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**- SADRWMS -**

**The International Project  
on**

**SAFETY ASSESSMENT DRIVING RADIOACTIVE  
WASTE MANAGEMENT SOLUTIONS**

**Second Plenary Meeting  
October 2005**

**Chairman's Report**

## **Background**

The safety of radioactive waste management and disposal facilities can be evaluated by using safety assessment methodology. In this context safety assessment means evaluation of the actual and potential hazards to human health and the environment associated with the natural evolution of a radioactive waste management facility over time, and with events, both deliberate and accidental, which could affect its integrity. By means of such analysis it is possible to identify the strengths and weaknesses in the overall safety of such facilities and as necessary to develop actions to improve their status.

It is important that safety assessments are carried out in a traceable, transparent and consistent way in order to provide an assurance to stakeholders (such as governments, regulatory authorities, the general public and technical/scientific personnel) that the facility has been or will be sited, designed, constructed, operated and closed in such a manner that will provide a high level of assurance that human health and the environment is protected over the necessary long timescales.

The International Project on Safety Assessment Driving Radioactive Waste Management Solutions (SADRWMS) is designed to examine the application of safety assessment methodology to predisposal waste management practices and facilities including waste storage, and will complement the experience gained with the Agency project “Improvement of Long-term Safety Assessment Methodologies for Near Surface Disposal Facilities” (ISAM) which was completed in 2000, and the current CRP “Application of Safety Assessment Methodologies for Near Surface Disposal Facilities” (ASAM) whose purpose is to investigate practical application of safety assessment methodologies to a range of near surface radioactive waste disposal facilities. The SADRWMS project will encompass all types of radioactive waste including disused sources, small volumes, operational waste and spent fuel, legacy and decommissioning waste, and large volume NORM residues.

Safety assessments for various types of predisposal facilities have been carried out for many years now, but there have not been any international efforts to compare the techniques and methods applied in such assessments. Nor has consideration been given to how the results of these assessments are interpreted and used in decision making on design development or modification, safety upgrades, periodic safety assessment or licensing activities. The need for approaches to predisposal safety assessment being compared internationally and programmes investigated to develop international harmonisation has been recognised at a number of international forums in recent years, particularly the December 2002 Conference on Issues and Trends in Radioactive Waste Management.

Of particular relevance and importance in this context is the application of safety assessment to the storage of radioactive waste. Due to the delays experienced in many countries in developing waste disposal facilities, waste has to be stored for

increasingly longer periods. Some countries are also considering extended storage as an alternative to disposal. This issue was debated at the 2000 Cordoba Conference, where the sustainability of such an option was seriously questioned, and resulted in the issue being featured in the Waste Safety Action Plan (2003). The IAEA Secretariat has held a number of meetings to explore and debate this issue widely and an international position paper has been published on the subject. To a large extent the paper recognises that indefinite storage is not a sustainable option, while acknowledging that storage is a necessary phase in safely managing most types of radioactive waste. It is clear that safety assessment of predisposal management activities needs appropriate and valid methodologies. Security concerns expressed over long-term surface storage were evident during the various discussions on the topic and again the need was emphasised to address physical security threats within the overall safety assessment process.

The draft Safety Guide DS284 (*“Safety Assessment for Nuclear and Radiation Facilities Other Than Reactors and Waste Repositories”*) provides guidance on performing a safety assessment for facilities and activities associated with the management of radioactive waste prior to disposal. Under the Joint Convention, such a safety assessment will be required for all new facilities prior to implementation. DS284 has evolved to cover a wide variety of facilities, including environmental restoration & radioactive waste stores. The guide emphasises the importance of ensuring that the extent and complexity of the safety assessment is commensurate with the nature of the activity or facility and its attendant risk.

