



IP FUNMIG
2nd Interim Activity Report

Report to D0.13 “2nd Semi-Annual Activity Report (18 Project Months)

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Foreword

The present report gives a brief overview of the project activities during the FUNMIG project months 13-18. The report focuses on documentation of work progress, outcome of and response to the first annual review, and major problems encountered.

Information on activities of individual RTDC's during this reporting period are given through RTDC leaders (PID0.10 ("2nd Semi-Annual RTDC Activity Reports (18 Project Months)"). Other information is provided through the Coordination Team, assisted especially by the Executive Committee.

For a detailed analysis of the project achievements, supporting documents at the Project Intranet Site need to be consulted.

The present report and associated Deliverables, Project Internal Deliverables and Milestones have been accepted by the Governing Board of the Project..



Summary

The activities and progress for the project months 13-18 may be summarized as follows:

- The different planned R&D activities have, with few exceptions, progressed according to schedule. Correspondingly, with few exceptions, Deliverables and achievements of Milestones are on schedule
- The outcome of the 1st Annual Project Workshop has been documented in the form of Workshop Proceedings, presently in print as a CEA Report
- Preparations for the 2nd Annual Project Workshop are in good progress
- The number of Associated Groups has increased steadily
- Preparation for the second training workshop is in an advanced state
- Submission and acceptance of the SSA KNOWDISS paves the way for efficient implementation of training on a broader basis than the present project
- The first annual project review took place and all follow-up activities have been implemented
- The first project year reporting has been finalized, resulting in the acceptance by the Commission, including acceptance of the request for the second advance payment

In summary, the project is progressing well with few minor deviations from the original workplan that do not endanger the overall project schedule and performance. Nevertheless, coordination of administrative actions with the Commission appears necessary in order to enable the Commission to meet reasonable deadlines in response to submission of final documents for a specific reporting period.



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1. Project objectives and major achievements during the reporting period

The overall objectives of the present semi-annual project period are to:

- Ensure continued good performance of the Project, including
- Incorporate recommendations from the first project review in order to further improve project performance.

The timely submission of deliverables and milestones is the key tool for overview monitoring the S+T progress. The formal Deliverables (D), Project Internal Deliverables (PID) and Milestones (M) reporting documents are available at the Project Intranet Site (see section 6). With few exceptions these documents have been delivered on time. These formal reporting documents are frequently associated with underlying more detailed documents, such as reports, minutes and publications. The formal reports and underlying documents are placed at the Project Intranet Site. For discussion of progress on individual topics, the underlying reports need to be consulted. With few exceptions, the work is progressing according to schedule. Where partners have reported difficulties, this is associated with strategies for catching up with original time schedules and thus no specific corrective actions are required. A general overview over the progress on a RTDC and WP level is given in section 3.

The first project review was held 28 March 2006, in Brussels. The outcome and the actions in response to that review are discussed under section 4. The key topic of the review was that as known from the onset of the project, there were difficulties to define and implement work on integration of the S+T work towards application to PA. The key achievement in response to the review was to come to agreement and achieve effective implementation of work associated with those parts of RTDC6 that were not felt to have progressed as needed.

From the onset of the project, efforts have continued to simplify reporting and lower the burden for Contractors and RTDC leaders. This approach also found support in the first annual project review. The outcome is that (i) the number of Deliverables for the second project year has decreased, for example through merger of activity and integration reports, (ii) with respect to some PID's, support is given for the already implemented approach of reporting through the Annual Workshop Proceedings, avoiding reproduction of information or generation of unnecessary text material, and (iii) also with respect to PID's, making reference to published results instead of reproducing/duplicating such information in the form of project reports.

In summary, the achievements during the present semi-annual reporting period reflect the objectives and ensure continued good performance of the Project.



2. Major problems encountered

One major problem was related to the definition and organization of integration scientific technical results for their application to PA. This problem has been solved (see section 4). Another major problem remains. This problem is related to the difficulty of alignment of reporting with the Commission and the difficulty of the Commission to respond in time with respect to acceptance of the first project year and the thereafter-following administrative actions leading to the next advance payment.

Despite submission of final reports for the first project year, including response to the first project review, by the middle of May, request for additional document required for acceptance was made 14 June. The final documents were submitted within one week. Nevertheless, the Commission will not be able to have documents signed and the second advance payment in acceptable time. This is a problem for Contractors, especially SME's.

Agreement with the Commission on how to streamline reporting and administrative procedures will be sought in order to avoid such delays in next advance payment.



3. RTDC/Workpackage and Component 7 progress within the reporting the period

The overall information is given in below table, provided by the RTDC leaders and the Coordination Secretariat (Component 7).

The following amendments of the work plan are identified:

PID2.2.11: Concerning NICA-DONNAN parameters for U(VI) humate and the use of phosphate systems, the experimental program is not advancing as originally planned. As a consequence, the forthcoming work will be rescheduled.

PID2.4.1 and M2.4.1: Due to unexpected difficulties in obtaining in-situ biofilms growing in the ÄSPÖ Hardrock Laboratory, the work to be accomplished within Milestone 2.4.1 and the PID2.4.1 will be delayed by about six months, from planned 18 and 24 project months, respectively, to about 24 and 30 project months.

PID3.1.1: There is a delay in the preparation of this deliverable. The responsible contractor (ANDRA) will prepare it for the end of the second reporting period.

PID3.1.2: Reflecting error in planning, it will be delivered November 2006.

PID3.1.6: Mistakenly in the work plan.

PID3.1.7: Based on miscommunication in the course of establishing the second 18 months implementation plan, the deliverable date was given 18 project months contrary to the end of the project. The latter is obvious because the PID is dealing with overview outcome of project achievements.

PID3.1.8: Associated with DR experiment and delayed by six months (from 18 to 24 project months).

PID3.2.1: Delayed by six months (originally planned for 18 project months), due to maternity leave by the responsible scientist.

PID3.3.3: Delayed by six months.

PID4.4.2: Considerable delay. This responsible Contractor (No. 21 (KTH)) has not been able to keep up with the work program schedule. Through the RTDC4 leader, at the forthcoming ExCom meeting, 20 November 2006, this Contractor will present a strategy on how to handle the delay. Until acceptance of a strategy, a second advance payment will not be transferred. The contractor has sent a document justifying this delay..

