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Organisation de Coopération et de Développement Economiques
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English - Or. English

**NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE**

Integration Group for the Safety Case (IGSC)

SUMMARY RECORD OF THE 14TH PLENARY MEETING OF THE CLAY CLUB

**Held at the ONDRAF/NIRAS offices in Brussels, Belgium
on 20-21 October 2004**

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CLAY CLUB WORKING GROUP
Summary records of the 14th meeting

Dates: 20-21 October 2004

Location: ONDRAF/NIRAS HQ, Brussels, Belgium

The list of participants is presented in Annex A

All slides and supporting materials are posted on the restricted Clay Club website.

1. GENERALITIES

Philippe Lalieux, chair of the Clay Club and on behalf of ONDRAF/NIRAS welcomed all participants at the meeting. He reminded that this year the Clay Club lost a much esteemed colleague and friend: Steve Horseman, BGS, UK. He recalled Steve had long relationship with international cooperation, and was closely associated with the work of the Clay Club as a key expert. He was the main author of the first Clay Club report which, ten year after its publication is still considered as a major textbook. He was the coordinator of the self healing study. On behalf of the Clay Club and the NEA secretariat, Philippe Lalieux expressed his condolences to Robert Cuss and Helen Reeves who were Steve colleagues at BGS.

Apologizes

Annex A gives the list of participants with apologizes.

Agenda of the 14th meeting

The agenda [NEA/RWM/CLAYCLUB(2004)1] was approved; some items were moved with respect to some participants' constraints.

Summary report of the 13th Meeting

The members agreed with the minutes of the 13th meeting of the Clay Club [NEA/RWM/CLAYCLUB(2003)4].

Next Clay Club Meeting

The 15th Clay Club meeting will take place on 8-10 November 2005, at the NEA-HDQ in Issy-les-Moulineaux, France.

No topical session has been proposed yet; any idea is welcome.

2. SELF-HEALING CLAY CLUB INITIATIVE

Objective

This project, which started in 2002, involves the preparation of a state-of-the-art report of current understanding on the potential for self-healing and self-sealing in argillaceous media. The subject matter is multi-disciplinary since it draws upon hydrogeology, geochemistry, mineralogy, rock mechanics, soil mechanics, soil science, petroleum geology, structural geology and other geoscientific disciplines.

Status of the report

The status of the Clay Club initiative on self-healing as well as work that is still needed to finalize the report, were presented by Robert Cuss and Helen Reeves from BGS.

The structure of the report reflects the multi-disciplinary approach of the initiative. Most of the basic work (literature review, process identification etc.) concerning hydro-mechanical aspects of self-sealing and self-healing in clays is available. Gaps still exist in some sections but the main literature is amassed. The core of the report is nearly finished and essentially needs editing. From BGS point of view; an average of 5 days per chapter is necessary for finishing the whole set of chapters BGS was in charge of (see below for geochemical chapters). In that respect, one main aim of the finalization phase is to develop conclusions via a multi-disciplinary team inside BGS. It was acknowledged that the report was late and too long (around 480 pp.) vis-à-vis the initial estimations.

A summary of the status per chapter was presented and is given hereafter:

- Chapter 3: Geo-mechanics; about 40p; need for final editing, need more rock specific information (already received from Nagra and University of Bern), 5 days.
- Chapter 4: dilatancy and brittle-ductile transition: about 40p, nearly to the end, need final editing about 5 days.
- Chapter 5: fractures and faults; looked through the literature; 35 pages; requires re-ordering about 5 days.
- Chapter 6: stress; need to incorporate additional information, 5 days.
- Chapter 7: plastic deformation; this section was added in 2004, final editing needed; 5 days.
- Chapter 8: creep deformation: reasonably mapped out, need for final editing, (may move some materials from chapter 2 on Basic Concepts on geomechanic), 5 days.
- Chapter 9: swelling and softening; almost finalized from a hydro-mechanical point of view, may require input materials from CNRS/CREGU.
- Chapter 10: geochemical changes: structure made, need for assistance from CNRS/CREGU.
- Chapter 11: fault sealing closed to the end, 5 days.
- Chapter 12: repository excavations, some integration needed, 5 days.
- Chapter 13 conclusions, to be finalised.

