their behaviour: TSWG on C-14 (Topic 2.2,)							Waste forms TSWG, Focussed on C-14, to define a TEP. The TSWG to be considered later to fulfil the requirement of the Topic for other radionuclides.
4	Monitoring the Environmental reference state: TSWG (Topic 6.3)							TSWG launched in November 2011. The WG will work for one year and a new milestone is then planned.
5	Safety of construction and operations: ORWG (Topics 5.1 and 5.2)							ORWG must be started after some preliminary.
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)							More work Is needed on the subject before an EG decision.

	SRA Topics and their deployment activities	2011	2012	2013	2014	2015	2016	Actions on-going or to follow* (an Activity outline is given in Appendix 2 for added details)
7	**Monitoring programme: TSWG (Topics 6.1, 6.2, 6.4)**							A TSWG will be launched in 2015 for review of all available results (MoDeRn project) to define a new programme to be built for improvement of strategies, review of available technologies, and development of new technologies.
8	**"Benchmarking" for confidence in LT safety in Safety Cases: TSWG (Topic 1.3)**							Set up an ORWG and later TSWG to prepare an eventual project to be launched in 2015.
9	**Efficient peer review and related QA processes*:* ORWG (Topic 1.2).**							ORWG launched at the November 2011 Exchange Forum (survey of current practices).
10	**Long-term stability of bentonite in crystalline environments: TEP (Topic 3.9)**							BELBaR TEP started 2012-03-01 for bentonite erosion (effects on the Long-term performance of the Engineered barriers and Radionuclide transport).
11	**Various Topics belonging to different categories** **Topics concern the governance of the decision making and various Topics related to technical feasibility of repository component (Topics 7.1, 3.1, 3.2, 3.3, 3.4, 3.5, and 3.16) s**							Launch of a TSWG to redefine the contents of the Topics and propose rules of exchange for further TEPs and TTs, and a programme.

	SRA Topics and their deployment activities	2011	2012	2013	2014	2015	2016	Actions on-going or to follow* (an Activity outline is given in Appendix 2 for added details)
12	ORWG on Adaptation and optimisation of the repository (Topic 4.1)							Initiate ORWG to develop a roadmap.
13	IEP on Communicating result from RD&D (CC1, CC4)							ORWG could be launched in 2016.
14	Competence Maintenance, Education and Training: ORWG CMET (CC 2)							EG go ahead for ORWG decided and discussed at Exchange forum no 2. ToR finalized in June 2012.
15	Nuclear Knowledge Management: ORWG NKM (CC3)							Decision on an ORWG to be taken by the EG (in 2012).
16	WMOs IEP (WMO 1-6)							IEP Organization of e.g. : • Workshop on licensing related issues? • Hot line? Decision on IEP to be taken by the EG (in 2012).

* At the date of the publishing of this Deployment Plan

Legend to Table A1-1:

Decision to be taken by the EG:

Decision taken by the EG:

Working group:

TEP:

Possible

The time needed for the respective working groups (ORWGs and TSWGs) to conclude their work may differ from one project to another. For example, the Executive Group decided to launch the Full scale plugs and seals technical project (line 2) in 2012, based on the future results of the TSWG. Concerning C-14 (line 3), the subject is seen as less mature and therefore the project will be launched in 2013, also based on the future results of the TSWG.

Appendix 2

Listing of Joint Activities and activity outlines

Important note:

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

	SRA Topics and their deployment activities	
1	Waste forms and behaviour: TSWG launched in 2011 (Topics 2.1, 2.4, 2.5).	FIRST project and no outline is given here
2	Full scale demonstration of Plugging & Sealing: TSWG launched in 2011 at first (Topics 3.6, 3.10 and 3.14,).	An activity outline is given
3	Waste forms and their behaviour: TSWG on C-14 (Topic 2.2).	An activity outline is given
4	Monitoring the Environmental Reference State: TSWG (Topic 6.3).	An activity outline is given
5	Safety of construction and operations: ORWG (Topics 5.1 and 5.2).	An activity outline is given
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).	No, only 1.1 exists
7	Monitoring programme: TSWG (Topics 6.1, 6.2, 6.4)	An activity outline is given
8	“Benchmarking” for confidence in LT safety in Safety Cases: TSWG (Topic 1.3).	An activity outline is given
9	Efficient peer review and related QA processes: ORWG (Topic 1.2).	An activity outline is given
10	Long-term stability of bentonite in crystalline environments: TEP (Topic 3.9).	An activity outline is given
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).	No, only 3.2 exists
12	ORWG on Adaptation and optimisation of the repository (Topic 4.1).	An activity outline is given
13	IEP on Communicating result from RD&D (CC1, CC4).	No
14	Competence Maintenance, Education and Training: ORWG CMET (CC2).	An activity outline is given
15	Nuclear Knowledge Management: ORWG NKM (CC3).	No
16	WMOs IEP (WMO 1-6).	No

SRA Key Topic:	SRA Topic:	SRA Topic priority:
Technical feasibility and long-term performance of repository components (3)	Full scale demonstration of plugging and sealing (3.6) Description of seals and plugs systems and modelling of their long-term behaviour, with assessment of the consequences on long-term safety (3.10) Salt backfill (3.14)	High for the first High for the second Medium for the third

Type of activity:	Expressed interest*:
Technical Projects for all three but TSWG initially	ANDRA, BMWi, SKB, POSIVA, ENRESA

Product:

For the first, the products are the results of the full scale demonstration of plugging and sealing.