None of these amendments have a critical impact on the overall performance of the project.



In summary, the work is progressing well. As expected, in few cases work is delayed or redefined based on unexpected difficulties or new findings. Amendment of the work program will be documented in the forthcoming more detailed second annual reporting and the associated third 18 months implementation plan.



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
1.1	Report on complexation constants update: Carbonate and sulphate complexes of actinides and lanthanides	PID delivered	PID 1.1.1
	Bibliographic report on the silicate complexation of trivalent lanthanides and actinides	PID delivered	PID 1.1.2
	Design of an electrochemical systems (micro cavity or carbon paste)	Experimental problems to design micro-cavity or carbon paste electrodes: reorientation of the study to silicate systems in agreement with RTDC leaders.	M. 1.1.1
1.2	Report on Pu (and Sr) sorption on smectite/illite	PID delivered	PID 1.2.2 and attached CIEMAT reports CIEMAT/DMA/2132/2/06 and CIEMAT/DMA/2132/3/06
	Sorption of nickel on biotite	PID delivered	PID 1.2.4
	Report on sorption measurement and modelling	PID delivered	PID 1.2.7
	Mechanism of lanthanide sorption on montmorillonite minerals: a macroscopic and spectroscopic study	PID Delivered	PID 1.2.11
	Data base of selectivity coefficients (thermodynamic constants) on pure minerals	PID Delivered	PID 1.2.12
	Report on modeling of binary systems and selection of ternary systems for retention of RN on minerals	Pending	PID 1.3.1 Pending
1.3	Report on retention of humic substances by minerals	PID Delivered	PID.1.3.2
	Development of a method to derive the effective reactive surface area of soil metal oxides	PID delivered	PID 1.3.3
	Development of the LCD model for ion, humics adsorption to minerals.	PID delivered	PID 1.3.4



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
1.4	Report on uptake of U, Np and Pu by calcite	U, Np, Pu coprecipitation experiments and EXFAS measurements are progressing on schedule. Work on U(VI) published in peer reviewed journal. Work on Np(V) published as internal user report of ANKA synchrotron facility	PID 1.4.2
	Se retention onto clay minerals and pyrite.	Data obtained for Se(IV)/clay minerals systems are presented. Due to experimental difficulties, For Se(-II)/pyrite system, all the data are not yet available. These data will be presented together with those obtained by coprecipitation in a second report which will be scheduled in the 3rd 18 months implementation plan.	PID 1.4.3
	Report and article on survey of 4f-element solid-solution in naturally formed calcite as a natural analogue for the 5f-elements.	An upper limit for f-orbital element substitution in migration modelling can be taken as 7.5 mmoles/kg calcite	PID 1.4.4

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
2.1	<p>Study of the incorporation of actinides of different oxidation states (III, IV, V, VI) into hydroxy-aluminosilicate colloids.</p> <p>Generation and behaviour of intrinsic uranium(IV) colloids as a prerequisite for the investigation of uranium(IV) pseudocolloids.</p>	<p>The speciation of colloid-borne Cm is made by TRLFS using direct excitation at 382 nm and at 370 nm, where Cm is excited indirectly through the energy absorbed by Cm-borne humic acid.</p> <p>The solubility products of U(IV) colloids fits well in the known series of solubility products of other tetravalent actinides. UO₂·xH₂O(am) colloids were investigated for their colloidal stability by zeta potential measurements.</p>	<p>The results are currently summarized for a publication entitled “Interaction of actinides(III) with hydroxyl-aluminosilicate colloids: influence of humic acid” to be submitted to “Colloids and Surfaces A: Physicochem. Eng. Aspects”</p> <p>&</p> <p>PID2.1.1</p> <p>Opel, K.; Hübener, S.; Weiß, S.; Zänker, H; Bernhard, G.: Untersuchungen zur Löslichkeit verschiedener Urandioxid-modifikationen mittels LIBD und anderer spektroskopischer Methoden (in German). Tagungsband der 72. Jahrestagung der Wasserchemischen Gesellschaft, Fachgruppe der GDCh. Celle, 22. – 24. Mai 2005, S. 108-112 (V 22), ISBN 3-936028-39-7</p> <p>&</p> <p>PID 2.1.2</p> <p>Contributions 1st. Annual Workshop Proceedings 6TH EC FP - FUNMIG IP in Saclay (France) 28th Nov.- 1st. Dec. 2005</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
2.2	<p>Redox reactions of Pu with hydroquinone and on Pu-humate complexation in natural groundwater by XPS.</p> <p>Distribution of metal binding sites in humic substances</p> <p>Effect of humic acid on U(VI) solid phase stability and solubility</p> <p>New DFT based methods for calculations of NMR and EPR parameters for Ln(III)/An(III) humic acid complexes</p> <p>Surface bound humic acid interaction with metal ions</p> <p>Characterization and quantification of different forms of organic matter extracted from real site conditions (Ruprechtov site)</p>	<p>Pu(VI) and (V) are reduced to Pu(IV). No distinction between Pu-polymers and Pu-polymers bound to HS is provided by XPS, but from the size distribution mainly Pu-polymer-HS occurs. At concentrations higher than the solubility of Pu(IV) and near neutral pH, the Pu-polymer formation dominates the reaction path of Pu in solutions rich in humic substances.</p> <p>By resonant energy transfer monitoring the change in the luminescence intensity and therewith calculation of the distance r between metals bound to humic substances (HS).</p> <p>$UO_2 \cdot H_2O$ and UO_2CO_3 are the solubility limiting solid phases under normal and 100% CO_2 atmosphere, respectively, even in the presence of increased HA concentration in solution.</p> <p>Influence of dynamics of the $[Gd(DOTA)(H_2O)]^-$ complex in water solution on calculated NMR/ EPR parameters gave important information on the accuracy of the point-dipole approximation widely used in estimation of the lanthanide-ligand atoms distance from PNMR/EPR spectra.</p> <p>Humic acid immobilized on silica gel (SiO_2-HA) have been proved to be suitable to determine the binding constants of different radionuclides with humic acid.</p> <p>First results on the characterization of dissolved organic matter and sedimentary organic matter by means of MALDI-TOF-MS, stable carbon isotope analysis, microbial activity and extractions are obtained.</p>	<p>PID 2.2.2</p> <p>PID 2.2.3</p> <p>PID 2.2.4</p> <p>S. Komorovský, M. Repiský, O.L. Malkina, V.G. Malkin, I. Malkin and M. Kaupp, <i>J. Chem. Phys.</i>, 2006, 124, 084108.</p> <p>&</p> <p>PID 2.2.5</p> <p>Gy. Szabó, J. Gucci, P. Reiller, H. Geckeis, R. A. Bulman, accepted in <i>Radiochim. Acta</i></p> <p>& PID 2.2.6</p> <p>PID 2.2.7</p>