Clay Club members reminded that the motivation of this report was to establish the link between field observations, observations around excavations and the underline scientific basis. The style of the report should be thought in view of a reading by non-geomechanic-educated readers.

Clay Club members also acknowledged that the current gaps in the reports reflect gaps in the open literature and therefore that a review by funding organizations should be sufficient before the publication of the report.

The Clay Club thanked the BGS for its efforts and willingness to finalise the work that was commissioned to Steve Horseman.

Link between the self -healing Clay Club initiative and the EC-SELFRAC project

Frédéric Bernier (Euridice, Belgium) summarised the status of the EC-SELFRAC project. The SELFRAC project aims to characterise the EDZ/EdZ and its evolution with time. The main objective of the project is to understand and to quantify these processes and to assess their impact on the performance of radioactive waste geological repositories. Two different potential geological formations for deep radioactive waste repositories are studied: the Opalinus Clay of Mont Terri (Switzerland) and the Boom Clay (HADES, Belgium). The project (2001-2004) is nearly to the end and therefore the review and the state-of-the-art report are nearly finished. A terminology exercise was developed as a starting point of the SELFRAC project and in particular during the EC CLUSTER conference of 3-5 November 2003 (proceedings available). In particular, EdZ and EDZ were differentiated as were self-healing and self-sealing:

*“The **Excavation Disturbed Zone (EdZ)** is a zone with hydro-mechanical and geochemical modifications, without major changes in flow and transport properties. Within the EdZ there are no negative effects on the long-term safety*

*The **Excavation Damaged Zone (EDZ)** is a zone with hydro-mechanical and geochemical modifications inducing significant changes in flow and transport properties. These changes can, for example, include one or more orders of magnitude increase in flow permeability”.*

***Sealing** is a reduction of fracture permeability by any hydromechanical, hydrochemical, or hydrobiochemical processes.*

***Healing** is sealing with loss of memory of the pre-healing state”*

The final draft is planned by March 05 and so by mid-05 the final report should be released. Meanwhile a synthesis report will be provided also by mid 2005.

The Clay Club acknowledged the complementarity of the two initiatives and requested a consistency check. A quotation of the respective reports in each initiative is welcome. The terminology is one the priority for consistency between the two reports: the Clay Club report will use the EC-SELFRAC terminology and the word “sealing” will be put in place of “healing” in the Clay Club report.

CNRS/CREGU contribution

The contribution from CNRS (CREGU-Nancy) concerns Chapter 9 (swelling) and Chapter 10 (geochemical changes) of the Clay Club report. Regarding chapter 9, a draft version from BGS exists on a pure rock mechanics bases. Some additions/checks are needed to ensure

completeness. With regards to chapter 10, the structure established by BGS is available but assistance from CREGU is necessary. The existing contributions from CREGU are difficult to integrate as such in BGS current version.

From the discussions, it emerged that CREGU has to reorganize its contribution to fit it into BGS current structure and that direct exchanges are needed between the two parties in view of providing a consistent full report. It was also suggested that field observations should be added.

It was also clear that administrative matters between BGS and CNRS/FORPRO/CREGU were not appropriately sorted out for different reasons. In order to facilitate the finalization of those two chapters and thus of the full report, Clay Club members agreed on the following steps to proceed in:

- The NEA will provide a contract directly to the CREGU (without going neither through CRNS nor via FORPRO) by using HSK contribution, as soon as a technical and cost proposal from the CREGU has been received.
- The BGS will formally confirm its agreement on this (ASAP).
- Meanwhile the CREGU will provide a quotation based on agreement with the BGS on the content of the contribution.
- Patrick Landais, Andra will be the contact person with the CREGU.
- The contract with BGS will be thus updated by removing CNRS subcontract.

Guidelines for review by funding organizations

During the review, funding organizations will:

- look in particular for any missing points on site-specific issues;
- check if site specific information is correctly taken into account;
- check that all used data and information are publishable.

