CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Attendance at the 4th plenary meeting of the Integrated Group for the Safety Case (IGSC) of the Organization for Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA) (20.06002.01.111)

DATE/PLACE: November 6–8, 2002, Paris, France

AUTHOR: Budhi Sagar

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Subject

Attendance at the 4th plenary meeting of the Integrated Group for the Safety Case (IGSC) of the Organization for Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA)

Dates of Travel and Countries/Organizations Visited

November 4–9, 2002, NEA offices in Paris, France. Prior to the IGSC meeting, the traveler visited the Korean Atomic Energy Institute in Daejeon from December 26–November 3 as a member of a peer review team organized by the International Atomic Energy Agency (IAEA).

Author, Title, and Agency Affiliation

Dr. Budhi Sagar, Technical Director, Center for Nuclear Waste Regulatory Analyses (CNWRA), San Antonio, Texas.

Sensitivity

N/A

Background/Purpose

The IGSC is one of the three groups created by NEA Radioactive Waste Management Committee; the other two being the Forum on Stakeholder Confidence (FSC) and the Working Party on Management of Materials from Decommissioning and Dismantling (WPDD). The U.S. Nuclear Regulatory Commission (NRC) has been involved in the RWMC and the three groups it established from their very beginning because of the direct relevance of the subject matter to the NRC mission. The purpose of this particular trip was to attend the 4th plenary meeting of the IGSC.

Abstract: Summary of Pertinent Points/Issues

The members of the IGSC are senior technical specialists knowledgeable in assembling and reviewing safety cases for proposed geologic repositories. The focus of the group is on methodologies and strategies for characterizing and evaluating disposal sites. The IGSC selects its program initiatives under the direction of NEA Radioactive Waste Management Committee (RWMC). Currently, Ms. Margaret Federline of the NRC chairs the RWMC. The IGSC selected topics are generally of interest to a majority of the member countries, are amenable to international considerations, provide added value to national programs, and cover strategic areas relevant to management of radioactive waste. The program initiatives are addressed by task-oriented sub-groups and the results are documented in NEA documents. Currently, the initiatives include preparing a safety case brochure; developing topical sessions for the plenary meetings; holding workshops on time-scales in the postclosure safety; planning

workshops on geologic stability [the Approaches and Methods for Integrating Geologic Information in the Safety Case (AMIGO subgroup)]; holding workshops on the role of engineered barriers (the EBS subgroup); testing sorption models (the sorption forum), holding workshops on safety of repositories in clay medium (the "clay club"), preparing a thermodynamic data base (the TDB subgroup); and collecting and maintaining data on features, events and processes (the FEP subgroup).

The subject of the topical session held on the afternoon of November 6th was "The Potential Impacts On Repository Safety From a Potential Partitioning and Transmutation (P&T) Program." Fast reactors and accelerator-driven P&T schemes that convert actinides to less toxic fission products were discussed. The session included a broad overview of the P&T research in France, Japan, and the USA. In summary, the session concluded that P&T is not an alternative to geologic disposal but it does have the potential of reducing waste volumes, radiotoxicity, and heat production; its economic viability remains to be investigated. Also, a concern was expressed that full system studies that include the consideration of disposal of secondary waste streams from the P&T processes need to be carried out.

The first draft of the safety case brochure will be completed by the end of January 2003 when it will be sent to the IGSC and the RWMC members for comments. The revised text will be presented to the next IGSC plenary meeting to be held in October 2003. The RWMC will discuss the text in their March 2003 meeting. This brochure is meant to provide a simple description of the function, scope, and process of preparing a safety case but will not set a prescriptive tone. This IGSC activity reduces further any need for the proposed NAS study on the subject.

A proposal by the Swedish delegation to hold a workshop on "Management of Uncertainty in Safety Case: The Role of Risk" was accepted. The workshop will be hosted by the Swedish Radiation Protection Institute (SSI) and it is tentatively planned to be held in Stockholm on February 2–4, 2004. The objective of the workshop is to discuss approaches to managing uncertainty and risk in safety cases and regulatory reviews.

The AMIGO workshops are designed to be follow-ons to the previous GEOTRAP workshops. The first AMIGO workshop on "Building Confidence Using Multiple Lines of Evidence" will be hosted by NAGRA and is scheduled for June 3–5, 2003, at Yverdon-les-Bains in Switzerland. An interesting concept of the AMIGO workshops is that one day will be devoted to discussing the host's most recent safety case. For example, in the first workshop, NAGRA (the Swiss implementor) and HSK (the Swiss regulator) will discuss their work relative to the Opalinus clay. In this way as a reward for hosting the workshop and bearing some of the costs, the host organizations will get an "informal" review of their work.

Discussion

The agenda of the meeting, the attendee list, and list of decisions and main outcomes are attached. Significant discussions are summarized below.

REGULAR BUSINESS

Peter Flavelle of the Canadian Nuclear Safety Commission summarized the main points of the 3rd workshop conducted by the FSC in Ottawa on 14–18 October 2002. Three topics (i) What are the Social Concerns? (ii) How to Address Social Concerns? and (iii) Development Opportunities for Communities were discussed with the help of two "case studies." The first case study related to the Nuclear Fuel Waste Act that will guide the disposal of HLW in Canada. The second case study related to the Port Hope Area Initiative for the location of a low-level waste facility. Various stakeholders participated in the workshop. Based on discussions, two preliminary observations were made by Flavelle (i) a need was identified for greater participation by policymakers and, in particular, by regulatory staff in communicating to the public how they perform their functions, and (ii) greater clarity is needed to present to society the technical issues and assessments that are used in a safety case.

Bertrand Rüegger of the NEA provided status on three ongoing projects. He indicated that Version 2 of the Features, Events, and Processes (FEP) data base would be available in the Summer of 2003. Version 2 will include data from the SCK-CEN, SKI, SKB, and EC BENIPA project. He also provided the status of the Thermodynamic Data Base (TDB) project as prepared by the group's chairman, Mehdi Askarieh (NIREX, UK). Phase II of the TDB, which includes 15 participating organizations, will conclude in December 2002 with an update of data for U, Am, Tc, Np, Pu and Se. A 800 page document containing data on organic ligand (Ox, Cit, EDTA, ISA) of the same elements is also being prepared. Phase III of the project focused on "Communication/Interface With the User Community" is proposed in which courses and workshops will be organized to inform the performance assessment community about the potential use of the TDB.