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
2.2 cont	<p>Interaction of Se with mobile and immobile NOM</p> <p>Interaction of Th and Am with mobile and immobile NOM (Boom Clay)</p> <p>Fractionation of organics on mineral surfaces</p> <p>Composition of sedimentary organic matter of the Callovo-Oxfordian argillite.</p>	<p>No interaction whatsoever between Se(VI) and HS (Boom Clay or Gorleben HS) during the 3 months' observation time. The SeO_3^{2-}-HS system showed a decrease in total solution concentration and change in the Se solution speciation dominated by colloidal Se species associated with HS after one month. The detailed understanding of these latter results requires spectroscopic measurements.</p> <p>Linear relationship between the adsorbed amount of Am, Th and TOC was observed suggesting that the Am and Th partitioning is mainly governed by the NOM and that part of the NOM, ~1% is inactive for sorption (as FTIR shows no functional groups).</p> <p>First results of HA/FA fractionation on alpha-alumina by means of ESI-MS, UV/VIS and carbon XANES (STXM) are obtained.</p> <p>New extraction scheme for sedimentary organic matter was developed and applied (AG #19). Extracts were characterized by carbon XANES (STXM).</p>	<p>“On the interaction of dissolved Boom Clay and Gorleben humic substances with Se(IV) and Se(VI)” by Bruggeman, C., Maes, A., Vancluysen, J., submitted for publication to Applied Geochemistry. & PID 2.2.8</p> <p>A SCK-CEN technical report with the detailed results is in preparation. & PID 2.2.8</p> <p>PID 2.2.9 & M 2.2.6</p> <p>PID 2.2.10 & M 2.2.3</p>



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
2.2 cont	NICA-DONNAN model parameters for U(VI)	<p>The selection on phosphate due to its high interaction with U(VI) was decided in order to perform all experiments in a suitable time frame. Calibration curves were finalized at pH 4 in June 2006, but the isotherms will need another extra time to be obtained. Therefore, the complete work originally scheduled to be delivered at 18 project months is not finalized on time. The time schedule of this particular work is reorganized correspondingly. Due to experimental constrains for the U(VI) studies the part on active samples must be postponed to the third project year. A time schedule is proposed with a new milestone to check the availability of the calibration at pH 6. This action will therefore be redefined for the 3rd implementation plan also for the acquisition of parameters at pH 8 and the active sample part.</p>	<p>PID 2.2.11 & M 2.2.4</p> <p>Several extended abstracts at the IHSS 2006 conference, ISSN 1612-118x.</p> <p>Several contributions 1st. Annual Workshop Proceedings 6TH EC FP - FUNMIG IP in Saclay (France) 28th Nov.- 1st. Dec. 2005</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
2.3	<p>Experimental determination of UO_2^{2+} sorption at reducing and non-reducing mineral surfaces</p> <p>Interaction mechanisms of U and Se with the mineral phases pyrite/siderite in near-natural clay porewater (Boom Clay)</p> <p>Reaction mechanism of Np(V) and Pu(VI) with Fe(II) containing mineral phases of the Äspö granite and Fracture Filling Material.</p>	<p>Quantitative and kinetic information about U uptake was obtained for several minerals containing and free of Fe(II). No evidence for U(VI) reduction to U(IV) by Fe(II) containing minerals was found by XANES or XPS.</p> <p>TRLFS measurements were done on the U – biotite system. U(VI) was not found in solution. U(VI) on the mineral was only found by kryo-TRLFS, presumably as ternary uranyl carbonate complexes. Fe in the biotite quenches sorbed uranium. A final conclusion on the possibility for U(IV) on the surface thus cannot yet be made.</p> <p>From a thermodynamic point of view, Se(IV) is expected to be reduced by the used minerals. Such a reduction is not found. The observed strong retention is rather through sorption onto Fe(III) phases, observed at the FeS_2 surface.</p> <p>Np is retained onto both materials by reduction to Np(IV) in the presence of Fe(II) minerals. The sorption coefficient for Pu is significantly higher compared to Np or U. Pu retention takes place on a multitude of minerals. Sorption of U is also strongly correlated with the occurrence of Fe oxide phases.</p>	<p><i>“U(VI) interaction with Fe(II) containing minerals”</i> S. Regenspurg, T. Schäfer, K. Dardenne & M. Malm-ström, ANKA beamtime report. & PID 2.3.1</p> <p>Geipel, G., Baumann, N., Arnold, T. FZR report 2006 (in preparation). PID 2.3.2 & M 2.3.1</p> <p>PID 2.3.3</p> <p>PID 2.3.4</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
2.3 cont	Characterization of green rust as a function of formation environment	Development of method for characterising green rust using capillary-tube X-ray diffraction and by normal X-ray powder diffraction using a mylar film to avoid oxidation during analysis.	<p>Skovbjerg L.L., Stipp S.L.S., Utsunomiya S. and Ewing R.C. (2006) The mechanisms of reduction of Hexavalent Chromium by Sodium Green Rust Sulphate: Formation of Cr-goethite. <i>Geochimica et Cosmochimica Acta</i>, (in press) & PID 2.3.5</p> <p>Several contributions 1st. Annual Workshop Proceedings 6TH EC FP - FUNMIG IP in Saclay (France) 28th Nov.- 1st. Dec. 2005</p>
2.4	<p>Coupling between radionuclide mobility and heterotrophic microbially driven ferric iron mineral transformation</p> <p>Provision of biofilms on different surfaces under in situ conditions in the Äspö Hard Rock Laboratory, microbe site</p>	<p>Through dissimilatory reduction of nanoparticulate hematite binding of uranium is significantly increased. The increase in uranium immobilization is not primarily caused by the reduction of U(VI) to U(IV). It seems, that enhanced adsorption of U(VI) onto hematite due to co-adsorption of Fe(II) predominately accounts for the increase in uranium binding to the solids.</p> <p>The plan was to insert samples of pure apatite and quartz into specially constructed bio reactors in site at the Äspö hard rock laboratory. Extensive problems have been encountered to obtain good solid phases of the right size, especially for apatite. These have now been obtained and the search for a suitable spot in the Äspö tunnel has started. From there on the sample should stay connected to the groundwater flow for at least 30 days to allow the biofilm to grow. In this sense, the milestone M2.4.1 was not reached and will be approximately accomplished within the next 12 months. Consequently PID2.4.1 will be delayed with about 6 months.</p>	<p>PID 2.4.2</p> <p>Contribution 1st. Annual Workshop Proceedings 6TH EC FP - FUNMIG IP in Saclay (France) 28th Nov.- 1st. Dec. 2005</p> <p>M 2.4.1</p>