The basic structure of the BGS document should not be revisited and modified. These guidelines will be reminded by the Secretariat in due time.

End product

The conclusions/recommendations (chapter 13) should focus on integrated view on self-sealing/healing, when/where to use specific models and gaps in knowledge and how to fill them.

The published report will consist of a NEA black and white official report. Based on the planning of tasks (see below), the NEA publication may be available by end 2005. As the report is currently too long, it will be reduced to ~400 pages. The copyrighting has to be checked by BGS for open literature (e.g. use of illustrations) and by funding agencies for site-specific information.

Planning of Tasks

To allow editing (consistency) and final integration of all chapters, the following planning was agreed upon:

1. Draft BGS by end of this year (without geochemistry that is under the responsibility of the CREGU).
2. Contribution from the CREGU tailored to report needs by end of this year.
3. Consolidation by the BGS in early January 2005.
4. 3-months review by funding organizations by end of April 2005 (no comment means agreement).
5. Final consolidation by the BGS by end of June 2005; the BGS contract thus needs to be formally extended (without additional funding) to at least summer 2005.

3. PROPOSAL FOR A CLAY CLUB WORKSHOP IN 2006

Proposal-objectives

The proposal was presented by Laurent Wouters, ONDRAF/NIRAS on behalf of Prof. Vandenberghe (KUL, Belgium). The suggested title of the workshop is "*Faults & fractures at depth in argillaceous media – origin and evolution*".

The presentation was based on lessons learned since the Nottingham and Bern Workshops in 1994 and 1996 respectively. A few data, evidence and understanding exist on fractures generation and evolution at depth for relevant disposal in clay formation. Moreover, transferability from surface knowledge and oil-reservoir-based knowledge is not straightforward. It is time to establish where we stand ten years after the Bern workshop which raised issues linked with fracture flow in clays.

A list of potential issues to be discussed at the workshop was suggested such as:

- Anisotropy in the stress state of clay: What are the mechanisms for this memory? Are they linked to the texture?
- What is the detailed mechanical behaviour of clays at the limit between ductile and brittle, and how does it depend on the clay characteristics?
- How important are the compositional parameters (mineralogy, water content) for the geomechanic behaviour of clays?
- What is the relation between the regional geological stress fields and the one in the clay massif: relevance for the prediction of the stress field at scale of a gallery?
- The description of the relevant geomechanical parameters during the burial history of the clay. The variability of these parameters with depth and pre-load.
- The lessons learned from observations at surface and during underground works.
- Comparison with fracturing in reservoirs (petroleum geology).

Agreement at the meeting

Clay Club members agreed in principle on the proposal. One of the key issues will be to include burial history of the various clays. The workshop should maintain its focus on clays (cap rock) but will also look at CO₂ sequestration R&D and include oil industry experiences (mostly through geological surveys and universities). Members also agreed on the fact that the workshop should not take place before the end of 2006 since many workshops/conferences are already planned in 2005. Having the workshop not before end 2006 will also permit to build networking with oil industry that might take time, and to get new data from waste management organizations (e.g. Nagra). Moreover, members agreed to start the organization of the workshop quite well in advance such as early 2005 in order to explore the possibilities of collaboration with EAPG (European Association of Petroleum Geoscientists) or other professional organizations and in order to make an announcement at the Tours conference of March 2005 via a flyer.

Planning of tasks

1. Nagra will explore oil & professional contacts.
2. Ondraf will check with Prof. Vandenberghe (KUL, Belgium) the timing and hosting availabilities.
3. Program Committee: Nagra, Andra, Ondraf/Niras (lead), IRSN and BGS representatives; additional members are welcome.

4. TOPICAL SESSION: ORGANIC MATTERS, CHARACTERIZATION & EVOLUTION

The Topical Session was chaired by Ann Dierckx, ONDRAF/NIRAS; the rapporteur was Paul Wersin from Nagra.

Objectives

The Topical Session was aimed at providing a rough overview of current activities within several agencies and research centres regarding the characterisation of organic matters (OM) that are present in natural argillaceous settings and regarding the assessment of its evolution through time and considering repository-induced perturbations. It was not aimed at completeness or deepening a specific topic.