The objective of the Sorption Project is to demonstrate the applicability of different chemical thermodynamic modeling approaches to support the selection of sorption parameters for performance assessment. Twenty organizations, including the NRC and the CNWRA, are participating in this project. The project has defined 7 test cases for which 49 modeling results have been submitted by project participants. Preliminary results indicate that sorption models can be used to interpret measured data sets and provide support to Kd selection. However, a need for better modeling tools was identified. The scope for Phase III of this project is under discussion. Suggestions for Phase III include development of a surface complexation data base, modeling test cases in a predictive mode (without knowing the test results in advance), modeling compacted systems, scaling results, and including more organics in test cases.

Peter De Preter (NIRAS-ONDRAF—Belgium) provided a brief summary of the workshop on "Handling of Time-Scales in Assessing Post-Closure Safety" that was hosted by IRSN (France) on 6–8 November 2002 in Paris. Four topics were discussed (i) time scales in regulatory framework, (ii) functioning and evolution of barriers with time, (iii) limitations of assessing postclosure safety at different times, and (iv) relative value of performance indicators in different time frames. Preliminary conclusions of the workshop were (i) ethical principles require consideration of long time scales, (ii) limits of predictabality of the system should be clearly acknowledged in safety cases, (iii) calculated dose should be considered only as an indicator (in

contrast to prediction), (iv) regulator should play a role in defining stylized scenarios, (v) greater emphasis should be placed on safety in the early periods (e.g., 1000 years), and (vi) guidance is needed regarding dose calculation beyond periods of geosphere stability.

Richard Storck (GRS—Germany) described the objective of the Safety and Performance Indicators (SPIN) project as testing of applicability of additional indicators other than dose and risk. The study is limited to granitic formations and has eight participants (none from the USA). The safety indicators investigated and tentative conclusions reached were, effective dose rate—preferred at early times, radiotoxicity concentration in biosphere water—preferred at medium time frames, radiotoxicity flux from geosphere—preferred at late time frames, time integrated radiotoxicity flux from geosphere—not useful, relative activity concentration in biosphere water—not useful, and relative activity flux from geosphere—not useful.

Philippe Lalieux (NIRAS-ONDRAF—Belgium) summarized the activities of the Clay Club. Waste organizations in Belgium, France, Germany, Hungry, Japan, Spain, Switzerland, and UK are considering clay formations as potential host rock for repositories and are members. The Clay Club has prepared its own FEP data base and is continuing to update it. It has also created an easily searchable electronic data base of relevant references that currently has about 1,100 entries. Currently the Clay Club is focusing on understanding the self-healing properties of clay.

Based on an initiative by the Clay Club, a broad based workshop on "Geosphere Stability" is being planned. Alan Hooper (NIREX—UK) provided a brief overview of the rationale and plans. Although geologic formations are chosen for their long-term stability, it needs to be recognized that no natural system is in equilibrium. The key issue in safety assessments is the resilience of the main safety functions of the geosphere to natural perturbations. A series of workshops is planned. Each workshop will focus on a rock type with common issues for all workshops. The first workshop to be held in spring of 2003 will be hosted by the GRS (Germany) and focus on argillaceous media.

Hiroyuki Umeki (NUMO—Japan) briefed on the outcome of the first workshop on Engineered Barrier Systems (EBS) held on September 25–27, 2002, in Oxford (UK). To establish a baseline for this and future workshops, a questionnaire with questions on design and emplacement, characterization, modeling, and performance assessment was sent to the prospective participants. Twelve programs (including the WIPP and the Yucca Mountain projects) completed the questionnaire. The end product of the series of workshops is expected to be a document on "how EBS design is developed, justified, and implemented in the context of the safety case." The first workshop was focused on an assessment of the current status of integration of EBS design and modeling into total system performance assessment. The next workshop will focus on how design requirements and constraints evolve according to various stages of the project.

Klaus-Jürgen Röhlig (GRS—Germany) explained the development of the new project on Approaches and Methods for Integrating Geologic Information in the Safety Case (AMIGO). This is a follow on project to the completed GEOTRAP project. The objectives of AMIGO

include activities towards understanding and enhancing the state-of-the-art for representation of the geosphere in the safety case. Participants in the project will come from academic, industrial (e.g., oil and gas), regulatory, and implementer organizations. The host organization will bear some of the costs of the AMIGO workshops. As a "reward", one day of the workshop will be devoted to discussion of the safety case of the host organization so that they may get an informal review. Participation in the workshops will be limited to about 60 people. NAGRA, HSK (implementor and regulator respectively in Switzerland) and the University of Bern will host the first workshop. One of the three day workshop will be spent on discussing the case of Opalinus clay, the currently preferred medium in Switzerland. Lyndon Yose (ExxonMobil), Paul Nadeau (Statoil), and Sophie Violette (University of Paris) are being considered for invited speakers.

Abe van Luik (DOE—USA) briefed the group on the status of the IGSC's Brochure on Safety Case. This brochure will provide a simple description of a safety case for deep geologic disposal of long-lived wastes. It is meant to be accessible to a wide audience. Some concerns have been expressed about producing such a document (e.g., it could be used to criticize completed or on-going safety studies). In response to such criticism, the scope of the brochure has been refined to an explanation of the function (context), scope (key elements) and process (iterative nature) of preparing a safety case. The first draft of the brochure will be completed by end of January 2003, when it will be sent to the IGSC and RWMC members for review.

Phil Metcalf (IAEA) requested the IGSC group to provide comments on a advanced draft of the IAEA—WASSC Safety Standards for Geologic Disposal. NRC staff (Tim McCartin in particular) has actively participated in the development of this document along with the CNWRA staff being given the opportunity to comment. The document, after enumerating the basic principles of radioactive waste management, describes the safety standards for the pre- and post-closure periods, the legal and organizational requirements, and requirements for implementing waste management projects.

Björn Dverstorp (SSI—Sweden) explained the proposal on holding a workshop on "Management of Uncertainty in Safety Cases: The Role of Risk." The objective of the workshop is to achieve a common understanding of alternative approaches to characterization and evaluation of uncertainties and risk. Representatives of both the regulatory and implementing organizations are expected to participate. Approaches for risk-informed decision making, technical approaches for risk characterization, and potential for further methodology development will be the focus of the workshop. SSI will host the workshop in Stockholm on 2–4 February 2003.

COUNTRY REPORTS

European Commission: The 5-year 6th EURATOM Framework program spanning 2002–2006 has budgeted 90M euro for research related to geologic disposal and P&T concepts. Out of 103 expressions of interest, 26 have been selected for further consideration. The selected projects will emphasize "integration" so that these contribute to strengthening European competitiveness.