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
3.1	<p>Description of cation and anion diffusion behaviour with a common model</p> <p>Understanding processes controlling redox conditions of COx</p> <p>Critical review of theoretical approaches to speciation and diffusion driven transport in compact clay materials</p>	<p>Preliminary version of diffusion model for swelling clay porous media based on explicit consideration of hydration water of transported species. (Armines)</p> <p>Decision to transfer this work area, originally in WP3.2, to WP3.1.</p> <p>Identification / fine characterisation of sulphur and iron bearing phases in COx argillites; confirmation that late diagenetic phases are coherent with equilibrium model of porewater composition. (BRGM)</p> <p>Synthesis of synthetic montmorillonites having different Fe stoichiometries; characterization; demonstrated capacity to produce sufficient quantities for WP3.1 needs. (LMPC)</p> <p>Nominal progress on structural based model for Fe-bearing phases (UJF)</p> <p>Preliminary, working version completed (Andra)</p>	<p>PID3.1.5</p> <p>Minutes of RTDC3 progress meeting 31/6/06</p> <p>idem</p> <p>PID3.2.3</p> <p>PID3.1.1 delayed to December 2006</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
3.2	<p>Database of key parameters of clay rocks affecting solute transport</p> <p>Generate high quality dataset of sorption and transport data for several sorbing RN for different clayrock formations</p> <p>Assess effect of COx kerogen-derived organic complexes on Rn migration in argillites</p> <p>Quantification and modelling of transport of strongly sorbing tracers</p>	<p>Work on Opa finished (for DR).*</p> <p>Work on COx samples well advanced; initiated on Boom samples (received 3/2006).*</p> <p>Decision to reprogram overall report of results obtained on all 3 formations (PID3.1.7) to 2008*. (*CIEMAT)</p> <p>Questionnaire for obtaining existing data and measurement protocols sent to organisations (replies for end 8/2006). (SCK-CEN)</p> <p>Comparative interpretation of anion diffusion (TcO₄, HCO₃) in fractured and unfractured Boda samples. (II-HAS)</p> <p>Extraction and characterisation of OM, construction of percolation test banks. (Armines)</p> <p>Experiments with Co carried out on Opalinus but data interpretation not yet completed; Eu experiment underway. (PSI)</p> <p>Development of μ-LIBS and column techniques well advanced; comparative tests underway with Cox samples. (CEA)</p> <p>Experimental system for measuring diffusion of actinides under controlled P, T, C conditions operational and producing initial data for Pu-238 diffusion through Opalinus clayrock. (FZK-INE)</p>	<p>PID3.2.1 (delayed till end 2006)</p> <p>PID3.1.7 (moved to 2008)</p> <p>PID3.2.8</p> <p>Minutes of RTDC3 progress meeting 31/6/06</p> <p>PID3.2.4</p> <p>PID3.2.7</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
3.2 cont	<p>Development of methods for visualizing / mapping / modelling porosity and mineralogy distribution in clayrock, as well as associated tracer concentrations after diffusion/sorption experiments</p> <p>Modelling of diffusion in heterogeneous media</p> <p>Modelling and quantification of diffusion in clayrock on medium spatial scale samples (dm)</p>	<p>Decision on Cox sample management and preparation strategy for inter-comparative work in WP3.2 (common)</p> <p>Completion of sample preparation methodology for 2D / 3D image analysis (ERM)</p> <p>Demonstration of capacity of μ-LIBS to determine both tracer diffusion profiles and mineralogical distribution (resolution $<10\mu$) for Eu (CEA)</p> <p>Progress in developing RBS method for quantifying diffusion into clayrock (CIEMAT)</p> <p>Finalization of particle tracking model for modeling diffusion in 2D / 3D systems constrained by real porosity and mineral distributions at sub mm scale. (HydraSA, asso. partner)</p> <p>Development / validation of methodology; interpretation of results on Opa samples HTO, Sr; experiments on Cs, Co, Eu underway; Launching of experiments on Cox samples (HTO, Sr, Co, Cs, Eu) (CIEMAT)</p>	<p>Minutes of meetings on 13/4/06 and 5/5/06 (CEA)</p> <p>PID3.2.9</p> <p>Minutes of meeting on 13/4/06 (CEA); PID3.2.4 (cf. note)</p> <p>Minutes of RTDC3 progress meeting 31/6/06</p> <p>Minutes of meetings on 13/4/06, Doctoral thesis (9/2008)</p> <p>PID3.2.6</p>
3.3	<p>Generation of diffusion / retention data sets at intermediate scale (dm – m) by means of in situ experiments</p> <p>Predictive / interpretive modelling of databases</p>	<p>Nominal progress in DR experiment at Mont Terri: drilling, equipment of borehole; tracer injection and monitoring; sample supply to partners (Nagra)</p> <p>Finalization of scoping calculations for DR experiments (UDC and PSI/Nagra)</p> <p>Nominal progress in testing of relative advantages of numerical models of differing complexity to simulate data from in situ expts in Opalinus (GRS)</p> <p>Update of progress of data acquisition from Bure URL DIR expts (Andra)</p> <p>Idem for data available from tests carried out and on-going at HADES URL (SCK-CEN)</p>	<p>Minutes of joint MT / Funmig progress meeting</p> <p>Idem; Minutes of RTDC3 progress meeting 31/6/06</p> <p>Idem</p> <p>Minutes of RTDC3 progress meeting 31/6/06</p> <p>idem</p>