List of oral presentations

- Characterisation and Reactivity of Organic Matter in Opalinus and Callovo-Oxfordian Clays: Status of two Projects; *A. Courdouan, ITOe and P. Wersin, Nagra.*
- Boom Clay Organic Matter Characterisation; *M. Van Geet, P. De Cannière, SCK•CEN and A. Dierckx, ONDRAF/NIRAS.*
- Reactivity of Organic Matter; Past and Possible Future Evolution; *P. Landais, Andra.*

- Kinetic and Molecular Study of Gaseous and Liquid Products Generated by the Insoluble Boom Clay Organic Matter Submitted to Thermal Stress ; *I. Deniau¹, C. Largeau⁵, C. Beaucaire¹, F. Béhare², H. Pitsch¹, P. De Cannière³, M. Van Geet³ and A. Dierckx⁴, ¹IRSN, ²IFP, ³SCK•CEN, ⁴ONDRAF/NIRAS and ⁵CNRS.*
- Source Identification and Characterization of Humic and Fulvic Acids Isolated from Calloro-Oxfordian Argilite and Opalinus Clay; *T. Schäfer, INE-FZK.*

Round-up session

Based on the presentations, the discussion focused on the need for additional international cooperation in this field, and especially for the need of a specific Clay Club initiative.

Clay Club members acknowledged that the work on OM is at a pioneering level in various waste management agencies. Most developments (especially extraction and characterisation techniques) are unique and as such difficult to be compared. They also acknowledged that quite large differences exist in OM content, maturity and reactivity in various clays. The burial history is viewed as key input to better understand OM presence and evolution. The transferability of methods/results could benefit from a benchmarking-type exercise. During the topical session, the question on what we could expect from OM geochemistry in waste management was raised. The mobility of OM was considered as the key issue, especially in order to better define the level of details to be reached when assessing radionuclide sorption. OM oxidation was also seen as an effective follow up of perturbations induced during URL and repository operations (this links directly OM and design and duration of repository operations). One additional issue concerns the need to keep in mind the whole near field evolution (oxidation/sealing/thermal load +/- alkaline perturbation) and the time of radionuclide releases when looking at OM mobility and reactivity.

Suggestions for further work

Potential improvements on OM characterization were suggested:

- Detailed mapping of OM distribution in clay rocks (where is it?) in relationship with porosity.
- Improvement of “soft” extraction techniques (i.e. extraction that minimise induced perturbations to the rock and its pore water).
- Increase of the level of OM basic thermodynamic data.
- Further understanding of OM mobility.
- Potential benchmarking exercise based on same extraction and analytical techniques, “good”, well preserved samples from Opalinus Clay, Callovo-Oxfordian Clay formation, Boom Clay ... + ... and undisturbed situation.

However, Clay Club members acknowledged that it is too early for establishing a formalised and comprehensive assessment of what has been done up to now and defining recommendations. They suggested continuing exchanging information on what is ongoing at annual Clay Club meetings. A series of questions in relation to what is expected for the safety cases should be defined in order to structure the exchanges of information). To help progressively clarify these expectations, it was agreed to ask the support of the IGSC.

Planning of tasks

1. The rapporteur will provide a first draft of synthesis of the topical session with the help of the chair and the NEA secretariat.
2. The synthesis will be reviewed by the chair of the Clay Club.
3. The NEA will then provide proceedings (general distribution report) within the synthesis and compilation of slides.
4. Support from the IGSC will be requested.

5. FEPCAT CLAY CLUB INITIATIVE

Objective of FEPCAT

The FEPCAT catalogue for argillaceous media aimed at deriving a list of FEPs (Features, Events and Processes) specific argillaceous media. The catalogue provides an overview of past, on-going and planned “in-situ” and laboratory experiments. It aims to make a link between site investigations and their application in performance assessments and to provide a scientific background for assessment. The Report was published end 2003 [see: <http://www.nea.fr/html/rwm/reports/2003/nea4437-FEP.pdf>]. A questionnaire [NEA/RWM/CLAYCLUB (2003)5] was then sent to IGSC/Clay Club members in order to get feedback from end-users.

