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Application of Safety Assessment Methodologies for Near Surface Disposal Facilities (ASAM)

Safety Reassessment Working Group

*1st Research Coordinating Meeting,
11 to 15 November 2002, Vienna, Austria*

December 2002

SRA-1RCM



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1. INTRODUCTION

In November 2002, the International Atomic Energy Agency has launched a new research co-ordinated project in the field of safety assessment for near surface disposal facilities. The primary objective of the project is to investigate the application of safety assessment methodologies used for post-closure safety assessment, and in particular the one developed under the Agency ISAM project (Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities, 1997-2000), with the view to improve mechanisms for development and review of safety assessment and safety case for this type of facilities.

The Reassessment working group (WG) is one of the Application working groups of the ASAM project to investigate the role and application of the ISAM methodology for the re-evaluation of safety of near surface disposal facilities. At the first Research Coordinating Meeting (RCM) held from 11 to 15 November 2002, the group attracted 32 members from 19 countries including regulators, operators, safety assessors, and researchers.

This report summarizes the WG meeting activities and outcomes agreed during it.

2. DEVELOPMENT OF THE WORKING GROUP MEETING

2.1. *Plenary session*

The main purpose, scope and objectives of the Reassessment of Safety WG were presented to all RCM participants during the first plenary session. Then the Reassessment of Safety working group was established with wide range of representatives of Member States with RADON type facilities, vault type facilities, and countries planning the development of new near surface facilities. The list of the participants in the WG is presented in Appendix A.

2.2. *Working Group session*

The Reassessment WG held four sessions during the RCM following the agenda enclosed in Appendix B. During these meetings the detail scope and objectives of the WG activities, their priorities and the approach of the group, as well as a work plan for the short-term have been discussed and agreed.

The first WG session (Tuesday, 12 November 2002) commenced with a presentation on the detailed overview of the proposed scope, objectives and outcomes of the Reassessment WG activities, made by Peter Ormai, leader of the WG.

The members of the WG expressed their interest in similar areas:

- reassessment of safety of past practices and facilities built according to previous standards and for which upgrading of safety is necessary; and
- reevaluation of the safety of near surface facilities, upgrading safety with slightly different priorities than selection of an upgrading option (e.g. change of geological conditions, review of waste acceptance criteria);
- periodic reassessment of facilities under normal operation built according to current safety standards.

It was agreed that the group activities would aim to:

- a) provide practical demonstration of the iterative application ISAM safety assessment methodology to address real problems;



- b) support the review and judgment of the acceptability of differing options by providing a quantitative comparison of them; and
- c) practical demonstration of the re-assessment process in order to support decision making in the selection of alternatives for upgrading/demonstrating safety.

The volunteered reference site (Püspökszilágy repository) was presented by Károly Berci (Hungary) along with the approaches and results of the safety assessments performed for this facility during the last few years. The presentation was also followed by presentation of national experience of Drigg (UK) and Baita Bihor (Romania) facilities in the context of applying the ISAM methodology.

Based on the presentations and discussions related to them, an initial list of issues important to be considered in the implementation of the ISAM methodology were identified, and suggested to be addressed in the Reassessment WG Test Case (listed below).

These discussions continued on Wednesday, 13 November when Peter Ormai introduced the proposed approach to be adopted and activities to be carried out by the WG along the three-year project and planned activities. A presentation of the possible decision making process for selection of an appropriate upgrading option, with emphasis on the safety assessments needed was made by M. Kozak. It addressed also the different data needs and associated uncertainties, and the resulting difficulties in direct comparison of risks (e.g. radiological and non-radiological) from differing activities. The establishment of the technical basis for the safety assessments that need to be conducted to support the decisions on appropriate upgrading option was also discussed.

Based on the presentations active debate took place and in particular on the different decision making stages to be considered in the Test Case:

- i) interpretation of results of safety assessment performed;
- ii) decision on the selection of options for upgrading facility safety (retrieval of waste, improvement of engineered barriers, etc.) to be evaluated in the next step; and
- iii) definition of criteria for the decision making process, once selected options have been evaluated and safety assessment results need to be used as a basis for selection of most appropriate option to be implemented in practice.

These decision making processes will be addressed by the WG and in order to be able to use the Püspökszilágy repository as a reference one for the Test Case it was considered necessary to review the safety assessment performed that concludes that safety upgrading measures need to be implemented to ensure that the long-term safety of the repository is in compliance with internationally agreed safety criteria.