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
3.4	<p>Measurement and modelling of natural tracer distributions in clay-rock formations at large spatial scales</p> <p>Development of tools and methods for upscaling transport determining parameters and models to geological formation scale</p>	<p>Analysis of tracer profiles in Mont Rousselin anticline completed; second drilling campaign underway (UBerne)</p> <p>Nominal progress in testing of numerical models of differing complexity to simulate large scale tracer data (GRS)</p> <p>Production of report on strategies (SCK-CEN)</p> <p>Production of a GIS-based database (version 1) for organizing relevant data influencing transport and retention of radionuclides in Callovian-Oxfordian formation (BRGM)</p>	<p>PID3.4.1</p> <p>Minutes of joint MT / Funmig progress meeting; Minutes of RTDC3 progress meeting 31/6/06</p> <p>PID3.4.4</p> <p>PID3.4.2</p>



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
4.1	<p>- Establishment of the bedrock response to past redox perturbations. Past oxidation infiltration events will be analyzed by studying those oxygen consuming products present in the host-rock.</p> <p>- <i>In-situ</i> analysis in the FEBEX tunnel of the chemical gradients produced by the bentonite and of mass transfer from bentonite to granite.</p>	<p>- The literature survey of methods for separating oxidised Fe and Mn from rock materials has been completed.</p> <p>- Decision on the instrumentation of the new FU-1 and FU-2 boreholes as well as of the new instrumentation of the FBX 95.002 borehole.</p> <p>- Completion of the report with interpretation of groundwater analysis data obtained from the already existing boreholes in the vicinity of the FEBEX gallery, including the results of tracers I and Re.</p>	<p>-PID 4.1.1 “Literature survey of methods for separating oxidised Fe and Mn from rock materials”</p> <p>- Milestone 4.1.1 (CIEMAT)</p> <p>- Milestone 4.1.2 (AITEMIN)</p> <p>- RTDC4_M18 Meeting Overheads (AITEMIN).</p> <p>- PID 4.1.2 “Report with interpretation of groundwater analysis data obtained from the already existing boreholes in the vicinity of the FEBEX gallery, including the results of tracers I and Re”</p> <p>Technical Report: “Hydrogeochemical characteristics and groundwater evolution in Grimsel Test Site (GTS), Switzerland” by B. Buil et al. Ref: CIEMAT/DMA/M2132/8/06.</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
4.2	<ul style="list-style-type: none"> - Experimental study and modelling of the connectivity within the fracture network at the FEBEX site. - Laboratory studies of the pore structure and flow paths in granite samples. - Laboratory studies as a support of radionuclide migration experiments in WP 4.4. 	<ul style="list-style-type: none"> - Geophysical logging and tomography of the granite in the FEBEX gallery: acquisition of data. Starting of the interpretation and modelling of the data. - Decision on the distribution to many labs of the samples from the new FU_1 and FU-2 boreholes and on joint work to support <i>in-situ</i> studies. Most of the organizations are being involved. - Analysis of the granite block used for the mock-up experiment. - Study of the structure of crystalline rock matrices from nanometre to decimetre scales by PMMA impregnation technique was a support for diffusion studies of radionuclides in granite with the novel technique RBS. 	<ul style="list-style-type: none"> -RTDC4_M18 Meeting Overheads (AITEMIN). -RTDC4_M18 Meeting Overheads (CSIC). -PID 4.2.1 “Report on the results of the experimental activities carried out in the FEBEX gallery or with the samples of the site” - Document on the FUNMIG new boreholes samples available and their distribution to all participants (Funmig web) - Technical Report by OVIUNI. (In spanish) by M. Montoto & F. Mateos. - PID4.2.3 “Report on petrography studies by impregnation techniques”. -Abstract submitted to the MRS 06 fall meeting. (L. Pettinen <i>et al.</i>) <i>Paper in preparation.</i> -PID4.2.2 Report on hydraulic function of the pore space structure at different scales.



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
4.2 cont	<p>- Laboratory studies as a support of colloid migration experiments in WP 4.4.</p> <p>- Study of filtration mechanisms and diffusion of colloids in granite.</p>	<p>-3D geometrical descriptions of micro fracture network in granite media (drill cores)</p>	<p>Siitari-Kauppi et al, "Porosity and micro fracturing of four granite samples and one clay sample analysed with ¹⁴C-PMMA impregnation + autoradiography", Technical Note 26.5.2006 Funmig / RTCD 4.2.</p> <p>I. Tiseanu et al. "3-D host rock structure and composition by dual-energy tomography"</p> <p>M. Iovea et al. "Dual energy X-ray computer axial tomography and digital radiography investigation of cores and other objects of geological interest"</p> <p>-PID4.2.2 Delay in the work. The contractor has sent a document justifying the delay.</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
4.3	<ul style="list-style-type: none"> - Formation and stability of bentonite colloids in granite environments under realistic conditions. - Quantification of inventory of potential bentonite colloid source. - Colloid generation from fracture infill minerals from the Grimsel Test Site (GTS), Switzerland. - Bentonite colloid stability as a function of geochemical conditions. 	<ul style="list-style-type: none"> - Design of different type of cells cells for experiments of colloid generation from compacted bentonite. - Study of the effects of clay density and water chemistry on colloid generation. First results. 	<ul style="list-style-type: none"> - PID4.3.1 “Report on formation and stability of bentonite colloids in granitic environments under realistic conditions” - Technical Report by U. Alonso et al CIEMAT/DMA/2132/10/06. Abstract submitted to the MRS 06 fall meeting (U. Alonso et al). Bouby, M. et al. “Interaction of Bentonite Colloids with Cs, Eu, Th and U in Presence of Humic Acid: A Flow Field-Flow Fractionation Study” excerpt from Institut für Nukleare Entsorgung, Annual report 2005 T. Shafer et al. “Prediction of bentonite colloid stability in natural and simulated granite groundwater 1st Annual Workshop Proceedings 6TH EC FP - FUNMIG IP Saclay (France) 28th Nov.- 1st. Dec. 2005, Eds. G. Buckau, L. Duro, B. Kienzler, ANNEX IV Proceedings