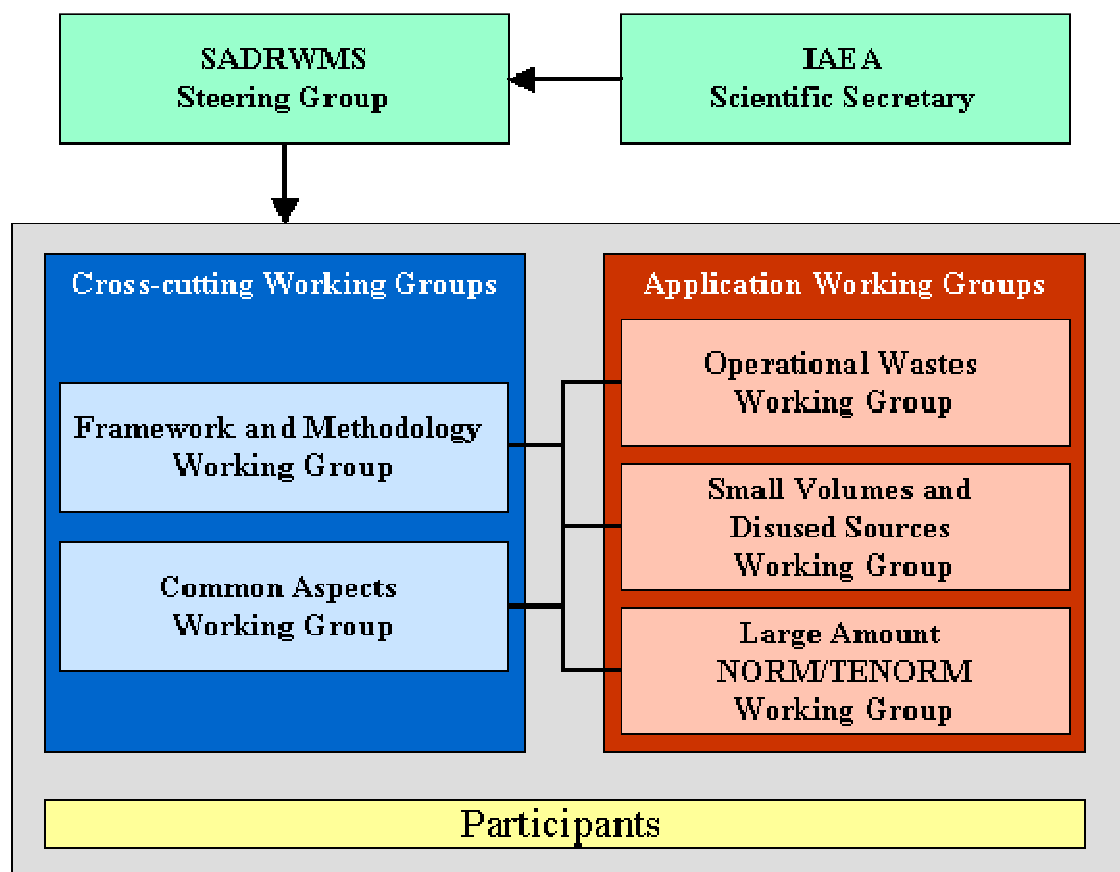
The first SADRWMS technical meeting was held in May 2003. This meeting mapped out the project with the objective of developing and harmonising approaches to safety assessment of activities and facilities for management of radioactive waste prior to disposal, with the *aim of driving forward towards disposal solutions*.

Specifically, the SADRWMS Project aims to develop practical advice for those performing or reviewing safety assessments in predisposal management and storage of radioactive waste (operators, regulators and other specialists). A detailed description of the scope, objectives, content and work programme proposed for SADRWMS is found in the Project Report. A generic flow-chart is being developed as a tool to guide the application of safety assessment to all aspects of predisposal radioactive waste management. Participants are encouraged to join and contribute actively to several of the five working groups.

The project is open to professionals working in the field of safety assessment and predisposal management and storage of radioactive waste. The first plenary meeting for SADRWMS was held in Vienna from 22 to 26 November 2004 (see Chairman’s Report, Nov. 2004) and the second plenary meeting was held in Vienna from 17 to 20 October 2005.