Several specific issues were raised during the group discussions in the two sessions that were suggested for future consideration by either the Reassessment WG or the Cross-cutting WGs:

a. Clarification of requirements for containment period and the subsequent dispersion period

It was considered that more detailed guidance for the need and rationale for inclusion of such requirements, for example for lifetime of the waste disposal system components, in the assessment context is necessary. It was proposed to investigate the approaches and practices



in Member States and to summarize the outcome in a [discussion](#) paper that will be reviewed and discussed by the WG.

b. Decreasing the level of conservatism

The WG considered important to investigate the approaches for decreasing the level of conservatism, evaluation and justification of the appropriate level and its consistency with regulatory requirements. Guidance in this area was felt important to be developed by applying the ISAM methodology in the Reassessment WG Test Case with particular focus on ways of formulation and justification of best estimate input in safety assessment; reassessment of scenarios (e.g. barrier degradation, consecutive evolution); consideration and justification of probabilities of disruptive events, including human intrusion; performance of consequence modelling; comparison of results, estimation of remaining level of conservative assumptions; use of probabilistic calculations; and approaches for interpretation of safety assessment results.

c. Further data collection - value or cost analysis

Lack of data or insufficient data was another area important for reassessment of safety of existing near surface facilities. It was considered important to explore mechanisms for identifying the important information necessary for safety reassessment and for providing these information. Possible examples to consider are reassessment of the inventory; investigation of behaviour of radionuclides in chemical conditions provided by degrading vault; formulation of limited set of biosphere models (less conservative approach). The Reassessment WG proposed to focus on the development of decision-making scheme for prioritization and selection of data needed for revaluation of safety. This issue could also make use of the results and experience of the reassessment of the Hungarian repository.

d. Evaluation of improved engineered barriers – technical feasibility, reversibility, cost estimates, lifetime issues

Evaluation of engineered barriers of a near surface disposal facility after their improvement/upgrading is very important and especially in the process of upgrading safety of facilities built in the past according to previous standards and requirements. This is also important process in selection of an appropriate engineered barrier from series of options (e.g. backfill of vaults, final cap design).

e. Guidance on the practical application of ISAM safety assessment

Practical guidance on how to use the ISAM methodology for the Test Case and in particular in its iterative application to support development of robust safety assessment, reliable results and how the methodology can be used in decision making on selection option for safety upgrading of near surface repositories.

3. REVIEW OF THE WORKING GROUP SCOPE AND OBJECTIVES

As mentioned before the members of the working group expressed their interest in the reassessment of the safety of near surface facilities, from two different points of view:

- reassessment of safety of past practices and facilities built according to previous standards and for which upgrading of safety is necessary; and



- periodic reassessment of facilities under normal operation built according to current safety standards.

It was agreed that the WG will focus on definition of decision making factors and processes required for selection of options for increasing long-term safety of existing facilities based on the use of safety assessment results rather than on evaluation of quantitative results of radiological impacts directly derived from the implementation of selected safety upgrading options nor focusing on other risk to workers and public. It will also investigate issues that are relevant to the iterative application of the ISAM methodology (decrease level of conservatism, prioritisation of need of data, etc.) and will provide guidance for treating these issues.

4. DEVELOPMENT OF A WORK PLAN

The Working Group has discussed and agreed to develop a Test case that will facilitate achievement of above stated objectives. The group participants also agreed to a work plan based on four main activities:

- *Activity 1 Definition of the working group test case*
- *Activity 2 Initial selection of safety upgrading options;*
- *Activity 3 Safety assessment of selected options (conduct parallel evaluation of the radiological impact of these options); and*
- *Activity 4 Analyses and comparison of results of evaluated options for providing guidance on issues and factors relevant to be considered in the decision making process.*

A more detailed plan was agreed for Activity 1, which is outlined below.

4.1 Activity 1. Definition of the Working Group Test Case

Based on the main objectives of the WG and discussion on the WG's priorities it was agreed to use an existing volunteer site and to review the existing safety assessment for this facility as a starting point for the development of the Test Case. The Hungarian facility was proposed, with particular attention on the application of the ISAM methodology and some of the issues identified during the meeting (see "a" to "e" in Section 2), such as approaches for selection and justification of the level of conservatism, adequacy of data used.