Feedback from end-users

Martin Mazurek (University of Bern, Switzerland and co-ordinator of the project) presented orally a first analysis of the compilation of responses that were received from height “Clay” organizations to the dedicated questionnaire [NEA/RWM/CLAYCLUB(2003)5] on the utilization of the NEA FEPCAT for argillaceous media inside an organization. As some answers were received just before the meeting, it was mentioned that this compilation will be revisited in order to make a consistent synthesis of all comments and to provide some key recommendations for the future. From the first compilation, with regards to the interface between phenomenology and safety assessment, the methodology of derivation and classification of FEPs was well received. FEPCAT is used both as a base for *a priori* FEPs list development and as *a posteriori* checklist. The report is considered as helpful for safety assessment specialists as for site characterization experts, which means that the initial goal has been achieved. However the database is not very usable for assessing “domestic” level of knowledge especially due to high heterogeneities in the considered programs. FEPCAT is not often used to define further domestic development but considered as an adequate “entrance” to other programmes. As an example, the FEPCAT database (methodology and content) has been used to help assess potentialities of Canadian argillaceous formations vis-à-vis international existing knowledge.

Some users ask for more details on uncertainties but it was considered by the Clay Club members as practically impossible to be achieved. One positive feedback also concerns the helpfulness of FEPCAT in defining “gaps” in knowledge base and potential for international cooperation.

With respect to the need and frequency for updating, a wide range of answers was provided. Clay Club members were in favour of updating the FEPCAT per group of FEPs (discipline

oriented) when specific new information is available rather than in bulk after key safety cases being produced, with a frequency of about 5 years.

The “relevance to safety” evaluation that was used in the FEPCAT elaboration was sometimes misinterpreted, especially by safety assessments specialists. Basically, FEPCAT judgements are driven by phenomenology. The wording “relevance to system understanding” (i.e. driving process or not), reflects more accurately the FEPCAT content and might be more acceptable to the safety assessment community.

Planning of tasks

1. Additional feedback on FEPCAT utilisation is still welcome.
2. Clarifications on some comments are needed; the NEA will contact directly organizations.
3. The NEA will compile all answers with the help of Martin Mazurek.
4. A presentation of feedback will be made at the 6th IGSC meeting.

5. CATALOGUE OF CHARACTERISTICS

Objectives

The catalogue of characteristics provides an overview of key geoscientific characteristics of clay formations studies with regards to deep geological disposal. It aims to help in understanding communalities and differences in clay characteristics. However it has not to be used such as an input for PA (performance assessment).

Status

Jean-Yves Boisson, IRSN, and co-ordinator of the initiative presented the status of the brochure and the Excel tables. The Clay Club thanks J-Y. Boisson and the IRSN for their investment in the work. Positive answers were received from US, Canada and UK regarding the inclusion of “past” formations in the Catalogue. As no answer was received from Italy, members decided to remove the Italian clay formation from the catalogue.

The Catalogue will consist of an introductory brochure and specific databases in a CD-ROM (MS Word and Excel versions) per formation. A final draft version has been made available on the Clay Club website since May 04. The aims and content of the brochure were discussed thoroughly at the meeting. In particular, it was stressed that the brochure should provide all the necessary caveats to the use of the Catalogue (e.g. significance of the data and data variability, principal utilisation of the Catalogue, etc.). It should be also mentioned in the brochure that curves could be taken as illustrations but cannot be used to define a specific relationship between parameters. With respect to the brochure, the idea of inserting map which represents various locations of clay formations of the Catalogue was well received, but the map still needs to be finalized. Regarding table 3 of the brochure, the nature of information needs to provide an idea of the project development but doesn't need to provide detailed history e.g. dates of approval. Clay Club members acknowledged the helpfulness of the section on “Illustrations” but considered there is still need to explain a few illustrations in particular those on correlations.

Organisations were requested to formally agree on the brochure by the 15th of December and in particular, they should:

- approve the acknowledgement session and in particular check names of all contributors to the catalogue from their own organizations;
- review carefully the chapter on “Limitations” especially regarding spatial variability.