Belgium: Two clay host rocks are being studied: the Boom clay at Mol/Dessel and Leper clay at Doel. NIRAS-ONDRAF, the agency responsible for construction of a repository has published the 2nd Safety Assessment and Feasibility Interim report (SAFIR–2). The objective of SAFIR–2 is to inform the government on the technical feasibility and safety of long-lived waste disposal in clay and to open a public debate. In addition to Mol and Dessel, the municipalities of Fleurus and Farciennes are contemplating offering sites for consideration. A report on selected sites for study will be prepared in 2004.

Canada: The Nuclear Fuel Waste Act that was passed in June 2002 came into effect on November 15, 2002. This legislation calls for the waste generators to establish a Nuclear Waste Management Organization (NWMO). Within three years, the NWMO must submit to the government a study setting out its proposed approach for long-term management of nuclear waste. At least three alternatives must be considered in the study: geologic disposal in the Canadian shield, storage at nuclear reactors, and centralized surface storage. Elizabeth Dowdeswell, a former diplomat to the UN, has been appointed the president of NWMO. Two additional commissioners were appointed to the Canadian Nuclear Safety Commission (CNSC) to bring the tribunal to full strength of seven.

Czech Republic: According to the concept approved by the government, a deep geologic repository will be in operation by 2065. This concept was approved despite opposition from the Ministry of Environment. Initial activities for selecting six sites for detailed studies will begin in 2003. Performance assessments for three repositories for low and intermediate level waste were updated in 2002.

Finland: In May 2002, the government approved TVO's application to construct a new nuclear power reactor at Loviisa or Olkiluoto. The repository for spent fuel will be located at Olkiluoto, which has also been approved to accommodate the spent fuel from the new reactor. Construction of an underground rock characterization facility (ONKALO) is planned to be started in 2004. Posiva aims to submit an application for the construction permit around 2010 and an application for operation around 2020. The operational life period of the repository is estimated to be 90 years. Regulatory guide YVL 8.4 on long-term safety of disposal was published by Stuk in 2001, guide YVL 8.5 on operational safety of encapsulation and disposal facilities will be published in early 2003.

France: A new regulatory body for nuclear safety and radiation protection, the Direction Générale de la Sûreté Nucléaire et de la Radioprotection (DGSNR) has been created. This body reports to the Ministry of Industry and Environment for nuclear issues and to the Ministry of Health for radiation issues. The DGSNR has authority over all civil nuclear activities including transportation. The Institute for Radiological Protection and Nuclear Safety (IRSN) was created by a decree on February 13, 2002. Its role is to provide expert appraisal and conduct research. ANDRA is constructing an underground laboratory at the Bure site; a granitic site for research has yet to be selected. In 2006, based on global evaluation report of the two sites, the government may propose a new law to guide further work.

Germany: Abandoning nuclear energy is an essential part in the reorientation of the German energy policy. According to an agreement between the government and the utilities, the residual electricity volumes to be produced by 19 nuclear power plants currently in operation cannot exceed 2,623.30 TWh, which amounts to an average life time of 32 years for the reactors. Reprocessing of spent fuel will end as soon as possible but at least by 2005, interim storage facilities will be built at reactor sites to minimize transportation, and the underground exploration of the salt dome at Gorleben will be interrupted for at least three years. The federal government would like to construct one facility for all types of radioactive wastes by 2030.

Hungary: According to Act No. CXVI of 1996, the government has created an organization, the Public Agency for Radioactive Waste Management (PURAM) for disposal of HLW; spent fuel is not considered waste under the Hungarian law. The Hungarian Atomic Energy Authority (HAEA) will manage the financing of all work. The modular dry storage facility at the Parks Nuclear Power Plant can store spent fuel for up to 50 years.

Japan: The Nuclear Waste Management Organization (NUMO) was established as the implementing organization on October 18, 2000. NUMO will be responsible for site selection, demonstration of disposal technology, development of a license application, construction, operation, and closure of the repository. According to its plan, NUMO will solicit volunteer municipalities for preliminary investigation areas in 2002. The Nuclear Safety Commission (NSC) published the First Report on the Basis for Safety Standards for HLW Disposal in November 2000. The NSC organized a "Special Advisory Board on High-Level Radioactive Waste Disposal Safety" to develop safety guidelines before selection of potential sites, which were issued on September 30, 2002.

Italy: Italy has closed down its four nuclear power stations but it still has to dispose of its legacy wastes (about 200 cubic meters of HLW and spent fuel). The policy of the Italian government is to decommission all nuclear power stations and all other nuclear installations, including experimental facilities. The property of all nuclear power stations has already been transferred to a new government owned company called SOGIN. Within a year, the parliament is expected to issue a decree detailing the management of HLW.

Korea: In Korea, 17 power units are currently in operation and 4 are under construction. Nuclear power represents 28 percent of the nation's electric power production. A centralized spent fuel facility will be built by 2016. Since 1997, the Korean Atomic Energy Research Institute (KAERI) has been conducting a 10-year, 3-phase research program to develop a repository concept suited to the Korean conditions. A repository concept will be recommended to the government in 2007. A peer review of KAERI's research was organized by the IAEA; Dr. Sagar (CNWRA) was a member of this review team.

Spain: The Ministry of Economy granted a new operating license to the José Cabrera NPP (commissioned in 1968) until April 30, 2006, after which this plant will be phased out. Decisions with respect to management of spent fuel have been postponed to 2010. In the interim, ENRESA will operate a centralized temporary storage for all spent fuel produced in Spain.

Sweden: The SKB has presented a research and development program to authorities that allows only 2 years for regulatory reviews of the license application. A formal consultation process between the SSI and SKI on the one hand and the SKB on the other has been established. The SSI and SKI have also set up advisory groups called the INSITE and OVERSITE respectively. SSI plans to issue a guidance document in 2003 explaining its expectations with respect to compliance requirements. The SKB is currently investigating two sites: Östhammar and Öskarshamn and has phased out its activities at the Tierp site. An application to build a repository at one of the sites is planned in 2007.

Switzerland: A license for operation of storage facilities of HLW was issued to utility-owned ZWILAG in 2000, which is now functioning. This has relaxed the time pressure for construction of a repository. NAGRA has abandoned its plans for the Wellenberg site after a negative vote from the municipality on September 22, 2002. The siting feasibility for a HLW repository will now be based on investigation of the Opalinus clay option. A decision from the Federal council on Opalinus clay is expected in 2–3 years. In the mean time, disposal within the framework of a multinational project will continue to be an option. The Nuclear Energy Law is being debated in the parliament. It contains a provision that will require monitoring of geologic repositories for an extended period before closure. This law will also decide whether to phase out nuclear power.