During the performance of this Activity 1, the reviewers will bear in mind the following activities, with particular consideration of the need for additional information/data, and the selection of some upgrading options to be evaluated in the WG Test Case.

4.1.1. Review of Safety Assessment of performed for the reference volunteered site

Three subgroups have been established to review the safety assessment of the Hungarian repository developed by AEAT:

- Assessment Context and System Description;
- Scenarios and Models; and



– Analysis of Results.

The ASAM participants and the appointed leaders envisaged to take part in the accomplishment of Activity 1 are presented in Appendix C. P. Dzanga (South Africa) and K. Berci (Hungary) were appointed as a leader of Activity 1 and a Hungarian contact person; and also a review team was established as presented in Appendix D.

4.1.1.1 Scope and objective of the review

The review should be carried out with the aim investigate the safety assessment approach for a real site (Hungarian repository) with view to the application of the ISAM methodology in order to understand the assumptions and results that lead to the conclusion that the repository requires selection of an appropriate upgrading option to ensure its long-term safety. This review aims also to determine whether the volunteer disposal facility addresses common issues and interests expressed by the WG participants and to assist the structuring of the Test Case.

To reach this goal it was agreed to:

- (i) review the safety assessment approach of the AEAT post-closure safety analysis of the Hungarian repository in light of the ISAM methodology and identify issues that need further consideration in the WG Test Case;
- (ii) define additional issues to incorporate, in an structured way in the Test Case, corresponding to the ISAM methodology - purpose, system description, scenario development, etc. based on their national experience.

The review should keep in mind the goal of trying to understand and learn about the assumptions and decision made at each stage of the methodology with the view to develop a consistent and well-justified safety assessment that will serve as a basis for selection of options for upgrading safety of existing facilities.

This WG activity will also compare and contrast the AEAT safety assessment performed for the repository with the ISAM approach used for other cases, as well as the ISAM Test Cases. Use the ISAM vault test case is an option to be considered. Technical comments to the AEAT analysis are expected to be made. Hungarian participants will carry out the same analysis for the Hungarian safety assessment that has been performed recently.

4.1.2 Expected outcomes

It is envisaged that Activity 1 will lead to:

1. Identification of differences, strengths and weak points in the post-closure safety assessment performed by the AEAT; lessons learned as well as main points to be addressed in the Safety Reassessment WG Test Case. Technical comments (as appropriate) with particular focus on the basis and confidence at each stage of the assessment process.
2. Specification of desired/additional changes/modifications to the safety assessment of the Hungarian repository, which will be the interest of the WG participants.
3. Proposals for structuring the WG Test Case based on the Hungarian volunteered site as well as issues identified by participants that need to be considered in the next steps.



4.1.3. Schedule

The agreed schedule of the accomplishment of the main activities related to Activity 1 are presented below and in Appendix D:

- A CD with the AEAT Safety Assessment of the Hungarian Repository to be sent out in 1 week. (December 2002)
- Individual contributions to subgroup leaders (31 March 2003)
- Reviews to be sent to Activity 1 leader; ideas for Activity 2 to P. Ormai (2 April 2003)
- P. Ormai sends out compiled ideas for Activity 2 to all participants (15 April 2003)
- Activity 1 leader sends compilation to the working group; participants comments on Activity 2 ideas to P. Ormai (30 April)
- Next WG meeting (2– 6 June 2003), IAEA Vienna.

4.2 Working Group documentation

The expected working materials to be developed and circulated for review and comments within the Reassessment WG are the following:

1. Individual participant reviews to the subgroup leaders;
2. Summary reports compiled by the subgroup leaders and sent to the leader of relevant Activity;
3. Report developed by the Activity 1 leader summarizing the subgroup reports sent to all WG participants;
4. Ideas and proposals for Activity 2 (Decision Making) to WG leader by beginning April
5. Summary of the ideas for Activity 2 compiled by the WG leader circulated to all WG participants; and
6. Comments from participants on these ideas back to WG leader prior to WG meeting.