## Organisation

The organisation structure of SADRWMS is presented in the Figure.



*Figure: Organisational Structure of the SADRWMS Project*

## Participants in the Second Plenary Meeting

Marcela Medici (Argentina), Maisa Magalhães (Brazil), Farid Asgharizadeh (Iran), Rodolfo Avila (Sweden), Peter Burrows (UK), Milena Christoskova (Bulgaria), Chris Fisher (UK), Reinaldo Gil Castillo (Cuba), Andrey Guskov (Russia), Olga Karlina (Russia), Phil Hallington (UK), Ladislav Konecny (Slovakia), Vladimir Lokner (Croatia), Valdas Ragaisis (Lithuania), Jagos Raicevic (Serbia&Montenegro), Arvind Upadhyay (India), Azucena Sanhueza – Mir (Chile), Isabel Steyn (Sth Africa), Geoff Williams (Australia).

## **Program**

The Second Plenary Meeting of the SADRWMS International Project opened on Monday 17 October 2005 with a welcome from the Chair and brief introductions from all participants. Represented at the meeting were 19 participants from 16 countries, together with two representatives from the Agency (Phil Metcalf and Luis Jova Sed of the Waste Safety Section).

### ***Overview by Secretariat***

Phil Metcalf presented an overview of how SADRWMS fits into the wider work of the Waste Safety Section, and provided a list of recent relevant publications together with a summary of other work in progress.

In particular, the meeting was advised of the Agency plan to replace the Safety Guide (SG) “Safety Assessment for Near Surface Disposal of Radioactive Waste” (WS-G-1.1), the only Agency safety publication to date relating to safety assessment, by a safety assessment Requirements document, together with three safety guides relating to disposal, predisposal waste management, and monitoring and surveillance of disposal facilities.

Other relevant new documents under preparation include:

- a new Requirements document on management of radioactive waste (minus decommissioning aspects);
- a new SG on storage (approved by WASSC);
- perhaps a SG on long-term storage;
- a new SG “Classification of Radioactive Waste” (DPP just approved by WASSC); and
- two Safety Reports “Long Term Storage” and “Storage of Small Amounts of Waste”.

Phil Metcalf also summarised the various other relevant “Review and Development” projects within the Agency (these are basically standing forums of specialised expertise). These included ISAM/ASAM (Improvement/Application of Safety Assessment Methodologies), EMRAS (Environmental Modelling for Radiation Safety), and DeSa (International Project on Evaluation and Demonstration of Safety for Decommissioning of Nuclear Facilities). A complementary project on application of safety assessment methodology to geological disposal is under consideration.

It was also pointed out that the SADRWMS working group needs to be clear about the distinction between a Safety Case and Safety Assessment in the pre-disposal management of radioactive waste, and that the tools being developed for applying safety assessment methodology need to both aid development of proper safety assessments and also to clearly guide peer review of developed safety assessments.

### ***Thematic Working Groups***

The chairpersons of each of the two cross-cutting (thematic) working groups, and of the three application working groups, presented brief summaries of work performed in each of the groups to date and where each one is heading.

Then the meeting divided into individual thematic working groups and work proceeded in these individual groups over several days. Details of the work accomplished and the future plans of each of the two thematic working groups, the Framework and Methodology Working Group and the Common Aspects Working Group, are presented in the accompanying Chairperson's Reports.

A highlight is a plan by members of the cross-cutting thematic working groups to produce an innovative software package to aid application of safety assessment, with the ability to click and calculate ones way through all the various elements of a safety assessment, and with hyper-text explanatory links. It was emphasised that throughout such a software tool, there must be numerous warnings of the ***need to think*** about one's actual circumstances and data and not just to forge ahead mindlessly using default values.