For the second, description of state of the art, technical report on LT behaviour of seals and plugs.

For the third, the state of the art regarding the coupled thermal, mechanical and hydraulic behaviour of crushed salt backfill will be further developed and documented.

Proposed title (as appearing in Appendix 1):

Full scale demonstration of plugging and sealing

Time table:

As from 2011/2012

Explanation of the contents of the activity:

For the first

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.

For the second

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.

For the third

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 activity:

For the first, the schedule could be the following:

- 2012–2013, design & specification related studies, modelling including performance test of the design phase.
- 2012–2013, design of the testing system.
- 2014–2018, construction, resaturation, monitoring, control of performance.

For the second:

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

For the third

– 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.

Current on-going work (through EC, IAEA, bilaterally…):

Passed activity: TSWG

Numerous on-going activities

Decision of the EG:

Project leader: SKB and POSIVA

Preparatory work to this becoming a full project (TSWG)

- Meeting in September 2011 called by the team leader where Project team starts work on a more comprehensive description of the project and a ToR including a general time plan. Reflect the role of the IGD-TP participants in the project and criteria for including them if there are several expressions of interest.
- Description to be put on the Intranet before the next Exchange Forum.
- Presentations at the next Exchange Forum.
- Preparatory work finished by January 2012.
- Application to the 7th FP in 2012.

Schedule: start September 2011 end January 2012

Group: BMWi, RAWRA, Andra, ENRESA, NAGRA lead by SKB and POSIVA

Full project: this is a **Technical Project** (TEP)

Submitted to the EC in March 2012

Start of the project in 2012– 2013 for 4 year period

Partners: Posiva (coordinator), Andra, DBE TEC, GRS, Nagra, NDA, RAWRA, SKB, CTU, NRG.

* The consultation was made with the intention of organisations also in expressing their interest in a Joint Activity (the lists at this stage are not intended to be complete).

SRA Key Topic	SRA Topic:	SRA Topic priority:
Waste form and their behaviours (2)	Release from ILW and their detailed characterisation (2.2)	High

Type of activity of work:	Expressed interest:
TSWG then a Technical Project (TEP)	NAGRA, ONDRAF/NIRAS, NDA(leader), BMWi

Product:

A report on the subject

Proposed title (as appearing in Appendix 1):

Waste form and their behaviour: work on C-14

Timetable:

2012–2016

Explanation of the contents of the activity:

C-14 is produced inside nuclear power plants, and the produced amount depends somewhat on the type of reactor (it is higher for a gas cooled reactor and lower for a Candu type reactor, LWR being in between). It can be found mainly in the fuel (either the fuel itself or the "hardware" of the fuel assemblies) or, to a lesser extent, in the coolant (also in the graphite moderator for the gas cooled reactors). The part contained in the coolant is then filtered into the spent resins. These resins are the major contributor to the C-14 inventory in LLW repositories.

This C-14, whatever its location, can be in organic or inorganic form, and the release can be either gaseous or not.

One can state that:

- Work has been undertaken on this subject for graphite waste (LLW-LL) inside the "Carbonate" project (on-going characterisation work inside European countries).
- Work has also been undertaken on the C-14 content of metallic objects (ILW) (Andra).
- Work has also been undertaken on LLW-SL other than graphite waste, such as ion exchange resins (SKB).

Comments received:

- Confirm which wastes require detailed characterisation of C-14, as this may or may not be needed depending on the waste type and C-14 form. (NAGRA)
- We have a preference to work on gaseous release of C-14. We have an active experimental programme on-going in this area to investigate the release of C-14 (g) from irradiated steel and graphite. We intend in the future to expand this programme to also consider reactive metals (e.g. irradiated uranium). Collaboration in this area would be excellent and is a very high priority work area within our own research programme. (NDA)

Short description of activity:

The work would be broken down into two steps:

1. A review of the state of the art in Europe on the subject of C-14 characterisation.
2. A technical project.

Current on-going work (through EC, IAEA, bilaterally…):

Carbowaste project, national programmes (as stated above)

Decision of the EG:

Project leader: NDA

Preparatory work to this becoming a full project

- Meeting in September 2011 called by the team leader where Project team starts work on a more comprehensive description of the project and a ToR including a general time plan and criteria for engaging other IGD-TP participants.
- Put an "announcement" on the Intranet end of September/beginning October.
- Presentations at the next Exchange Forum.
- Selection of IGD-participants until December 2011.
- Launching of the Project (TSWG) January 2012, with the possibility to follow by a TEP.
- Possible application to the 7th FP in 2013.