With respect to the core of the document, it was noted, both by J-Y. Boisson and M. Mazurek that a few inconsistencies still exist on data that were provided by organizations. Examples were provided (problems of scales, disparities between formations, best estimated values not always mentioned that make difficulty to check consistency of data, mineralogical inconsistencies, etc.). Therefore, *a final cross checking by each organization on his own data Excel table is requested before publishing the Catalogue.*

Planning of tasks

1. By 15th of December, organizations will review by the brochure and will make a consistency checking. Before and as soon as possible J-Y. Boisson will send to each organization what he has already pointed out as inconsistency.
2. By 15th of December, Grants for publication to be sent by the BGR and ENRESA to the NEA.
3. Early 2005, publication by the NEA (brochure and a CD-ROM with all Excel tables).
4. With respect to the updating, Clay Club members consider that it is too early to decide. A first feedback of the use of the Catalogue should be provided, as it was done for the FEPCAT, before updating the catalogue. Members also recommend not underestimating the updating work.

6. IMPACT OF NEA PEER REVIEWS ON R&D PROGRAMMES REGARDING ARGILLACEOUS HOST-FORMATIONS

The presentations dealt with experiences from Opalinus Clay (Nagra), Dossier 2001 Argile (Andra) and SAFIR 2 (ONDRAF/NIRAS) peer reviews. From those three presentations, it was recognized that:

- Peer reviews help confirm adequacy of methodologies and provide hints on future national R&D programs.
- The NEA peer review is one review among a broader series (academic, regulatory, etc.).
- Only Nagra used purposely the NEA peer review results for public relations purposes.
- The classical request after a peer review is a one-to-one follow-up of the recommendations; however, there is a need to prioritize recommendations and to put each of them in a wider perspective in order to cope with various constraints e.g. duration of experiments (esp. for *in situ* experiments in clays), available funds, uniqueness of the national approach *vis-à-vis* other programmes, existing information abroad.
- Consistencies among the various peer reviews should be fostered.

- It is of particular importance to consider reviews' recommendations *vis-à-vis* the initial Term of Reference.

Each peer review report is available and could be downloaded from the NEA website:

<http://www.nea.fr/html/pub/webpubs/welcome.html#rp>.

7. GEOSPHERE STABILITY WORKSHOP

Philippe Lalieux presented the outcomes of the workshop on “Stability and buffering capacity of the geosphere for long term isolation of radioactive waste: application to argillaceous media”. He reminded that the workshop was organized in the framework of an IGSC initiative and considering the IGSC guidelines [NEA/RWM/IGSC (2002)13]. On behalf of all members he thanked again GRS for hosting the workshop in Braunschweig, Germany on 9-11 December 2003.

Scope of the workshop

The scope of the workshop was:

- Multiple lines of evidence to support the stability/buffering/robustness of the clays over long time scales (up to ~1Ma).
- Resilience of the favorable properties of clays to natural perturbations (e.g. climate, seismic).
- Repository-induced effects excluded from the workshop.
- Whole spectrum of argillaceous media envisaged as host formations (from poorly indurated, soft clays to hard, fractured clays).

Main outcomes

The workshop provided arguments to support stability and buffering capacity of argillaceous formations as a base argument for a safety case:

- Expected hydraulic, mechanical or chemical perturbations should be buffered by the clay formation properties.
- Little indication of direct impact of surface changes on the host clay transport properties at depth.
- Radionuclide pathways in the surroundings may be affected (modification of the hydrogeological and geochemical boundary conditions) esp. by climate changes.
- Predicting the overall geological evolution of a given site and its environment up to 1 Ma seems feasible.
- A large spectrum of geoscientific arguments in support of the long-term stability of host formations is being used e.g. various spatial (site to basin) and temporal scales; comparisons with much less favourable geological situations; scoping calculations as an help to test the robustness of the proposed repository systems. But there is a need for better harmonising and justifying the potential multiple arguments in support to the geosphere stability. There is indeed an apparent lack of consistency when comparing the various sites and therefore the

corresponding sets of arguments. One should foster a better justification of why an argument is used or is valid for a site or a host formation and not in another case. Conceptual models should be valid for various sites.