The Common Aspects Working Group spent considerable time discussing issues to do with the interfaces between the waste generator and waste manager, and waste management and the operation of disposal. In particular, concern was expressed to the Agency Secretariat of a potential gap in guidance for application of safety assessment to the actual operational phase of a waste repository. The SADRWMS project is considering application of safety assessment to all phases of pre-disposal waste management up to the actual operation of disposal of the waste. And the ASAM project is focussing on application of safety assessment post-closure of a disposal facility. It was pointed out that the operational phase of disposal involves some aspects quite different from storage which is being considered in the SADRWMS project.

In particular, the operation of disposal would generally involve a requirement for specific monitoring (again, considering a proportionate approach, eg. whether borehole monitoring or measurements of dust are required), and maybe a safety assessment supplemented by environmental modelling.

The scope of the ASAM project is to consider "practical application of the ISAM safety assessment methodology to proposed and existing near surface radioactive waste disposal facilities. The emphasis of the ASAM project is on post-closure safety assessment, although, where considered appropriate, operational safety might also be assessed." The meeting requested the Agency Secretariat to clarify the boundary between the SADRWMS and ASAM projects, to ensure that there isn't a gap involving the application of safety assessment to the operational phase of disposal.

A work plan for the future work of these two groups, which will essentially be combined from here on, was developed and agreed (see Appendix).

### *Joint Meetings with DeSa*

On Wednesday morning, 19 October 2005, the SADRWMS plenary group met with the brains trust of the DeSa project (whose purpose is to aid application of safety assessment to decommissioning of nuclear facilities), and a joint meeting of DeSa and SADRWMS delegates was held on the Thursday. These were particularly useful opportunities for both working groups to become familiar with the work of the other, to discuss the interface between the two projects, and to learn from the experience of each other.

An issue of particular importance identified at the joint meeting with the DeSa working group is the interface between the work-areas of the two groups. It was recognised that decommissioning could all too easily proceed, with or without adequate safety assessment, to successful completion without giving proper consideration to the waste packages being produced for another authority to manage and ultimately dispose of. And it was recognised that this could well be the political imperative, to remove one headache for government (eg. an old nuclear power plant) and simply add to a bigger pile of radwaste (another headache, but one which unlike the old NPP is less likely to go away). The aim of SADRWMS and DeSa together is to provide incentives to manage both headaches better.

Other issues canvassed at the joint meetings with DeSa included:

- peer review of DeSa outputs is to be conducted via computer access;
- initially DeSa has formed 5 working groups to develop the assessment methodology, including working groups on the graded approach and on regulatory review, and another involved with confidence building;
- in phase II, DeSa will examine application of the methodology to three test cases;
- the need for a thinking period following a time of care-and-maintenance. Having determined a high-level strategy for decommissioning of a particular facility, this “thinking period” allows time to evolve the best practical details;
- waste generators (ie. those undertaking decommissioning) must comply with the requirements of waste managers – need for communication and understanding between each;
- the main focus of DeSa is the protection of workers and the public (so DeSa safety assessment is principally concerned with doses to workers and public arising from the decommissioning operation);
- should decommissioners meet waste acceptance criteria (WAC) defined by the waste managers? A principle should be that the decommissioning operation has to produce acceptable waste;

- in regard to the two requirements of dose/risk criteria and WAC, where is the boundary between the two projects? Should decommissioners simply put waste somewhere, or do something with it (ie. undertake some processing to produce a better waste form for the waste managers)?
- the chairman of DeSa, Ken Percival, reminded us that safety assessment is an enabling activity, not the process itself;
- it was pointed out that compliance with WAC may well increase doses and/or generate secondary waste – hence, the need for a proper balance;
- characterisation of waste must be part of the decommissioning process;
- need for a synergy between decommissioning and waste management; feedback is needed which may slow the decommissioning;
- the decommissioning safety assessment should be very much waste-driven;
- the goal is a seamless flow of safety assessment methodology between DeSa and SADRWMS, together with consistency in the recommended graded approaches.