USA—WIPP: As of October 21, 2002, WIPP has received 1,329 shipments of contact-handled TRU waste. The DOE has set new goals of sustaining 25 shipments per week. In February, the DOE published a document titled "The Environmental Management Top-to-Bottom Review Report" in which a risk-based plan to enable accelerated cleanup and closure of all nonessential sites related to the weapons program is outlined. The plan requires consolidating TRU waste from small quantity sites at large quantity sites to benefit from economy of scale. The major current effort at WIPP is to prepare for the certification by the EPA, which is required every five years; the application for recertification will be submitted in November 2003.

USA—Yucca Mountain: The DOE is preparing to submit a license application in December 2004. To prepare for this major action, the DOE's Office of Civilian Radioactive Waste Management has undergone a major reorganization in which an Office of Repository Development has been created in Las Vegas while an Office of Strategy and Program Development has been created in Washington D.C. A strategy document for safety assessment that will be incorporated in the license application has been developed. The NRC has published two major documents: The Yucca Mountain Review Plan, which provides guidance to its staff regarding review of any license application, and an Integrated Issue Resolution Status Report, which provides status of prelicensing issue closure.

TOPICAL SESSION

The subject of the topical session was "The potential Impacts on Repository Safety From a Potential Partitioning and Transmutation Program". This session was chaired by Jorg Hadermann (Paul Scherrer Institute—Switzerland) who, in his introductory remarks, indicated the link between a potential P&T program and repository safety. The primary link to repository safety is through alteration of the waste form.

Jean-Marc Cavedon (ECA—France) gave a status of the P&T research and development work in France. The P&T strategy is to recycle plutonium (and some minor actinides) in Pressurized Water Reactors (PWR) multiple times, thus reducing plutonium inventory and minimizing long-lived waste. Through this strategy, the CEA estimates that plutonium stocks can be reduced from over 600 tons in 2050 to about 200 tons. Initially, plutonium was extracted from spent fuel for use as fuel in Liquid Metal Fast Breeder Reactors; a fast neutron spectrum was and still is, indeed, the most efficient option. Currently, the CEA in cooperation with Framatome, EdF, and Cogema, is developing technology based on gas cooled reactors. Currently, at the La Hague plant, U and Pu (spent fuel has approximately 950 kg/t U and 10 kg/t Pu) are extracted from spent fuel through the Purex process and residue is turned into "classic" glass. The future possibility is to also separate Np (430 g/t), Am (320 g/t), and Cm (24 g/t) and turn the rest into "light" glass. Other toxic elements are Tc (810 g/t) and I (170 g/t) and research is being conducted to transmute these, too. It takes only 300 years for the radiotoxicity of "light" glass to reach the level of radiotoxicity of initial U, compared to 10,000 years for "classic glass" and 200,000 years for unprocessed spent fuel. Both fast-reactor and accelerator based research programs are being pursued for transmutation.

Hiroyuki Umeki (NUMO—Japan) described the P&T program in Japan. Research in P&T technology started in Japan in 1987 with the OMEGA (Options for Making Extra Gains from Actinides and Fission Products project). In Japan, the research as explained by Jean-Marc is also being conducted. In the accelerator-driven subcritical (ADS) system, minor actinide and long-lived fission products are partitioned from the spent fuel, the rest is fabricated into fuel for use in ADS transmutor. The spent fuel from the ADS is subjected to pyrochemical reprocessing to remove minor actinide and fission products and the remaining again recycled to ADS.

Abe Van Luik (DOE—USA) said that the DOE policy was to evaluate the potential costs and benefits of P&T. Studies are being conducted on both the single-tier systems in which the spent fuel from a Liquid Water Reactor (LWR) is processed in an ADR or fast reactor once and the dual-tier system in which the spent fuel is partitioned into MOX fuel for Pu burners and the spent fuel from Pu burners is then used in ADS or fast reactors. System studies in the US show preference for reactor based transmutation. The DOE has proposed isolation of Cs and Sr, recycle Pu and Np in LWRs and later recycle minor actinide in fast reactors. Depending on the national nuclear power scenario, P&T may delay or avoid need for a second repository. The potential benefits of P&T include HLW volume reduction, management of short-term heat load, reduction of long-term heat load, and reduction in radiotoxicity and long-term dose. However, several issues need to be resolved, including demonstration of system-wide economics, demonstration that new waste streams can be managed, and national policy decisions for large investments in this technology. In the Yucca Mountain Final Environmental Impact Statement, the DOE has committed to incorporating information from future P&T studies in its decisions. This will be done during the preparation of a Mitigation Action Plan for the EIS, and during the repository licensing process, if necessary.

Michel Hugon (EC) provided a status of the P&T program in EC's EURATOM program. The objective of the EC research program is to provide a basis for evaluating the practicality, on an industrial scale, of P&T for reducing the amount of long-lived radionuclides to be disposed.

Pyrochemical Processes (salt/metal extraction and electrorefining) and aqueous processes (solvent extraction with innovative compounds) are being researched for removal of minor actinides. For transmutation, preliminary design studies for a European experimental ADS (cyclotron, linac) have been undertaken and associated safety and licensing issues are being considered. Uranium free nitrate fuel, thorium-plutonium oxide fuel, and innovative actinide-based oxide fuels are being researched for the ADS.

Peter Wydler (NEA) gave a brief overview of the NEA work on P&T. He described the main function of transmutation to convert highly toxic actinide and long-lived fission products to shorter-lived, less toxic fission products. A cost comparison study shows a cost increase of up to 25 percent (over costs of once through fuel cycle) for a 300 percent reduction in TRU if fast reactors are used. The ADR, on the other hand may cause a cost increase of 55 percent for only a 200 percent decrease in TRU. The difficulty of a true cost comparison was pointed out during the meeting, however, so these numbers should be considered very approximate. It was indicated that 99.9 percent of actinides have to be recovered for reducing the toxicity by a factor of 100. The Pu burning strategy (as MOX fuel) permits management of excess plutonium, but reduces the radiotoxicity of HLW by only a factor of about 5.

It was concluded that P&T must be considered as a long-term endeavor. It may be an important element in the future and may play an important role in technology selection, if nuclear remains part of the energy mix. A considerable amount of R&D will be needed before the new reactor and fuel cycle technologies could be deployed. Due to the long-term constraints for the introduction and phase out of the technology, the full potential of a transmutation system can be exploited only if the system is utilized for at least a hundred years. In any case, P&T is not an alternative to geologic repositories.