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
4.3 cont	<ul style="list-style-type: none"> - Understanding of filtration processes and colloid diffusion. 	<ul style="list-style-type: none"> - Rock-colloid interactions as a function of colloid charge have been carried out using the microPixe technique. Problems on quantification of colloid retention are being treated. - The study on the size effects on colloid diffusion in granite has been completed. 	<ul style="list-style-type: none"> -A paper to be submitted to EST is being prepared (U. Alonso et al).
4.4	<ul style="list-style-type: none"> -Radionuclide transport studies at different scales: mass transfer from the bentonite to the granite. - Analysis of the effects of bentonite colloids in the radionuclide migration in a granite fracture. - Study of the reversibility of sorption of tri-tetravalent actinides on bentonite colloids.(Also 4.3) -Study of the kinetic of the sorption of radionuclides to humic surfaces. 	<ul style="list-style-type: none"> -Design of the mock-up experiments and scoping calculations for radionuclide transport have been completed. - Study of the Eu and Pu migration in the presence of bentonite colloids. The reversibility of sorption seems to be the main issue to be addressed. 	<ul style="list-style-type: none"> - Milestone 4.4.1 “Decision on the optimisation, design and installation of mock-up experiments” and related report (Samper <i>et al.</i>) - PID 4.4.1 ”Report on the impact of bentonite colloids on RN transport” T. Missana et al “Role of colloids on the migration of Eu and Pu in a granite fracture: laboratory experimental results and related uncertainties” Technical Report “CIEMAT/DMA/M2132/11/ 06 - A paper to be submitted to the JCIS is being prepared (T. Missana et al). PID4.4.2: Pending



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
4.5	<p>-To generate data and process understanding for phenomena that cannot be obtained from laboratory studies, and to verify process up-scaling with respect to time, spatial scale and heterogeneity. For selected areas of investigation sites: Establishment of relevant data-set and compilation of background information.</p> <p>-Investigations of the palaeo aspects by using natural radioactive elements are under development.</p>	<p>A detailed analysis has identified plausible end-members as primary mixing components for the present groundwater. The portions of different groundwater contributors together with knowledge about the evolution history provide a good picture of the present hydrological situation. A large number of geochemical processes have been identified, including a detailed analysis of the origin of excessive U concentrations in some deep groundwater samples from Forsmark.</p>	<p>PID 4.5.1 M. Laaksoharju et al “Report on real site process analysis in crystalline rock”</p> <p>PID 4.5.2 and associated report: “Report on palaeohydrological data related to physico-chemical processes from crystalline rocks in glaciated and non-glaciated areas”</p>



WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
4.6 cont	- Modeling of multicomponent reactive transport under equilibrium conditions.	-A methodology has been developed for the effective modeling of multispecies reactive transport in heterogeneous environments. This includes transport undergoing chemical reactions such as dissolution-precipitation as well sorption/desorption in homogeneous and heterogeneous ambient environments.	<p>Milestone 4.6.1: “Decision on sites to which the developed methodology should be applied (UPC, CSIC).”</p> <p>De Simoni et al “A procedure for the solution of multi-component reactive transport problems” Water Resour. Res., 41, W11410, doi:10.1029/2005WR004056, 2005.</p> <p>Dentz, M., et al. ” Exact effective transport dynamics in a one-dimensional random environment” Physical Review E 72, 031110, 2005.</p> <p>Zavala et al., Multi-component transport under equilibrium conditions, Technical Report, FUNMIG, 2006.</p> <p>Deliverable: PID 4.6.3: “Report on methodologies for the incorporation of multicomponent reactive transport to safety assessment “</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
5.1	Application of the newly developed geo-monitoring system to groundwater from Ruprechtov site and test of practicability, especially tightness against atmosphere.	<p>The new borehole sampling system and the associated laboratory set-up for probing under undisturbed conditions was successfully applied to groundwater samples from different boreholes at Ruprechtov site. Comparison of Eh- and ph-values with those analysed by in-situ probe show good agreement for most of the wells.</p> <p>Results have been compared with existing data from other sites.</p>	<p>Progress report on measurement of colloids and major geochemical parameters in natural groundwater</p> <p>(Document on project intranet web space)</p>
5.2	Determination of geochemical state of uranium and other trace elements in sediments from Ruprechtov site	<p>Characterization of samples from Ruprechtov site.</p> <p>Application of the newly developed confocal set-up at ANKA to a Ruprechtov sample. High lateral resolution of $2 \times 5 \text{ mm}^2$ is reached and 3D-elemental distributions have been derived. The supposed immobilisation mechanism for a uranium(IV) phase is confirmed.</p> <p>Application of U(IV)/U(VI) separation method to first samples from Ruprechtov site. Identification of the major uranium fraction as U(IV).</p> <p>Application of sequential extraction and U-exchange experiments with ^{233}U at selected sediment samples from Ruprechtov site.</p>	<p>Microanalysis (micro-XRF, micro-XANES and micro-XRD) of a tertiary sediment using micro-focused synchrotron radiation. Submitted to Microscopy and Microanalysis.</p> <p>PID5.2.1</p> <p>(Documents on project intranet web space)</p>
5.3	Provide hydrogeochemical conditions and identify the role of processes with impact on carbon chemistry at Ruprechtov site.	<p>Additional analyses of $\delta^{34}\text{S}$ in dissolved sulphates and ^{14}C in DOC in groundwater from infiltration area and tertiary basin. Interpretation and documentation of all existing hydrogeochemical isotope data with regard to the flow regime and carbon chemistry at Ruprechtov site.</p>	<p>Characterisation of Hydrogeology and Carbon Chemistry by use of natural isotopes – Ruprechtov site, Czech Republic. To be submitted to Applied Geochemistry.</p> <p>(Draft paper on project intranet space)</p>
6.1	To list boundary conditions (expected radionuclide fluxes from the near-field) for the various European disposal concepts	<p>First report on boundary conditions established</p>	<p>PID6.1.1 and associated document “Boundary conditions”.</p> <p>Available at the Intranet.</p>