5. ORGANIZATION OF WORKING GROUP ACTIVITIES

It was agreed the WG to be coordinated and lead by a leader (Peter Ormai, PURAM, Hungary), deputy leader (Inma Simon, CIEMAT, Spain) and supported by a technical adviser (Matt Kozak, Monitor Scientific, USA). The work plan agreed envisages a series of tasks to be carried out for which an individual coordinator was also identified (see Appendix C). As effective coordination between the Application and Cross-cutting WGs was considered important for the successful performance of the planned activities, liaison participants were agreed to represent the WG and provide updated feedback and guidance from the Common Applications Aspects WG and Regulatory Review WG.

6. WORKING GROUP MEETINGS

- Joint Working Group meeting is planned to be held from 2 to 6 June 2003 in Vienna.
- A separate Reassessment Working Group meeting is also considered in the June-September 2003 period.



- Second RCM is scheduled for February 2004

7. SUMMARY

The Reassessment Working Group has made a promising progress at 1st RCM, therefore all conditions are given to start realizing the tasks commonly agreed upon. The WG leaders wish to thank all participants who have taken part in the discussions and indicated their willingness to participate in the future in the work of the WG.

Any other colleagues who would like to join the Working Group are highly welcomed and encouraged to contact either the WG leader (Peter Ormai, e-mail: peter.orma@rhk.hu) or the IAEA secretary (B. Batandijeva, e-mail: B.Batandijeva@iaea.org).



APPENDIX A.

List of Participants

Name of expert	Country
A. Tkachenko	Russian Federation
G. Simeonov	Bulgaria
P. Ilie	Romania
D. Ene	Romania
J. Duran	Slovak Republic
E. Blazques	Spain
A. Gonzales	Spain
Z. Alekseeva	Ukraine
N. Shiriaeva	Belarus
I. Rydzy	Italy
D. Bennett	United Kingdom
I. Petr	South Africa
M. Dionisi	Italy
R. Talioni	Italy
Palagummi	India
P. Dzanga	South Africa
P. Ormai	Hungary
K. Berci	Hungary
I. Simon	Spain
M. Kozak	USA
S. Konopaskova	Czech Republic
M. Ligaunova	Czech Republic
L. Watts	United Kingdom
A. Motoc	Hungary
L. Juhasz	Hungary
M. Pallato	Philippines
R. Little	United Kingdom
P. Davis	United States of America
R. Cady	United States of America
Zs. Szanto	Hungary
I. Somroo	Pakistan
J. Hart	Netherlands



APPENDIX B.

1st Research Coordinating Meeting

***Application of Safety Assessment Methodologies for Near Surface
Waste Disposal Facilities (ASAM)***

11 – 15 November 2002

**TENTATIVE AGENDA
OF
SAFETY REASSESSMENT WORKING GROUP**

Tuesday, 12 November

Morning

Working session 1:

- 1. Definition of the detailed scope and specific activities of the working group. Interactive session allowing attendees to participate in the definition of the detailed scope and activities of the Working Group**
 - 1.1. Overview of the proposed scope, objectives and outcomes: Evaluation of the role of safety assessment in decision process for potential improvements.
 - 1.2. Presentation of proposed approach to be adopted by the Working Group and planned activities.
 - 1.3. Presentation of the possible decision making process, with emphasis on the safety assessments needed, the differing data needs and associated differences in uncertainties between them, and the resulting difficulties in direct comparison of risks from differing activities.
 - 1.4. Establishment of the technical basis for the safety assessments that need to be conducted to support the decisions.
 - 1.5. Presentation of approaches for intercomparison of differing kinds of risks, which assist decisions to be made from the technical evaluations.

2. Participants proposals and discussion

Wednesday, 13 November

Morning

Working session 2:

- 3. Presentation of a volunteered reference site**
- 4. Presentations of national experience and examples in the context of applying the ISAM methodology:**
 - 4.1. Discussion on strengths and weaknesses of national approaches.



- 4.2. Definition of issues identified in the reference and national presentations aimed at defining issues to be addressed in the Test Case.