- The need to provide a comprehensive “history” of the host formation was also emphasized in view of presenting multiple line of evidence of the capacity of the host formation to fulfill the safety functions. This contributes to building confidence when presenting a safety case. The petroleum industry already has important experience on this matter, and this should be further used.
- Most studies are deal with very active areas (academic) and/or deeply buried formations (oil) and so waste management (WM) sites are rather “boring”. Transfer of knowledge gained in active areas is not straightforward. WM have to make their datasets and tools more available to academic (“advertising”) to foster studies on relevant WM systems. A Networking & competence mapping need to be developed, and there is also a need to inform academic on waste management issues.
- It was also observed that some on-going Clay Club initiatives will respond to some issues pointed out at the workshop such as self-sealing, natural tracers ...

Feedback from participants

1. Feedback from participants was overall positive.
2. The workshop was considered as a good platform for academic participants to have a better idea of WM issues.
3. Participants represented a good mixture of academic + agencies + regulators.
4. WM site specific datasets are usually of high quality and resolution; it would be of interest to better “advertise” this in order to foster interaction with the academic community (even on sites with relatively smooth evolution).

Status of the synthesis and planning of tasks

1. The proceedings synthesize the key findings per each main topics covered by the workshop, put end- users perspectives and compile all papers abstracts received since the workshop. The synthesis was drafted with the help of Emmanuel Mouche and Vanessa Teles (CEA), the Secretariat and the workshop Programme Committee.
2. The final draft is under review and will be available for final approval by end of November.
3. The NEA publication will be released early next year.

8. IGSC SELF-EVALUATION /TRANSFER OF KNOWLEDGE ON URL EXPERIENCES

That topic was identified during the self-evaluation of IGSC [NEA/RWM/IGSC(2004)17]. Zoltan Nagy, Puram presented the Hungary experience and needs regarding the transfer of knowledge on URL (underground research laboratory). He mentioned that it should be of interest to get an overview report providing guidance to organizations which are planning new investigation program and/or URL. Some of the typical questions are as follows:

- How to carry out investigation program?

- When/why to go underground?
- How not to repeat the same mistakes/duplication?
- What must be measured *in situ*/in URL?

He also mentioned that with respect to a reading of international and SKB reports, no unique answer to those questions currently exists. Philippe Lalieux reminded the audience of one of the latest NEA/SEDE initiatives that was aimed at providing some ideas regarding the rationale for going underground for testing (see GD: NEA/RWM(2001)6/Rev1 on <http://www.nea.fr/html/rwm/docs/2001/rwm2001-6-rev1.pdf>).

The Clay Club could provide specific technical contribution on what to measure and how. However, the need to revisit the SEDE document is to be decided by the IGSC.

In the course of the discussion, the importance of networking, of sharing of bibliography and of long-term archiving was also acknowledged. In that respect, the Clay Club compilation initiatives (FEPCAT, Catalogue, Extraction techniques, etc.) were viewed as efficient entrances to other national programs.

9. CLAY CLUB PROJECT ON LONG-TERM NATURAL TRACERS PROFILES: NAMELY “CLAYTRAC”

Objective

The project aims to provide an overview of available data sets regarding long term natural tracers profiles. The added value of that work compared to studies dealing with individual sites in isolation lies in the comparison and integration of data, results and conclusions from a variety of sites and formations. The application of a consistent methodology of data collection, processing and modelling will also meet the following objectives:

- To develop and apply a consistent way of data processing and evaluation that is the basis for comparability (e.g. consideration of tracer-specific porosities and diffusion coefficients).
- To evaluate the strengths and weaknesses of different tracers for quantitative understanding of transport processes in argillaceous rocks.
- To comment on commonalties and differences among the sites under consideration.
- To identify gaps in existing data sets and make recommendations for future data acquisition campaigns.

The total cost for the project is 140,000 Euros. Six organisations committed themselves (Andra, IRSN, Mecsekerc, Nagra, Numo, Ondraf/Niras). A binding answer from BGR is still to come.