Schedule: start September end January

Group: ONDRAF, BMWi, NAGRA, COVRA, Andra, Lead by NDA

Full project

The objective is to be able to suggest a technical project to the EC in April 2013 for launch in January 2014.

Start of the work in January 2012 for a one year period.

EG meeting number 6: this project is now officially launched with target set at stating in October 2012 to the EC on whether this should be an EC project.

SRA Key Topic: Monitoring **(**6)	**SRA Topic:** Monitoring of the Environmental Reference State (6.3)	**SRA Topic priority:** H
Type of activity of work: Technical/Scientific Working Group	**Expressed interest:** ANDRA (leader), Nagra, NDA, Amphos21, BGS, BRGM, GRS, ENEA, BfS, Resolution Resources International, POSIVA	
Product: Define a guideline for a reference state of the environment and subsequent monitoring		
Proposed title (as appearing in Appendix 1): Monitoring the Environmental Reference State		
Timetable: 2011–2017		
Explanation of the contents of the activity: 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 even after, thus keeping a memory 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 among the countries, a common baseline of what is needed will be defined. It will then be the basis for further recommendations.		
Short description of activity: 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 products. At first, a roadmap will be issued defining all of this. The idea would be to launch a technical project in 2013 to produce a reference publication/book and relevant guidelines. Further technical and/or scientific developments to answer specific requirements may also be envisaged. The content of the work includes e.g.: • Defining a generic approach which will be pertinent for different types of projects and environments. • Taking into consideration existing guidelines from NPP's and mining operations (+ tailings). Check existing papers from IEAE and NEA. • Evaluating, on the basis of foreseen operations what will be the most impacted parameters of the environment. • Establishing a link with the monitoring system of the underground infrastructure. • Creating SRL (Surface research laboratories) on the model of URL's starting with generic SRL's. • Including health surveys. Questions to be addressed are: Where: The area to be observed and monitored. What: The compartments of the biosphere that should be monitored. What: The choice of the markers: biomarkers, biodiversity, quality of the environment… How: The way the selection of the monitoring systems for the repository environment will be made (scientific, and technical criteria, social requirements). Why: The definition of actions that should be adopted in order to contribute to the preservation of the environment. Why: The evaluation of the perturbations that could be induced during the exploitation phase. When: After the site selection and then as soon as possible.		
Current on-going work (through EC, IAEA, bilaterally…): The EC FP7 project MoDeRn aims to provide a reference framework for monitoring activities in geological repositories for radioactive waste. The project started 2010-05-01 and ends 2014-04-31.		
Decision of the EG: The Topic was discussed at the Exchange Forum no 2. EG meeting number 6: The TSWG is launched at the November 2011 Exchange Forum. A set of questions will be addressed at that time by the team leader to begin organising the TSWG. At first, a working group is constituted for a one year project.		

SRA Key Topic:	SRA Topic:	SRA Topic priority:
Safety of construction and operations (5)	Improved methodology, approaches and documentation on risk assessment, risk management, further documentation for reporting (5.1) Strategies to evaluate the impact of operational issues on the disposal system (long-term safety, design, costs…) (5.2)	High for the first Medium for the second

Type of activity of work:	Expressed interest:
For both, an Organisational Working Group	For the first: ANDRA, POSIVA For the second: NAGRA, ONDRADF/NIRAS, NDA, POSIVA, BMWi

Product:

For the first, a report on structured proactive approaches, including applications for risk management and evaluation of the different approaches in specific cases.

For the second, a report listing the issues, the options and their impact according to the LT safety, operational safety, costs, logistics grid.

Proposed title (as appearing in Appendix 1):

Safety of construction and operations

Timetable:

2012–2018 for the first

2019–2025 for the second

Explanation of the contents of the activity:

For the first point (Improved methodology, approaches and documentation on risk),

Building on studies undertaken in the past decades (which have been particularly focused on the long-term safety issues) the work should include:

- To start with checking the available information on operational safety from existing facilities in operation or under construction (e.g. in WIPP, Konrad and ONKALO, and in all underground research facilities).
- Then to evaluate where interchange with other industries might be possible (for example the mining industry and the more recent work of the carbon capture and sequestration industries, noting that mining and tunnelling requirements might by very different).
- And to develop common databases and/or information exchange forums (for example for initiating events, accessing standard procedures and for reporting and sharing data relating to deviations such as frequency of failure of various types of equipment).

Example of additional development and demonstration:

- Ventilation in an underground construction is always challenging. It becomes more challenging when “nuclear facility”-type ventilation is required. Strategies for ventilation (single or dual) and their demonstration need to be developed for all types of geological repositories.

For the second point (Strategies to evaluate the impact of operational issues on the disposal system).

Developing strategies and evaluating the impact on long-term safety, design, complexity and cost of geological repositories for specific operational issues.

This contributes to planning the design approach. The discussion of assumptions and approaches in handling operations, ventilation and radiation controlled areas vs. non-radiation controlled areas. They are factors influencing the design, layout and costs.