Pending Actions/Planned Next Steps for NRC

No policy issues for Commissioner's attention were identified during the trip. There are, however, topics that need management attention. These are:

- whether one or more NRC staff should review the Safety Case Brochure that will be received in January 2003 (recommend that at least one NRC and CNWRA staff member with performance assessment expertise, as well as one member of the public outreach team, review this document); the author intends to coordinate the collection of comments on this document for transmission to the NEA

- whether the report by the sorption forum should be reviewed (at a minimum, CNWRA staff will review, as they are participating in the modeling exercise)

- whether NRC and CNWRA staff should participate in the Clay Club Forum to be held on December 12–13 (do not recommend participation because there is little of interest or relevance to the current U.S. program)

- whether NRC and CNWRA staff should participate in the following workshops:

- AMIGO workshop on "Building Confidence Using Multiple Lines of Evidence" on June 3–5, 2003, (recommend participation)

- EBS workshop (details not known at this time—participation by a CNWRA staff member is planned in the Fiscal Year 2003 CNWRA Operations Plans)

- the workshop on "Management of Uncertainty in Safety Case: The Role of Risk" on February 2–4, 2004, (recommend participation); I had agreed to help the organizers develop the program for this workshop

- the workshop on geosphere stability, date undetermined (recommend participation)

Points for Commission Consideration/Items of Interest

No issues for Commission consideration were identified during this trip.

"On the Margins

None.

Attachments

A copy of the agenda, attendee list, and list of decisions and main outcomes are attached.

SIGNATURES:

Budhi Sagar
Technical Director

11/27/2002
Date

CONCURRENCE:

Gordon Wittmeyer, Manager
Total System Performance Assessment &
Integration Element

11/27/2002
Date

Wes Patrick
President

11/27/2002
Date

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Integration Group for the Safety Case (IGSC)

Convocation and Agenda for the 4th Meeting of the IGSC

Paris, 6-8th November 2002

English - Or. English

JT00133477

INTEGRATION GROUP FOR THE SAFETY CASE (IGSC)

Agenda
For the 4th Meeting of the IGSC

Paris, 6-8 November 2002

The fourth meeting of the Integration Group for the Safety Case will be held at the New building (OECD, Chateau de la Muette, and Room 5, 75016 Paris) on 6-8 November 2002.

The meeting will be chaired by Abe Van Luik and will start at 9 a.m. on the first day. It is scheduled to end at 12:00 on the last day.

English will be the working language.

The contact person, for arrangements and practical questions, is Suzanna Grant: suzanna.grant@oecd.org

Delegates participating are advised that the security arrangements in force at the building include the obligation to present an identity document bearing a photograph. This document will be requested at the time of issuing Delegates' cards for the meeting on first entry to the building.

REMARK: **In the first column of the agenda, the following letters are inserted:**

"I" means: information to the IGSC, no decision to be achieved

"D" means: decisions to be achieved at the end of the IGSC meeting

"R" means: recommendations to be made by the IGSC

DAY 1 - Wednesday 6 November 2002

9:00	**1.**	**Opening**		
	1.1	Welcome Introduction of new delegates	*A. van Luik, Secretariat*	
D	1.2.	Adoption of the Agenda Objectives of the meeting	*A.van Luik* *Secretariat*	NEA/RWM/IGSC(2002)10 NEA/RWM/IGSC(2002)11
D	1.3	Approval of the Summary Record of the second Meeting of the IGSC		NEA/RWM/IGSC(2001)8
9:30	**2.**	**Reports on NEA and RWMC Activities**		
9:30 **I**	2.1	The NEA and the RWMC *Progress to date*	*NEA secretariat*	NEA/RWM/IGSC(2002)4
9:40 **I**	2.2	Forum on Stakeholder Confidence: 1. *Outcomes of last workshop* *2. Next workshop*	*P. Flavelle*	Oral presentation
10:00 **I**	2.3	Peer reviews SAFIR 2: first feedbacks ANDRA 2001: Objectives OPALINOUS Clay: Objectives	*Organisation's representatives*	
10:40		***Coffee break***		
11:00	**3.**	**Status Reports on On-going and/or Completed IGSC Activities**		
I	3.1	FEP Data Base 1. Status	*B Rüegger*	NEA/RWM/IGSC(2002)11
R	3.2	TDB Project Next programme of work	*F. Monpean*	Room document
I	3.3	Sorption Project Status of the work	*B. Rüegger*	Room document
12:00		***Lunch***		

TOPICAL SESSION:

4 The potential impacts on repository safety from a potential P&T program.

See ANNEX 1

13:40		**Introduction ;**	*Chairman: J. Haderman*
		Objective of the TS, Introductory statement	
14:00	4.1	***Part A: National Strategies***	
		Speakers will have 30 minutes including 5 to 10 minutes for discussion after each presentation.	
I		French Strategies	*J.M. Cavedon*
I		Japan Strategies	*S. Kimura H. Umeki*
I		US Strategies	*A. van Luik*
15:30		***Coffee break***	
15:50	4.2	***Part B: Technical bases***	
		Speakers will have 30 minutes including 5 to 10 minutes for discussion after each presentation.	
I		EC project :	*M. Hugon*
I		NEA Project	*P. Wydler*
16:50	4.3	Discussion:	Chairman and rapporteur : *J. Wollrath*
R		Messages to be delivered.	
17:30		***Adjourn***	

Day 2 - Thursday 7 November 2002

	3.	**Status Reports on On-going and/or Completed IGSC Activities (continue)**		
9:00	**3.4**	**Handling of Time Scales Workshop**	*P. De Preter*	Proceedings
I		Presentation of the Outcomes		
9:40		**Presentation of the Spin Project**	*R. Stork*	Oral presentation
I		Final result		
10:00		***Coffee Break***		
10:20	**3.5**	**Clay Club:**		
R		Status	*P. Lalieux*	NEA/RWM/CLAYCLUB(2002)3
		Self-healing proposal		NEA/RWM/CLAYCLUB(2002)1
		FEPCAT		
	5.	**Recent IGSC Activities**		
10:40	**5.1**	**Geosphere stability :**		
D		Guidelines; series of workshops,	*A. Hooper*	NEA/RWM/IGSC(2002) 13
		1st workshop	*P. Lalieux*	
11:00	**5.2**	**EBS project**		
I		a.) the EBS project	*H. Umeki*	
I		b) Outcomes of the 1st workshop,	*A. Hooper*	Room document
D		c) Decisions for the future (series of workshops, topics, dates, and location.)		
11:30	**5.3**	**AMIGO**		
D		a.) Presentation of the foundation document	*K. Roëhlig*	NEA/RWM/IGSC(2002)9PROV
R		b.) Presentation of the 1st workshop		NEA/RWM/IGSC(2002)12
12:00		***Lunch Break***		