WP	Objectives	Major achievements and decisions taken. If applicable, problems encountered and measures taken to solve the problems.	Documentation (source of detailed information (also planned))
6.2	To compile current representation in PA of processes investigated in RTDC 1-5.	First report established, to be updated along with the project, including making use of topical sessions for specific topics.	PID6.2.1 and associated document "Report on Topics and processes dealt with in the IP FUNMIG and their treatment in the Safety Case of geologic repositories for radioactive waste." Available at the Intranet.
6.3	To list currently available sorption databases.	First report established.	PID6.3.1 and associated document "FUNMIG Working Document Sorption Data Bases ("PA ready")". Available at the Intranet.
7.1	A knowledge management system will be set up to support knowledge dissemination and management and to ensure that the project itself and the results generated are communicated within the consortium and to a broader community.	The FUNMIG portal and the intranet is updated with new information (reports, events, meetings, new associated groups, etc). The presentation of the IP FUNMIG project at different conferences and seminars has been encouraged.	The www.funmig.com has been updated. The generic poster of FUNMIG has been updated.
7.2	To provide annual training courses on radionuclide migration in order to assure the transfer and dissemination of knowledge of the whole IP FUNMIG. Specific attention will be given to organisations from candidate member states and to young researchers.	The second FUNMIG training course is being organised under the title 'use of scientific results in site characterisation and performance assessment'.	A flyer of the second FUNMIG training course will be online in August. <u>Application of SSA KNOWDIS</u> as the future basis for joint training and communication project.
7.3	An active science shop will be established to provide independent, participatory research support in response to concerns experienced by civil society.	Continuation of science shop activities. A website has been created to communicate this initiative to a wide audience. The initiative has also been presented at the VALDOR 2006 symposium. Attendance to the summer school on "Science shops" organised within the framework of the TRAMS project.	A flyer presenting the science shop has been prepared and is online. Paper "science shops: an initiative to combine technical and societal knowledge for risk governance" in VALDOR proceedings.



4. Outcome of and response to 1st Year Review

With one exception, the outcome of the 1st annual review, 28 February 2006, was very positive. A series of very helpful recommendations for future work and reporting was also made, such as structuring future reporting along with the project performance indicators. The main exception refers to RTDC6 “The most critical area remains RTDC6...”. It was not obvious to the reviewers that work was progressing adequately.

Below the response to this key problem is discussed, followed by response to some other important review comments.

4.1 Key issue, RTDC6

After the review, a series of activities were initiated. With respect to WP6.2, a draft document “Key topics and treatment of processes in the Safety Case of Geologic Disposal” was established and circulated for comments to the WMO’s and IMG. This first working document describes the objectives and framework under which the report will be advanced towards the final report at the end of the project. It follows the key topics and processes treated in FUNMIG, and it documents the state-of-the-art as given in FEPCAT and RETROCK.

The document was circulated for comments, followed by a meeting 7-8 June 2006, hosted by NAGRA. The document was further advanced and serves the basis for PID6.2.1 “Interim Report on current treatment of investigated processes in PA”.

The topical sessions of the forthcoming Annual Workshops will be used for providing annual updates of the report. The present state of knowledge will be detailed for a selected set of processes. The aim of the Topical Session at the forthcoming the 2nd Annual Workshop is to bring forward documentation of the state-of-the-art on a series of crystalline host-rock specific processes and topics. The RTDC4 leader will organize this Topical Session correspondingly.

A number of administrative actions have been taken in order to set the frame for the desired progress in RTDC6. In order to provide for integration beyond the present IP, the coordinator of the forthcoming IP PAMINA will also be member of the IMG (Amendment). In addition, the WP description of WP6.2 has been amended in the 2nd 18 Months Implementation Plan. RTDC6 was also reorganized with respect to its objectives. In order to focus work in RTDC6 on its key tasks, WP6.4 has been moved to become part of WP4.6. The other two WP’s are progressing well, as seen from PID6.1.1 and PID6.3.1.

In summary: The problems encountered in RTDC6 were not new to the Project. The inherent difficulty in defining the responsibilities and work program became obvious already during the kick-off meeting in Barcelona, 25-28 January 2005, i.e. less than one month after the



Project started. Recognition of these difficulties by the project review resulted in a concerted action within the Project. All partners involved in RTDC6, including the IMG, have shown a strong commitment with readdressing this problem and the understanding how to split up the responsibilities between RTDC 1-5 and RDTC 6 was refreshed: The main work of processing the scientific results for use in performance assessment will be done within the host rock oriented RTDC (3-5) with the support of RTDC 1 and 2, while the task of RTDC 6 is to coordinate and consolidate the other RTDCs' contributions. Currently RTDC 6 is progressing adequately towards the achievement of the objectives initially set.

4.2 Additional key review comments

Review comments concerning individual RTDC's are taken care of by the respective RTDC leaders and are not discussed in this report. Exceptions are RTDC6 (above) and a key comment concerning direction of future RTDC5 work (see below, final bullet point).

(i) Streamlining of reporting:

Streamlining of reporting was a key objective from the onset of the project. This effort will continue through, for example (a) merging the Integration and Activity Reports, (b) continuing to make use of reporting through existing documents, avoiding reproduction of reports and publications, (c) making maximum use of public workshop proceedings in order to avoid generation of internal reports with no beyond-project-management added value, and (d) making direct use of topical sessions at annual workshops for complementing key deliverable on application of knowledge for the Safety Case.

(ii) Linking reporting to performance indicators:

The approach of linking reporting to key performance indicators will be developed for the forthcoming second annual reporting.