The requirement is a better understanding of the benefits and disadvantages with regard to safety, cost, logistics and technical difficulty of different design strategies such as transport underground (e.g. drift vs. shaft), vault designs(tunnels, small vaults, large vaults etc), package emplacement strategies (e.g. remote, semi-remote, manual, by row or column), and ventilation (continuous, local, natural). These issues are all important for helping to demonstrate ALARP through the design process.

For example, strategies to evaluate operational issues such as emergency plans, gaseous radionuclides and their impacts on workers and the environment during the operational phase. Explosive gases, air dust, ventilation and fire fighting strategies are certainly of interest to various WMOs.

Example:

- Concrete support for disposal drifts in clay environment: besides the design of concrete supports there is a need to proceed to demonstration of digging large drifts and installing the supports. The long term behaviour of the concrete in such an environment, and especially its consequences on the long-term safety should be assessed (qualitatively); and

Short description of activity:

For the first, an ORWG could be set up, inviting all interested parties and organising the information exchange process.

For the second, an Organisational Working group would have to be put together to work on the project:

- List the candidate functional issues (package emplacement for example).
- List potential solutions (remote, semi-remote, manual, by row or column for the same example).
- Analyse solutions on a LT safety, operational safety, costs, logistics grid.
- Report.

This could be done within 2 years

Current on-going work (through EC, IAEA, bilaterally…):

For the first: MIGS project*, Carbon capture TP (zero emission platform), national interest groups

Decision of the EG:

After an NEA workshop "Preparing for Construction and Operation of Geological Repositories – Challenges to the Regulator and the Implementer" in January 2012, a baseline for the ORWG is to be written.

* Nordic Rock Tech Centre AB (RTC) created MIGS in 2007 to develop ground support methods and equipment for deep mines. It is a grouping of major mining companies and global suppliers that have joined forces to increase underground safety and operational efficiency.

SRA Key Topic:	SRA Topic:	SRA Topic priority:
Safety case (1)	Increase the confidence in testing and further refinement of the tools used in safety assessments (1.1)	High

Type of activity of work:	Expressed interest:
A technical working group	ANDRA, SKB, BMWi

Product:

A report giving the results of the benchmarking exercise of material interaction models.

Proposed title (as appearing in Appendix 1):

Confidence increase in the safety assessment codes (concepts, definition of scenarios and computer codes).

Timetable:

For the first: 2012–2020

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.

Short description of activity:

For the first

1. Agree on scope of work.
2. Definition of the benchmark context.
3. Study of the different calculation cases (2013).
4. Discussion and presentation, writing of the final report (2014).

Current on-going work (through EC, IAEA, bilaterally…):

Obviously the benchmarking methodology is used inside the various WMO's.

Work similar to that mentioned here can be found inside the PAMINA project, and also possibly the FORGE project.

The NEA is also very active in this area (Integration Group for the Safety Case (IGSC).

Decision of the EG:

Not decided but requires more drafting and the other Topics must be included here (Topics 3.11, 3.12, 3.15, 3.17)

SRA Key Topic:	SRA Topic:	SRA Topic priority (H/M/L):
Monitoring (6)	Monitoring Strategies and programmes for performance confirmation of the repository (6.1) Availability of monitoring technologies and techniques (6.2) Monitoring of engineered barrier systems (EBS) during operation (6.4)	High

Suitable type of activity	Expressed interest for the activity by (name of organisations):
Technical/ scientifical Working Group	Posiva, SKB, Andra, Nagra, NDA, BMWi, Ondraf, Puram, TNO

Product/Result from the activity:

- Expert review on already existing achievements.
- Review of the requirements.
- Roadmap for new developments.

Proposed title of the activity(as appearing in Appendix 1):

Monitoring programme

Timetable for the activity (Start/End dates, duration):

Start: 2015

Duration: 12 months

2016

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 authorised."*

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 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 confirmation 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 to fulfil the requirements. Development / adaptation / test /assessment of hard & software.

Short description of activity:

- 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.
- Compilation of national monitoring approaches/strategies and their evaluation regarding performance confirmation
- 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.
- General requirements for using monitoring techniques for decision making processes during the operational phase until final closure.
- Check the state-of-the-art of existing performance confirmation strategies and programmes (basic rules, regulatory requirements).
- 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.
- Standards for performance confirmation and influencing issues (regulatory boundaries, scientific boundaries, uncertainties, technological advancements or restraints).
- 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.
- Consequences for confirmation programmes: scientific-technological (open questions, continuous R&D, targeted R&D), social aspects, tests, experiments, analyses; benchmarking), check against license conditions.
- 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).
- 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, formalisation of approaches.

Current on-going work on the Topic (through EC, IAEA, bilaterally…):

- EC FP7 Project “Monitoring Developments for safe Repository operation and staged closure (MoDeRn**).**
  - Report on “National Monitoring Contexts, Country Annexes”, Dec. 2010.