13:50 **R**	**5.4**	**Safety case Brochure** ▪ Presentation of the 1st Draft future steps ; ▪ Identification of the main issues ▪ Schedule for future tasks	*A. van Luik* *NEA secretariat*	NEA/RWM/IGSC(2002)15PROV
14:40 **I**	**5.5**	**IAEA safety requirements** How to support RWMC e.g. common subgroup (safety ad-hoc group + RWMC bureau?)	*P. Metcalf*	Draft of the IAEA document
15:00		***Coffee Break***		
	6.	**IGSC programme development**		
15:20 **D**	**6.1**	**Workshop on "Management of uncertainties in Safety Cases: Role of the Risk"** - objective and scope - topics - schedule	*B. Dverstörp*	NEA/RWM/IGSC(2002)14PROV
15:40	**6.2**	**Activities in the next 3 years**		
I/D		a.) Feedback of the last two years. Mandate still available?	*A. van Luik* *Secretariat*	NEA/RWM/IGSC (2000) 9
R		b.) areas that need to be improved (based on updating of NEA/RWM/IGSC (2000)10)		NEA/RWM/IGSC(2002)17
R		c.) new activities and priorities		
16:40 **D**	**6.3**	**Topical session of the 5th IGSC** -suggestions within scope and schedule		Oral presentation
17:00 **D**	**6.4**	**IGSC Website** (feedback , improvements)		
17:30		***Adjourn***		

DAY 3 - Friday 8 November 2002				
9:00	**6.**	**IGSC future work continued** (to allow members to add suggestions if necessary)		
9:30 D	**7.**	**Next Meeting: date/location**		
9:40 D	**8.**	**Election of two new members of the IGSC CG :** Replacing Doug Metcalfe and Gérald Ouzounian	*A. van Luik*	
9:50 I	**9.**	**Reports from Countries and International Organisations on matters of interest to the IGSC**		
I		*One report per country. Five minutes each. Oral presentations supported by a written text to be made available to all IGSC participants. (Ideally the texts are sent out to A. van Luik ahead of the meeting for inclusion in the IGSC web site).*	*National representatives*	Individual countries' texts
10:30		*Coffee break*		
10:50 I	**9.**	**Country Reports: continued**	*National representatives*	
11:30	**10.**	**Other Business**		
11:40 D	**11.**	**Closure of the meeting and synthesis of decisions**	*A. van Luik*	
12:00		*Adjourn and end of the IGSC meeting*		

ANNEX 1:

TOPICAL SESSION OF IGSC ON THE POTENTIAL IMPACTS ON REPOSITORY SAFETY FROM A POTENTIAL P&T PROGRAM.

At the 3rd plenary meeting of IGSC it was proposed to hold a Topical Session on "Potential Impacts of P+T on Long-term Waste Management and Disposal". The proposal has found the support of RWMC.

1. Rationale

Partitioning and transmutation is debated in many countries and possessing spent fuel and high level radioactive waste. Important projects are carried out in OECD countries, notably France, Japan and the USA. Within the Nuclear Fission Safety programme the European Commission is supporting several projects. It is anticipated that the contribution of the EC[1] will increase within the 6th Framework Programme.

P+T was evaluated in the seventies and not given priority on the basis of feasibility. It has been intensively taken up in the context of accelerator driven systems in the first half of the nineties. As a consequence of the historical development, R+D work takes place essentially in two different scientific communities with little overlap. And as it happens, the antagonism was considerable. In the meantime a realistic picture seems largely accepted: P+T will not make geological disposal superfluous but for some waste streams it has the potential to reduce lifetimes and volumes for geological disposal considerably on the long run, that is if nuclear energy is further developed in the future. P+T is also moving away from sole reliance on accelerator technology, and integrated fast reactors are being seen as potentially more powerful transmutation tools. Current research is focusing on making the partitioning processes more efficient.

Though the detailed work is being done in two communities different in their scientific and technical expertise, it seems advantageous to strengthen the interaction. It will help both sides to gain a balanced picture of the potential impact of P+T on geological disposal and to discuss in what directions future work will go.

2. Scope of a Topical Session

It should be emphasised that the topical session does not have the goal to present or discuss the technical details of potential future fuel cycles nor those of geological disposal. **The aim should be on the impact of future fuel cycles on geological disposal and on its pillars of safety in short and long-term performance.** Its theme is thus at the interface between P+T and waste management.

1. See reports: EUR 19614 EN on the "overview of the EU research projects on partitioning and transmutation of long lived radionuclides" and the EUR 19128 EN on the "Evaluation of Possible P&T strategies and of Means for implementing them".

Aspects that could be presented and discussed include the following:

- Impact on the time scale to be considered for the radioactive deep disposal:

  – Might we scale down from a very long-term period to a short or medium term?

- Impact on the radiotoxicity:

  – Which radionuclides are concerned by P&T techniques?
  – To what level are they removed from the waste stream?
  – What is the resulting inventory of P&T for disposal?
  – Which are key RN for deep disposal (high radiotoxicity, high uncertainties in knowledge, on their behaviour, high impact on some processes inside the deep disposal such as radiation, thermicity, criticality)?

- Impact on the amount of waste, nature of waste concerned by the P&T waste:
  – For which kind of waste does P&T seem to provide an interest? (ILW, vitrified waste, spent fuel, or potentially new waste forms)?
  – How can these technologies be applied to the wastes that already exist? What is the schedule regarding the process?
  – What type of secondary wastes, including amounts, will the P&T create?
  – Would one need new types of waste packages?

3. Use of this information in the waste management implementer and regulatory organisations

Participants in the IGSC may need to be able to answer the following types of questions in the future as the work on P&T matures:

- Impact on different scenarios (such as normal evolution and human intrusion):
  What are the changes in potential doses? Which are dominating radionuclides?
  Are there implication for other safety indicators?

- Implications for monitoring, and retrievability:
  What is the time schedule for waste treatment, is there any interest for going forward to a retrievability step after P+T?

- Implication on the step wise decision process:
  How could we address the various audiences that have concerns regarding disposal and P&T?
  Is it necessary to present the P&T waste stream in a safety case, perhaps as part of making a comparison between potential new technology scenarios, as part of an argument for building confidence?

- Impact on the various hazards/risks that need to be considered in a safety case (and not only the dose calculation):

  For which kind of risk will P&T have an impact including short and long-term risks (such as critical aspects, gas formation, short-term radiation, and temperature...)? What worker and public risks from handling and transportation are added by the pre-disposal activities introduced by P+T?