### ***Application Working Groups***

On the final day of the meeting, sessions of each of the three application working groups were held. Details of the work accomplished and the future plans of each of the three application working groups, the Operational Waste Working Group, the Small Volumes and Disused Sources Working Group, and the Large Amount NORM/TENORM Working Group, are presented in the accompanying Chairperson's Reports

An important aspect in the work of each of the three application working groups is the identification of several relevant test cases to which the safety assessment methodology being developed can be applied, and to document practical lessons learnt from these real case studies.

Some highlights of the work performed by each of the working groups are presented below.

### **Framework and Methodology Working Group**

The objective of this working group is to develop a framework for the overall processes of predisposal waste management, which allows for the identification of required safety assessments. Furthermore, methodologies for conducting these safety assessments will be derived using existing approaches. The actual execution of safety assessments is outside the scope of this working group.

The methodology working group is developing guidelines for the application of existing safety assessment methodologies and the identification of what is needed in the way of safety justification.

Members of this working group plan to produce an innovative software package to aid application of safety assessment, with the ability to click and calculate ones way through all the various elements of a safety assessment, and with hyper-text explanatory links. This will be based on the generic flow-chart which is being developed as a tool to guide the application of safety assessment to all aspects of predisposal radioactive waste management.

The framework proposed, as well as the safety assessment guidelines will be tested by three application working groups.

The main steps in developing the overall framework and the guidance on the safety assessment methodologies are:

1. Production of a flow chart covering all predisposal phases of radioactive waste management;
  - identification of main safety issues for each step;
  - identification of criteria applicable to each step;
  - identification of where safety assessments are necessary;
  - identification of which safety assessment approach should be used.
2. Production of an interactive software package incorporating the flow chart and with links to appropriate safety assessment methodologies and required input data.

During the meeting, the working group revised the draft flow chart for the overall framework.

## **Common Aspects Working Group**

The overall objective of the working group is to identify common aspects of predisposal radioactive waste management and to develop guidance on the application of safety assessments to these waste management facilities. The working group is considering a range of facilities, from very small and simple to very complex, in order to identify the common aspects.

The working group is producing guidelines for the application groups as far as the identified common aspects are concerned. This framework is intended to facilitate the activities of the application groups and to avoid duplications of work within these groups.

The outcome will also enable the application groups to decide on the level of assessment needed for different types of waste and practices (taking into consideration the level of detail of the overall project).

A further objective of the working group is to create and then manage the learning processes via the internet for the SADRWMS platform. This should support the exchange of information and of worked examples where the methodology has been applied.

The working group developed the basic structure of the overall project report as determined at the previous meeting. In particular, details concerning application of safety assessment common to the various phases of pre-disposal waste management were fleshed out. The relevant stages for which details have been provided for input to the software tool were:

- waste characterization/identification/classification;
- pre-treatment;
- treatment/conditioning; and
- storage.

## **Operational Wastes Working Group**

The Operational Waste Working Group is considering the management of operational waste including legacy wastes, decommissioning waste and spent fuel. The methodology, framework, common aspects and flow charts provided by the cross-cutting groups, together with existing safety assessments, will form the basis of the work for this working group.

The working group will test the applicability of the provided methodology, framework and common aspects from the cross-cutting groups as well as the flow charts and software package. This will contribute to the development of a harmonized common approach for the safety assessment of the predisposal management of the various categories of operational waste.

A key purpose of this work is to ensure that relevant pre-disposal waste management facilities are designed, constructed, commissioned and operated to meet the safety objectives. The potential need for upgrading safety of existing facilities will be specifically addressed.

Through the use of specific case studies, the application of the methodology developed by the cross-cutting groups will be demonstrated. Emphasis will be on a proportionate and effective application, which facilitates safety of the operation staff, the facility and the environment as stipulated by the regulations.