Further references

- Thematic Network on the Role of Monitoring in a Phased Approach to Geological Disposal of Radioactive Waste, European Commission, EUR 21025 EN, 2004.
- IAEA-Draft Safety Guide DS357 Monitoring and Surveillance of Radioactive Waste Facilities, to be published.
- IAEA-Disposal of Radioactive Waste, Specific Safety Requirements, IAEA Safety Standards Series No. SSR-5, 2011.
- IAEA Nuclear Energy Series, No. NW-T-1.19, Geological Disposal of Radioactive Waste: Technological Implications for Retrievability.
- EC-Project “PAMINA”, Report on the PAMINA Stakeholder Workshop: Communicating Safety Issues for a Geological Repository, Hooker & Greulich, 2008.

A huge amount of literature (reports, papers, books, country specific approaches, etc) on monitoring is available. Information is also available from the US (YMP and WIPP), as well as from the different waste management programmes.

Decision of the EG:

A TSWG will be launched in 2015 tor review of all available results from the MoDeRn project to define a new programme to be built for improvement of strategies, review of available technologies, and development of new technologies.

SRA Key Topic:	SRA Topic:	SRA Topic priority (H/M/L):
Safety Case (1)	Increase confidence in and further refinement of methods to make sensitivity and uncertainty analyses (1.3)	Medium

Suitable type of activity	Expressed interest for the activity by (name of organisations):
TSWG	BMWi (leader), Andra, SKB, GNS, Kemakta, POSIVA/S&R, Galson, ENRESA, Fortum, NRG, VTT, SCK-CEN, REZ, HZDR, TNO, GRS Other interested parties should contact the Secretariat

Product/Result from the activity:

Logical framework for the enhancement of confidence in long-term safety and concepts for its communication.

Proposed title of the activity (as appearing in Appendix 1):

"Benchmarking" for the confidence in long term safety in Safety Cases

Timetable for the activity (Start/End dates, duration):

2012–2015 (3 years)

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 waste management 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 waste management 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 activity:

First activity: Check the identification and conceptualisation of safety relevant features, events and processes; 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.

Current on-going work on the Topic (through EC, IAEA, bilaterally…):

A good basis for starting and structuring the work on this Topic are the reports compiled on the matter of building confidence by IAEA and OECD/NEA as well as reports from some WMO's. Most valuable seem to be the strategic publications by NEA and the working papers of the IGSC. A very first literature review identified the following reports of interest:

1. IAEA (1994). Safety Indicators in Different Time Frames for the Safety Assessment of Underground Radioactive Waste Repositories.
2. IAEA (2002). Issues relating to safety standards on the geological disposal of radioactive waste: Proceedings of a specialists meeting held in Vienna, 18–22 June 2001 (IAEA-TECDOC No. 1282).
3. IAEA (2011). Disposal of Radioactive Waste, Specific Safety Requirements (No. SSR-5).
4. Karlsson, F. (1992). Validation of Models for Safety Assessment of HLW-Disposal in Sweden.
5. Larsson, A. (1997). The International Intraval Project, Phase 2, Summary Report.
6. Lemons, J. (1996). Scientific uncertainty and environmental problem solving. Cambridge, Mass.: Blackwell Science.
7. OECD/NEA (2002). *Integration Group for the Safety Case (IGSC).*
8. OECD/NEA (1999). *Confidence in the Long-term Safety of Deep Geological Repositories: Its Development and Communication.*
9. OECD/NEA (1992). *Systematic Approaches to Scenario Development.*
10. OECD/NEA (1997). *Lessons Learnt from Ten Performance Assessment Studies.*
11. OECD/NEA (2004). *The Handling of Timescales in Assessing Post-closure Safety.*
12. OECD/NEA (2000). *Safety report 97: Post-closure safety of a deep repository for spent nuclear fuel in Sweden: An international peer review.*
13. OECD/NEA (2002). *An International peer review of the Yucca Mountain project TSPA-SR: Total system performance assessment for the site recommendation (TSPA-SR).*
14. OECD/NEA (2004). *Post-closure Safety Case for Geological Repositories.*
15. OECD/NEA (2010). *Regulations and Guidance for the Geological Disposal of Radioactive Waste*. Review of the Literature and Initiatives of the Past Decade (No. 6405).
16. PAMINA final report: "PAMINA – Performance Assessment Methodologies in Application to Guide the Development of the Safety Case. Project Summary report. June 2011."
17. IGSC MeSA report: "Nuclear Energy Agency. Methods in Safety Assessment (MeSA), NEA Report No. TBD, OECD/NEA, Paris. In Press."
18. NEA AMIGO project report: "Nuclear Energy Agency. Outcomes and main messages of the NEA AMIGO project. NEA/RWM/IGSC/(2009)5, Paris, France."

Decision of the EG:

Set up an ORWG and later TSWG to prepare an eventual project to be launched in 2015 for benchmarking of models.