- Impact on the reduction of uncertainties:

  Even if P&T would not reduce the dose, could we say that the uncertainties would decrease given the fact that we will reduce the duration of the long-term disposal (geosphere stability, uncertainties on actinide behavior.)? How about short term risks due to potential increase in radioactive inventory? How do risks from handling and transportation at the repository compare for waste streams with or without P+T? Do we reduce/increase the uncertainties? On which time frame?

4. Participants

As the previous topical session that took place at the previous IGSC plenary meeting, the audience of this topical session should consist of:

The IGSC members with a selected and limited representation of P&T community coming both from NDC (Phase 2 P+T systems study) and from EC. These persons could take mainly in charge the areas 2.1 as described above. The advantage from bringing in these selected experts would be to allow a limited, preliminary dialogue between the P&T and disposal communities.

5. Programme

The programme of the topical session will have presentations addressing the following points while keeping in mind the questions asked in section 2, above:

- General aims of P+T.
- Present status of P+T and its projected impacts on inventories and geological disposal.
- This would constitute the main part of the session and could include the following topics: Decision making bases and decision making process, Effects on design, size and type of repositories, Impact on confidence building process.
- Overview of EC activities + presentation of the new NEA/NDC studies.
- Main factors in recent safety evaluations of geological disposal and relevant open questions (in view of waste forms and inventories from P+T) such as Impact on P.A. indicators; values, uncertainties; Adequacy of current P.A. methods.
- New R&D needs.

The presentations should give the necessary background for a discussion that will be organised as a platform in order to provide decisions on potential future work in this area: a continued relationship between the two communities through the IGSC perhaps. An IGSC recommendation for future interactions is to be deliberated within the IGSC and delivered to the RWMC.

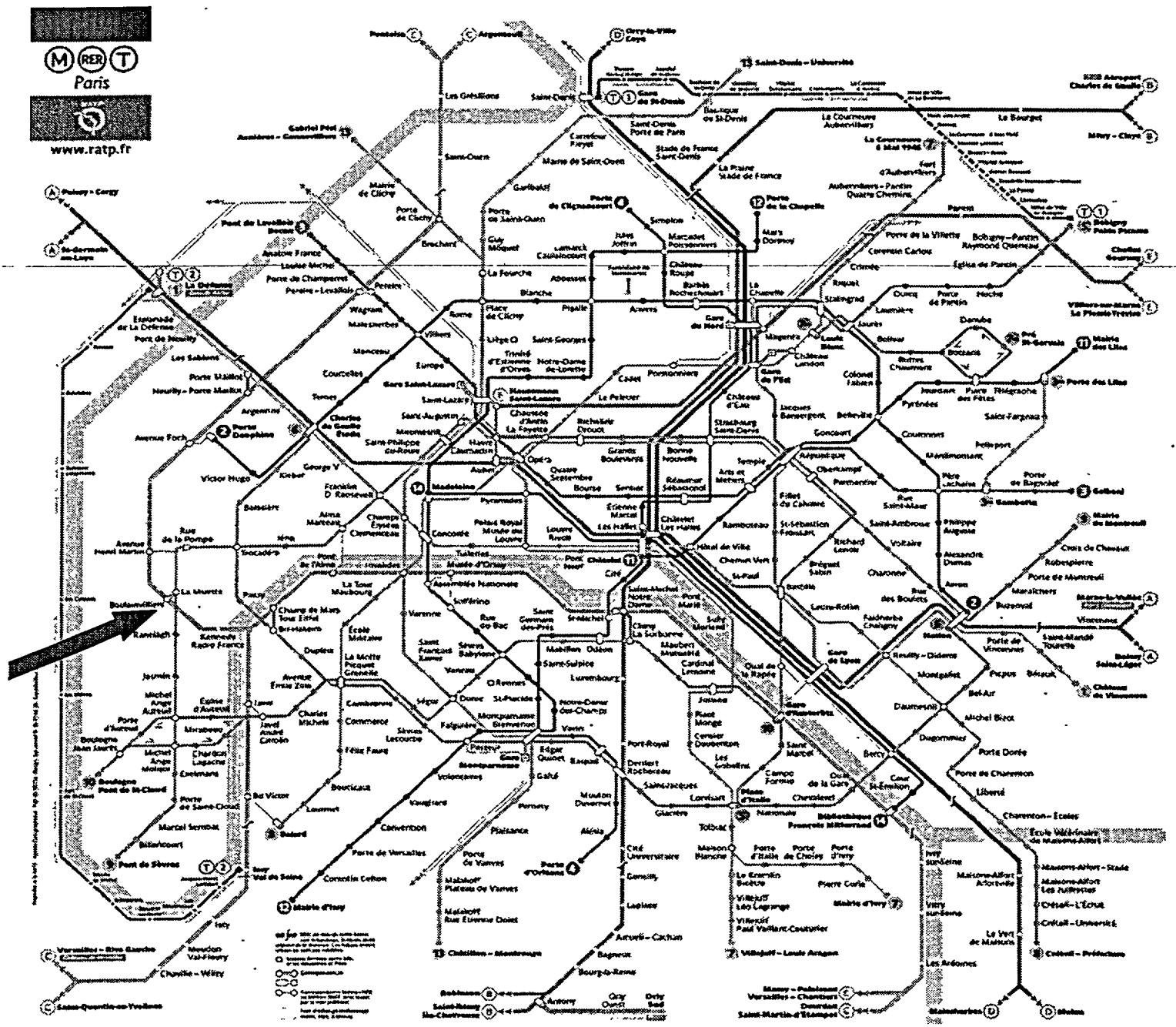
6. Deliverable

The outcomes of this topical session will be put into a general distribution document as it was done for other topical sessions of the IGSC. In addition, as noted above, a table document reflecting IGSC views and recommendations is to be made available to the RWMC, and will be used to support an oral report to the next scheduled meeting of the RWMC.