(iii) Clarification concerning development of PA models:

Limited development of models and tools for application to PA is done within the host-rock specific RTDC's 3-5. This is not subject to RTDC6. The work is not done in isolation within the Project, but close linking with PAMINA is a key element in this effort.

(iv) RTDC5/Relevance of Ruprechthov site:

Since recently, the Ruprechthov site is subject to Kaolinite surface mining. The present mining activities do not disturb the site significantly. If the hydrologic and geochemical characterization of the pre-mining situation is sufficiently successful, monitoring of changes in geochemical processes with mining related disturbances may provide valuable knowledge. If in a forthcoming evaluation the situation appears to be less favorable, work may become redirected. One possible area of studies is the impact of clay from the Gorleben overburden on the mobility of radionuclides.



After evaluation of the present achievements, the RTDC5 leader will present a proposal to the Governing Board at its meeting in Stockholm in association with the 2nd Annual Project Workshop.

5. Consortium management

5.1 Closure of first project year

All Annual Reports were delivered on time. These were used for the first annual project review. The reports were up-dated prior to the review. Following the review a final update was made, including provision of all required documents associated with acceptance of the first project years, paving the way for timely provision of the second advance payment. This latter step has proven less successful (see section 2)

5.2 Associated Groups

The number of Associated Groups has increased steadily (presently 26 organizations). For the Associated Groups, the Project serves as a general source of information on relevant on-going activities. In addition, the project is a source of information concerning relevant FP6 and forthcoming FP7 activities. For the Project, the Associated Groups are an asset with respect to, for example involvement in the R&D program and identification of training needs. As recommended in the first annual review, efforts will continue towards stronger involvement of the Associated Groups.

5.3 Preparing for the 2nd Annual Project Workshop

SKB has accepted to host the 2nd Annual Project Workshop. Negotiations with the conference hotel etc. are basically finalized. Only minor practical details are pending. The Agenda has been defined. In order to make optimal use of resources, especially lowering the travel efforts, the 2nd Annual Project Workshop is combined with a Seminar on application of scientific knowledge for the Safety Case, ExCom and GovBoard meetings, and the General Assembly. Individual RTDC meetings are also held within the context of the Annual Workshop. The host (SKB) has accepted to print the 2nd Annual Workshop Proceedings.

Creation of awareness of the forthcoming workshop within and beyond the Project is done over several channels. Potential participants beyond the Project partners are reminded that the workshop welcomes external participation. Spreading of the information is based especially on distribution of flyers (electronic and hard-copy) to all Project Partners and information at several conferences and international/national workshops and meetings.



5.4 S+T reviewers for the 2nd Annual Workshop Proceedings

The external review of S+T contributions to the 1st Annual Project Workshop Proceedings proved to be very successful. Budhi Sagar (SWRI) has accepted to be reviewer also at the 2nd annual workshop. In order to complement the PA expertise of Budhi Sagar, and considering that the topical session at the 2nd Workshop focuses on Crystalline Host-Rock, Mel Gascoyne with a corresponding expertise was addressed and has accepted to be one of the two S+T reviewers.

5.5 Preparations for second training course

The 2nd Training Course is in an advanced planning state. It will take place 23 – 25 October 2006. The program is ready and information about the course is disseminated within and beyond the Project. For this purpose the flyer is available at the Project WEB page and is disseminated at different conferences, workshops and meetings as hard-copies. All project partners (Contractors and Associated Groups) are also informed and requested to disseminate the information to potentially interested persons and organizations. In this context, the broad participation of Associated Groups from new Member States is very favorable. IAEA is also involved in making the training course known amongst potentially interested persons and organizations beyond the project.

5.6 Planning for future training activities

Within the context of application for the SSA KNOWDIS, planning for joint training with NF-PRO and PAMINA was done. Acceptance of this SSA by the two collaborative Projects and the Commission shows that the concept generated meets the expectations for effective training.

5.7 Main meetings held

Meetings below RTDC level are not reported. RTDC meetings for the relevant reporting period partly fall outside the project months 13-18:

- Meeting between the Coordination Team and the Commission, in preparation of the 1st Project year reporting, Brussels 8 February
- ExCom meeting, Brussels 27 March
- Project Review, Brussels 28 March
- RTDC-1 meeting, Gothenburg 30-31 May
- RTDC-2 meeting, Karlsruhe 2 August
- RTDC-3 meeting, Paris 20 June



- RTDC 4 meeting, Madrid 6 June
- RTDC 5 meeting, Karlsruhe 3 August
- RTDC 6 and IMG meeting, Wettingen 7-8 June

6. D's, PID's and M's

Formal Deliverable (D), Project Internal Deliverable (PID) and Milestone (M) documents, together with accompanying documents/reports and list of D's, PID's and M's with their status, are available at the Project Intranet site, under: "FUNMIG IP / Reporting 18 Months"



Annex: Use and dissemination

Use and dissemination is mainly related to communicating the project and its outcome to

- (i) direct end-users,
- (ii) involved and interested research organizations, and
- (iii) a broader interested community.

Direct end-users are mainly implementers and regulatory bodies. These end-users from the EU are involved in the project or have been invited to participate. This ensures that interested end-users are informed and can make use of the project outcome. Extension of the Associated Groups by additional direct end-users contributes to dissemination of the Project outcome.

Use of the project outcome within the research community beyond the Consortium is given by publication of the annual project workshop proceedings and publications in the open literature. In addition, involvement and communication with organizations from a broad set of European countries, also those with small nuclear programs and/or a low competence level, is important for the possibility of their use of the project outcome. Additional Associated Groups in the form of research oriented organizations is a key in broadening the direct dissemination of the project outcome to the research community. This is also very true for organizations from new member states.

A double page overview of the Project was published in the European Parliament Magazine, issue 220, 20 March 2006.

A broader interested community is addressed by alignment of project activities with projects where such groups/organizations are involved. One example of involvement promoting such dissemination of the project outcome is the participation with presentation by the GMF (European Group of Municipalities with Nuclear Facilities) at the forthcoming 2nd Annual Workshop.