EG meeting November 2011: acceptance by EG and launch of the TSWG

SRA Key Topic:	SRA Topic:	SRA Topic priority (H/M/L):
Safety Case (1)	Improve safety case communication on the short-term, transient and long-term aspects of geological disposal (1.2). First action: Safety Case Peer review ORWG	H

Suitable type of activity	Expressed interest for the activity by (name of organisations):
ORWG	POSIVA (leader), SKB, Andra, NDA Other interested parties should contact the Secretariat

Product/Result from the activity:

Efficient framework for Implementing Organisations' QA-related peer reviews of scientific and technical RTD reports supporting the Safety Case prior its submission as a part of a license application.

Proposed title of the activity (as appearing in Appendix 1):

Efficient peer review and related QA processes

Timetable for the activity (Start/End dates, duration):

2011–2025

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.

Short description of activity /project:

1. Initial step is to survey current review practices in the IDG-TP
    a. current requirements
    i. scope of review activities
    b. protocols, procedures, instructions
    c. TOR practices
    d. language of reporting
    e. documentation of reviews
    f. openness policies
    g. involvement of learned societies
    h. use of review teams
    i. independence requirements
    i. paid reviews
    j. resolution of disputes/disagreement
    i. need for consensus?
    k. Description of best practices
2. Pool of experts available for review activities:
    a. Password protected data base of available experts
    a. CV's of the experts
    b. Secretariat maintenance of the database
    c. prior validation of the experts
3. Scientific/technical forums for learned discussion
4. Initiation of review workshops

The work also involves Cross-Cutting Activities such as:

- WMO's own capacities for reviewing other WMO's work
- Cooperation with universities
- Cooperation with NEA/IGSC
- Links to education and training area

This could also include activities such as a web forum (for registered participants of the IGDT) to encourage scientific criticism and dialogue on topical reports related to long-term safety of geological disposal. Platform participants may post reports or manuscripts on the site and ask for comments or they may ask for comments on specific issues or Topics; other members are welcome to offer comments or reviews on these issues.

Current on-going work on the Topic (through EC, IAEA, bilaterally…):

The current peer review activities focus in general on the programme level instead of individual scientific and technical topic reports. Such more general programme activities on going are e.g.

- IAEA and NEA peer reviews available for programmes/projects.
- Some waste management organisations' standing review groups.
- ENSREG work on peer reviews.

Even though the scientific reports are published, the general scientific peer review unless initiated by the regulatory authorities is ad hoc. Furthermore the lead time for receiving input from the scientific community is long for the expert quality assurance of the individual reports.

Decision of the EG:

ORWG to be launched at the November 2011.

Exchange Forum (decided at the June 2011 EG).

EG meeting November 2011: 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.

SRA Key Topic:	SRA Topic:	SRA Topic priority:
Technical feasibility and long-term performance of repository components (3)	Long-term stability of bentonite in crystalline environments (3.9)	High

Type of activity of work:	Expressed interest:
A Technical Project (TEP)	SKB, POSIVA, Andra

Product:

– 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.

Proposed title (as appearing in Appendix 1):

Long-term stability of bentonite in crystalline environments

Timetable:

2012–2017

Explanation of the contents 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.

Short description of activity:

- State-of-the-art summary 2012–2014
- Laboratory experiments: 2013–2015
- In-situ experiments: 2014–2017
- Modelling: 2015–2017
- Evaluation: 2017

Current on-going work (through EC, IAEA, bilaterally…):

- Within almost all individual programmes.
- SKB/Posiva co-operation.
- EC FP7-project BELBaR (Bentonite Erosion effects on the Long term performance of the engineered Barrier and Radionuclide Transport).

Decision of the EG:

BELBaR TEP started on March 1, 2012 for bentonite erosion (effects on the long term performance of the engineered barriers and radionuclide transport). The project runs until February 28, 2016.

SRA Key Topic:	SRA Topic:	SRA Topic priority:
Technical feasibility and long-term performance of repository components (3)	Develop a common report on the lessons learned from in-situ experiments on the behaviour of bentonite. (3.2)	High/Medium

Type of activity of work:	Expressed interest:
Organisational Working Group	ONDRAF/NIRAS; POSIVA; NDA, BMWi

Product:

Compilation of results from different experiments.

Proposed title:

State-of the art of bentonite behaviour in in-situ experiments.

Timetable:

2012–2014

Explanation of the contents of the activity:

Useful input to the LUCOEX work.

The different experiments that have been undertaken on the behaviour of bentonite:

- At Mt Terri, HE-C (on the coupled thermo-hydro-mechanical (THM) processes developed in a clay host rock and a bentonite buffer), EZ-A (Testing of hydraulic stops in the host rock), ED-FE.
- At Aspö, LOT (on the changes induced on Bentonite by thermal effects), ABM (on the alternative materials to MX 80 bentonite), TBT (behaviour of a bentonite + sand EB), prototype repository.
- At Bure MAG (interaction between host rock and disposal materials).
- At URL, TSX (drift seal experiment), shaft sealing.
- At Grimsel, EGTS.
- At MOL, Praclay.

And no doubt others …

Short description of activity:

The project consists in compiling the results obtained on the subject through the various experiments (see list above).