Status

Martin Mazurek, University of Bern, coordinator of the project presented the positive feedback of the kick-off meeting regarding the “Natural tracer profiles across argillaceous formations - review and synthesis”, namely the CLAYTRAC project. The kick-off meeting took place on 19th October in the presence of contact persons from each funding organizations, the NEA and the Clay Club Chair. The main objective was to fix guidelines for future work and to formally

launch the project. At the kick off meeting, a formal agreement on technical content of CLAYTRAC was reached. Funding organizations agreed that the recent developments in extraction and analytical techniques have to be included in the study. A revised version of the proposal that takes into consideration the outcomes of the kick-off meeting will be added to the contract as "Project Guidelines". It was confirmed that CLAYTRAC does not aim at collecting new tracer data or at developing new codes. Regarding the modelling task, one of the most difficulty endeavours will be to define boundary conditions.

The flow of information between organizations and the core group Core Group¹ should be as followed:

- Technical information: Delegates <-> Core Group, cc NEA Secretariat.
- Administrative information: Delegates <-> NEA Secretariat <-> Core Group.

The funding organizations also agreed to the following commitment (in addition to providing funds):

- Provide data.
- Formal clearance of data and formal approval of the choice of the code(s) to be used at milestone 1 (July 2005).
- Attendance to the workshop.
- Formal review at milestone 2.

Clay Club members confirmed that Martin Mazurek was the adequate person to co-ordinate that project. The Clay Club also encouraged organizations who have no sites/data to be involved in CLAYTRAC in order to better understand the methodology aspects, justify the choice of most promising tracers, acknowledge modelling difficulties. The CLAYTRAC project will also help waste management organizations to provide one set of arguments when presenting a safety case.

Planning of tasks for CLAYTRAC

1. Duration of the project: Jan 2005- Dec 2006.
2. July 2005 – Milestone 1- compilation of data and approval on code to be used.
3. August 2006-milestone 2- draft report.
4. Funding organizations will have full control of the schedule.
5. Presentations of progress on the occasion of Clay Club meetings.
6. The end-product will be and an open, printed document of the NEA. Members suggested that a colour publication is absolutely necessary BUT additional financial support will be needed as the NEA secretariat has no budget for that. That last point needs to be confirmed. Additional scientific publications are being encouraged.

1. consisting of members the Rock-Water Interaction Group of the University of Bern, Switzerland (M. Mazurek [lead], T. Gimmi, H. N. Waber, P. Alt-Epping), of Andra (S. Buschaert) and Nagra (A. Gautschi)

7. INTERNATIONAL CONFERENCE, TOURS, FRANCE, MARCH 2005

Nasser Hoteit, Andra, presented the forthcoming international conference on “Clays in Natural and Engineered Barriers for Radioactive Waste Confinement”, which will take place in TOURS, France on 14–18 March 2005 as a follow up of the Reims conference of 2002 (see: www.andra.fr/meeting2005/).

He mentioned that more than 360 contributions had been already received with a representation of 25 countries. Some NEA initiatives may be presented at the conference such as Clay Club, AMIGO and EBS....

Most of contributions deal with engineered barriers and in situ experiments. A programme committee meeting is planned in November 2004 to select the most relevant contributions and organise the conference. A second circular of the programme is awaited for December.

8. COUNTRY REPORTS

The Clay Club members made a short presentation of their country report by highlighting the main topics. Country reports and/or oral presentations will be made available on the restricted Clay Club website.

It was noted by several members that:

- the level of detail and the type of information covered in the country reports (both oral and written) are too variable from one country to another (from detailed experimental results to change in the legal framework);
- most reports are organisation-specific rather than national;
- a lot of duplication exists with similar reports given at IGSC or RWMC levels.

Despite this, the usefulness of the country reports was confirmed as an entrance to national programme.

It was therefore suggested to the Secretariat to further harmonise, in coordination with the IGSC, the guidelines for such reports. In particular, it was suggested to have a common IGSC and Clay Club general report with a more specific annex dealing with clay-specific results and information.

ANNEX A

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