The following candidates for test cases to be used for testing of the overall framework and the developed methodologies have been identified:

- Ion Exchange Resins treatment at NPP Ignalina - (Lithuania);
- Legacy Wastes - (UK);

- Safety of radioactive waste management during en-masse coolant channel replacement (ECCR) of Indian Pressurised Heavy Water Reactors – (India);
- DeSa test case?

As well, a revised work-plan applicable to the Operational Waste Application Working Group was developed.

### **Small Volumes and Disused Sources Working Group**

The Small Volumes and Disused Sources Working Group is considering the pre-disposal management of waste originating from hospitals, industry and research. This includes waste from research reactors (excluding spent fuel). Disused and orphan sources will be also considered, independent of their origin.

The objective of this working group is to test and validate the framework and guidelines developed in the cross-cutting working groups for the specific types of waste within the scope of this group. The working group will provide feedback to the two cross-cutting groups, including suggestions for modification of the framework and guidelines produced. A technical report will be delivered with results of the validation of the framework and the results of application in test cases.

The following parameters were identified as relevant for the identification of wastes defining the scope of required safety assessment activities:

- waste generator;
- waste type;
- waste description;
- mass;
- volume;
- radioisotopes;
- activity concentration;
- chemical composition;
- dose rate.

During the meeting, the working group developed a revised work plan including the tasks:

- Review the text on Waste Identifications and Waste Streams.
- Apply flowcharts to identify information needed for safety assessment in the test cases. For the text cases that are envisaged, safety assessment of specific steps will be carried out by July 2006.
- Intermediate meeting to discuss the outputs – proposed for Sweden/Austria, August 2006.
- Complete formulation of the test cases – December 2006.
- To complete the safety assessment for the text cases – 2007.

## **Large Amount NORM/TENORM Working Group**

The Large Amount NORM/TENORM Working Group is only considering the management of NORM/TENORM waste. The framework and flow charts provided by the crosscutting groups, and body of safety assessment methodology together with existing safety assessments, will form the basis of the work for this working group.

The working group will test the applicability of the methodology and framework for its application from the crosscutting groups as well as the flow charts and software package to large amount NORM/TENORM waste. The working group will also attempt to provide a straightforward, harmonised method to deal with the management activities of NORM/TENORM waste, and guidance on all aspects of safety assessment relevant specifically to the management of large volume waste.

In its work, the working group will utilize existing safety assessments, and only to the extent necessary and possible conduct new safety assessments for NORM/TENORM.

The proposed test cases to trial the safety assessment methodology are the former Gachine open-cut uranium mine in southern Iran (a pond U mine in the south of Iran currently under IAEA safeguards), and the 10,000 drums of mining tailings waste stored at Woomera, South Australia. Existing data on both these situations are being gathered by the relevant national delegates.

Geoff Williams

## Appendix - SADRWMS – Work-plan for Cross-Cutting Groups

What	Who	When	Resources	Comments
Input reports from two groups	CC working groups			
Finalise questions (sorting/eliminating/adding)	CC working groups			
Compile draft report (one)				
Define draft specifications for software		Oct 2005		
Identification and Testing of Methodologies needed in the different Safety Assessments		Dec 2005		To be discussed with Wolfgang
Finalise specifications	6 persons + 2 Facilia	April 2006 (propose meeting, Sweden)	40 man days	Travelling & subsistence cost to be added
Develop interactive software based on flow charts (proto type)	Facilia	May & June 2006	2 man months	Major innovation widely applicable throughout the IAEA
Draft software available		July 2006		
Test software and finalise report	All (20 persons x 3 days) next SADRWMS meeting	? August 2006 (propose meeting – 3 days)	60 man days	Travelling & subsistence cost to be added
Working group agree test cases (3)	All (20 persons x 2 days)	? August 2006 (Same meeting – 2 days)	40 man days	Possibility of an extra working group with DESA to test the software
Test case 1				
Test case 2				
Feedback on results and problems				
Update of software and report				
Finalise working group reports				
Finalise software, including examples				