Current on-going work (through EC, IAEA, bilaterally…):

See above

Decision of the EG: This outline needs to be completed to include the other Topics (7.1, 3.1, 3.3, 3.4, 3.5, 3.6)

SRA Key Topic:	SRA Topic:	SRA Topic priority:
Development Strategy of the repository (4)	Adaptation and optimisation of the repository (4.1)	M

Type of activity of work:	Expressed interest:
ORWG	Andra

Product:

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

Roadmap for further work

Proposed title (as appearing in Appendix 1):

Adaptation and Optimisation of the Repository

Timetable:

2012–2018

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.

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 optimisation 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.

Current on-going work (through EC, IAEA, bilaterally…):

Decision of the EG:

Initiate ORWG to develop a roadmap

SRA Key Topic:	SRA Topic:	SRA priority (H/M/L):
Cross-Cutting Activity 2 (CC2)	Cross-cutting Activity: Competence Maintenance, Education and Training (CMET)	H

Suitable type of activity (ORWG or IEP):	Expressed interest for the activity by (name of organisations):
A regular working group (ORWG) without fixed end of the work	POSIVA, NDA, RAWRA, INPL, CTU, UPM, BGR, Stockholm University: Dept of Physics; University of Milan, TUC, Slovak Technical University ...

Product/Result from the activity:

– Overview of needs in the field of CMET to achieve the IGD-TP vision and to deploy its SRA.
– To promote the awareness and in other means make sure that there are capabilities and facilities to carry out RD&D work towards the vision and related education and training programmes.
– Opportunities for lifelong learning, mutual recognitions, accreditation especially leading to formal post-master's qualifications.
– Activities to close the gap between the vision and the current CMET state-of-the art e.g. by initiating different joint training activities and workshops to complement the IGD-TP's Joint Activities and to share knowledge about them.
– Raise awareness among the students and potential new personnel of the opportunities of work in the field of geological disposal.

Proposed title of the activity:

Competence Maintenance, Education and Training Working Group

Timetable for the activity (Start/End dates, duration):

Start end of 2011– spring 2012 to be continued until the end of 2014 (at least at the first stage).

Explanation of the objectives of the activity:

• "Transfer of the state of the art, the competence analysis and needs." This objective is to identify the shortfalls and needs in knowledge, skills and attitudes (competence) to undertake the planned research, development and demonstration activities and programmes identified in SRA and its DP effectively. This requires also the definition of the border of knowledge (the state of the art) for each of the SRA Topic. Such analysis activities need to be carried out in cooperation with all of the relevant Joint Activities in order to identify them on the European level.
• Quality assurance of training provided for new and experienced professionals in the field of nuclear waste management and especially geological disposal by developing quality assurance procedures and criteria for the voluntary accreditation of training (and education) in geological disposal.
• Develop the content of training i.e. "Curricula" for professionals in geological disposal for the development of joint training or engaging educators and trainers into developing E&T to meet the expertise needed to carry out the IGD-TP's SRA and its RD&D activities as part of the deployment. The different training needs (different jobs) of the different target groups need to be addressed in the curricula development.
• Ensuring indirectly that providers for CMET exist i.e. ensure the sustainability of providers and infrastructures/facilities for competence maintenance and development and new personnel.

See draft Terms of Reference in preparation for more details.

Short description of activity / project:

• To set up a working group to promote the IGD-TP's vision, SRA and its deployment and more specifically to collect and share information on knowledge, skills and attitudes (competence) needed, to discuss and propose recommendations for mutual recognition of competences related to specific tasks.
• To issue the results of the quality review of educational and training offering for accreditation of courses and programmes that meet pre-set quality criteria of the IGD-TP.
• To initiate Joint Activities in training and setting up training courses either derived from the IGD-TP's Joint Activities and new knowledge derived from them or on training related to SRA Topics current lacking competent training (the intention is not to be a training provider, but to act as a catalyst to get these activities on-going).

Current on-going work on the topic (through EC, IAEA, bilaterally…)**:**

– The European frameworks for university accreditations (the Bologna Process and ECTS)
– European Qualification Framework and National Qualification frameworks (in development and in adaptation in national educational legislation).
– ECVET system recommendation and piloting on-going prior 2013.
– EHRO-N – European Human Resources Observatory (run by JRC – IET).
– European Fission Training Schemes i.e. on-going Petrus II (Geological disposal), CINCH (Radiochemistry) and ENETRAP in the field of radiation protection.
– ENEN Association (qualification framework, single contact point for opportunities, and awareness activities targeted to students about employment opportunities in the nuclear field).
– IAEA recommendations and SAT (systematic approach to training), link to NKM*.
– IAEA URF Training Network.
– Various national initiatives like in the UK (NSA), Finland (TEM Committee for Nuclear Energy Competence in Finland, national YK/YJH - courses, YTERA doctoral school, FINECVET pilot projects), Germany, Sweden (NOVA College)...