5. Definition of Working Group priorities

Thursday, 14 November

Morning

Working session 3:

6. Structure of the Test Case

7. Development of a work plan

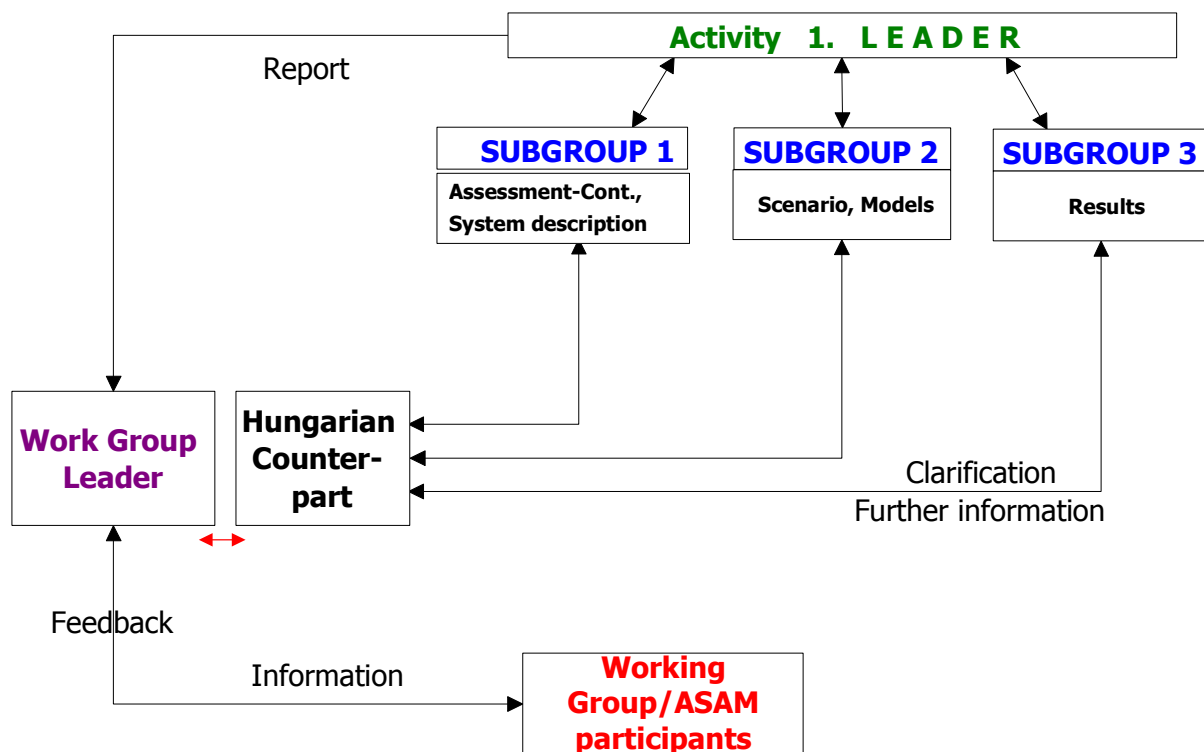
- 7.1. Functional approaches for working jointly.
- 7.2. Identification of subgroups and working goals, activities and responsibilities:
 - a. *Up to the 2nd RCM; and*
 - b. *During the project (2002-2005).*



Organization of Activity 1

- *Distribution of AEAT analysis.* Web site is not up yet and therefore it will be sent out by mail. For now, the main communication mean is the email.
- Activity 1 leader need to communicate with subgroups and Hungarian contact person and with WG leader (P. Ormai).
- Activity 1 leader is responsible for the technical content of the outcome and on-time completion of the task .
- Subgroup leaders are responsible for subgroup reviews, i.e. performance of technical review, collection of comments and development of summary and proposals for Activity 2.

The logic of the communication is shown below.



Working Group leader:	-	P. Ormai
Deputy Working Group leader	-	I. Simón
Technical Advisor	-	M. Kozak
Contact person for Activity 1	-	K. Bérci



Appendix D

Activity 1 Work plan

	Action	Deadline	Subtask leaders	Subtask members	Activity 1 Leader	Working Group Leader	Working Group Member	IAEA Secretary
1.	Sending out CD (Test Case)	10 Dec. 02					↓	* _____
2.	Organisation of the Review	Jan 03	*					
3.	Review		*	*				
4.	Review Summary	end of March 03	*	_____				
5.	Subgroups Summary	1 st April 03			↑ *	↑ *	↑	↑



6.	Ideas for Activity 2	10 April	*	*	↑ ↓	*	
7.	Compiled Activity 2 ideas	20 April			*	*	↑
8.	Comments on Activity 2 ideas	30 April	*	*	↓	*	↓
9.	Approved Activity 2 ideas	10 May	*	*	↑	↑	↑
10.	Issues to be discussed at WG meeting	20 May			↓	*	↑