Decision of the EG:

Leader: POSIVA

Preliminary guidance:

- Update the draft ToR with the objectives and participants of the IGD-TP's Exchange Forum no 2 meeting.
- Announce the expression of interest "call" on the Intranet (in June–July 2012) to get further expressions of Interest to participate.
- Propose CMET Terms of Reference for the IGD-TP's EG approval in May 2012.
- Potential presentation at the EF in November 2012 – including selected participants in the ORWG.

EG meeting November 2011:

Expression of interest "call" on the Intranet (in February 2012) to get further expressions *of interest* to participate.

* Nuclear Knowledge Management.

Appendix 3

Project management guidelines

To be considered according to ISO10006:2003. (Modified checklist):	ORWG or TSWG	TEP or TT
Analysis of the RD&D environment	applies	applies
Short- and long-term forecasts of RD&D developments	applies	applies
The needs and expectations of the interested parties	applies	applies
Objectives to be achieved from the activity	applies	applies
Statutory and regulatory requirements underlying the Topic in different partner countries	applies	applies
Documented identification of potential financial, regulatory and other risks	applies to some degree	applies
Identification of the activity's main processes and their inputs and outputs	applies to some degree	applies
Interactions with other processes within the activity and in the partner organisations	applies	applies
Resources needed and information flows needed	applies to some degree	applies
Activities and methods definitions	applies to some degree, often the objective of the activity itself	applies
Records that are required or desired	applies to some degree	applies
Measurement, monitoring and analysis	applies to some degree	applies
Corrective and preventive actions	applies to some degree	applies
Improvement and/or innovation activities	applies to some degree	applies

Appendix 4

Structure of the IGD TP organisation

The below paragraphs are taken from the IGD-TP Vision Report:

The basic structure of the organisation proposed for the technology platform includes an Executive Group that is supported by a Secretariat and a forum for exchange of information and discussion on RD&D needs, as well as results, in relation to implementation of geological disposal. The organisation forms a starting point for the platform organisation, which evolves over time.

All stakeholders endorsing the vision of IGD-TP are welcome to join the platform by application, see www.igdtp.eu.

Exchange Forum

The Exchange Forum participants are all stakeholders in Europe (e.g. waste management organisations, industry, research organisations, research centres, academia, technical safety organisations, non-governmental organisations) willing to contribute positively and constructively to the objectives and goals of the platform, such as establishing and implementing the Strategic Research Agenda (SRA) and the accompanying Deployment Plan (DP).

The participants' responsibilities include information exchange to and from the platform on the SRA and related RD&D needs, providing written recommendations to the Executive Group, participation in the consultation of the SRA and the DP, and they are also asked to identify and provide resources for the working groups.

Executive Group

The Executive Group (EG) is the decision and management forum of the platform. The technology platform will be implementer-driven. Members of the EG will be organisations either being responsible for implementing a waste management programme or being formally responsible for the RD&D programme needed for implementation. In addition, research organisations with significant autonomous budgets and/or available funding that can contribute to the work of the technology platform are foreseen to have an advisory role to the EG. The EG members' responsibilities are to take decisions and steer the different tasks of the platform; to prioritize activities and projects (to be funded jointly) for deployment; to initiate, monitor, and evaluate activities; to fund the Secretariat (equal division); to approve the SRA and DP; to establish working groups; to encourage information exchange with "Mirror groups" including regulators, and to develop reports and information to the Exchange Forum.

Secretariat

The Executive Group appoints the Secretariat, whose responsibilities are to organise and coordinate the activities of the IGD-TP; to support the finalisation and publication of the SRA and DP of the IGD-TP; to contribute to that the IGD-TP is organised in an appropriate manner to achieve the committed vision according to the timeframes set in the Vision Report, in the finalised SRA and in its DP; to act as an information and communication centre about the activities of the IGD-TP and on developments in the waste management community. The Secretariat maintains a public website at www.igdtp.eu where information and documents about progress, future and past events are published; supports the exchange of information among the committed members and other exchange fora, and fosters consultation and cooperation on projects. The Secretariat reports to the Executive Group.

Working Groups

Working Groups will be established within the working programme. These groups will have specified mandates such as development of the SRA, development of supporting activities such as education and training and knowledge management. Cooperative projects and other forms of Joint Activities carried out in the Working Groups will follow agreed work plans and objectives.

Other participants

Regulators and Technical Safety Organisations are also invited to participate in the technology platform for example by forming Mirror Group(s) as decided by them. The regulator's interaction with the platform shall not compromise their independence or prejudice their decisions.

Appendix 5

The IGD TP DP Working Group

This DP has been produced by the following DP Working Group with representatives from the IGD-TP's member WMOs:

ANDRA, France: Gérald Ouzounian and Richard Poisson

BMWi, Germany: Wernt Brewitz and Walter Steininger

Nagra, Switzerland: Lawrence Johnson

NDA, United Kingdom: Cherry Tweed and Neil Smart

POSIVA, Finland: Marjatta Palmu

RAWRA, Czech Republic: Jiri Slovak

SKB, Sweden: Torsten Eng

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