Support documents for the 4th IGSC plenary meeting

ITEM	IGSC ACTIONS AT THE 4TH IGSC MEETING	SUPPORT DOCUMENT	SCHEDULE
Item 1. Opening	❑ Information	❑ NEA/RWM/IGSC (2002)10 ❑ NEA/RWM/IGSC(2002)11 ❑ NEA/RWM/IGSC (2001)8	❑ By early October ❑ By end October ❑ Available
Item 2.1 RWMC activities	❑ Information	❑ NEA/RWM(2002)4	❑ Available
Item 3.1 FEP data base	❑ Information	❑ NEA/RWM/IGSC(2002)11	❑ By end of October
Item 3.2 TDB Project	❑ Recommendations on phase III	❑ Room document	❑ By the meeting
Item 3.3 Sorption project	❑ Information	❑ room document	❑ By the meeting
Item 3.4 Handling of timescales in assessing post closure safety	❑ Information on last workshop ❑ Recommendations on future work	❑ NEA/RWM/IGSC(2002)16 ❑ NEA Proceedings	❑ Available ❑ As soon as possible
Item 3.5 Clay Club	❑ Information and recommendations	❑ NEA/RWM/CLAYCLUB(2002)1 ❑ NEA/RWM/CLAYCLUB(2002)3	❑ Available ❑ by end of October
Item 4 P&T Topical session	❑ Recommendations: messages to the RWMC	❑ NEA/RWM/IGSC(2002)XXX	❑ After the IGSC plenary meeting
Item 5.1 Geosphere stability	❑ Decision: Agreement on the foundation/ ❑ Recommendations on the first workshop	❑ NEA/RWM/IGSC(2002)13	❑ Available
Item 5.2 EBS project	❑ Decision: Agreement on the series of workshop, ❑ Recommendations on the next workshop	❑ room document	❑ By end October
Item 5.3 AMIGO	❑ Decision: agreement on foundation document ❑ Recommendation on the first Workshop	❑ NEA/RWM/IGSC(2002)9/PROV ❑ NEA/RWM/IGSC(2002)12	❑ Available
Item 5.4 Safety case brochure	❑ Recommendation on the draft ❑ Decision on the future work	❑ NEA/RWM/IGSC(2002)15/PROV	❑ By end October
Item 5.5 IAEA safety requirements	❑ Recommendations	❑ Draft report	❑ By end October
Item 6.1 Management of Uncertainty in Safety Cases	❑ Decision: Agreement on the workshop	❑ NEA/RWM/IGSC(2002)14/PROV	❑ By end October
Item 9 Country reports	❑ Information	❑	❑ Distribution at the meeting

Remarks: all documents are or will be posted in the IGSC web site under the section meeting into the third meeting table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NEA/RWM/IGSC(2002)19

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

19-Nov-2002

English - Or. English

NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

NEA/RWM/IGSC(2002)19
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Integration Group for the Safety Case (IGSC)

LIST OF DECISIONS AND MAIN OUTCOMES OF THE TOPICAL SESSION OF THE 4th IGSC MEETING

Meeting held in Paris, France on 6-8 November 2002

English - Or. English

JT00135512

Integration Group for the Safety Case

LIST OF DECISONS AND MAIN POINTS OF INFORMATION

- Agenda was adopted
- Minutes of third IGSC meeting were adopted
- NEA Activities report- Next RWMC meeting in March 2003

Peer reviews

- SAFIR 2 on its last phase, report expected in January 2003
- ANDRA 2001 first orientation meeting, week of 11 November, a review to primarily address methodology
- OPALINUS Clay will start about April 2003

FEPs Database

- version 2 of database should be available by Summer 2003, to include either BENIPA or FEPCAT, and the new SKI FEPs database
- No recommendations for change were made by IGSC

TDB

- Phase II progress was noted, most reports to be available by end of 2003
- No recommendations for change were made by IGSC
- Phase III planned for next 3 years, to start January 2003
- Recommendation to not forget the interface between TDB and its users through either courses or workshops
- Actions: comments on Phase III due to secretariat by the end of November 2002

SORPTION

- Progress was noted - First workshop week of 1 November 2002 on results of benchmark exercises, report to be provided by the Summer of 2003
- Recommendation: IGSC recommended that the Management Board consider providing advanced drafts of report to IGSC members

Handling of Timescales

- Progress was noted
- Satisfaction expressed on outcome of workshop
- The IGSC recommended the PC to continue the work it has recommended be done as an ad-hoc group, and not to be in a hurry so as to be able to take advantage of expected results from ongoing initiatives: presentation at next IGSC
- Need to have PC members and new volunteers reconfirm, via email, their willingness to participate in the ad-hoc group to plan further work

Clay-Club

- Next Clay Club on week of Argillaceous Media Forum (12-13 December 2002) to gain benefit from participation in the Argillaceous Media forum
- Progress was made on FEPCAT and catalogue
- No recommendations for changes in planned work from IGSC

Geosphere Stability

- IGSC agreed with guidelines
- First workshop proposal agreed with (in Clay Club workshop, date not yet fixed)
- Need to confirm IGSC member of the PC (Alan Hooper, DOE representative?)

EBS Project

- Compilation of answers to questionnaire provided good baseline
- Open for additional answers until 20 November 2002
- Joint NEA-EC compilation report by end of 2002
- First workshop planned subsequent workshops, IGSC in agreement with proposal

- Proceeding of first workshop in 2003 (need final inputs from presenters and rapporteurs soon)
- PC members of first workshop to serve as Steering Group
- Next workshop date and location to be fixed (Finland host? To be confirmed)

AMIGO

- Foundation document presented and agreed to by IGSC
- First workshop approved, already defined but needs planning to be completed
- No detailed proposals for subsequent workshops at present, to be done after the first workshop
- Funding to be confirmed for first workshop (arrangement has been made between host [NAGRA] and NEA), needs definition for subsequent workshops
- IGSC needs to nominate contact persons by end of November 2002 [to be used by steering group in organising workshop]

Safety Case Brochure

- First re-draft by end of January 2003, to be provided to RWMC Burea and IGSC
- Comments from IGSC and RWMC Bureau by end of February
- New draft to be presented to RWMC in March 2003
- RWMC comments to be made into final draft submitted to IGSC
- Final agreement at 5th IGSC meeting
- Input from Timescale Worskhop, Peer Reviews, IPAG 3, EBS workshop and IAEA draft standard to be taken into account

IAEA Safety Requirements

- Comments to be sent by end of November 2002 to Abe Van Luik and Sylvie Voinis for collation and forwarding to RWMC
- Compilation to be provided to all IGSC members

Managing Uncertainty

- Support for a workshop in early 2004

- Additional Program Committee members to be confirmed (GRS-Cologne, NAGRA and US DOE representatives)

Foundation Document

- To be updated after this IGSC meeting
- Please comment on criteria for priorities be end November 2002

IGSC Website

- Proposal to transfer its maintenance to the NEA positively received
- End of December 2002 goal for transfer

Next IGSC

- Mid-October 2003, week of the 15th, venue to be determined

Topical Session on P&T

- Summary to be provided to IGSC for information and RWMC for comment
- Proceeding to be published as GD document, need final input from two of the presenters

Topical Session for 5th Meeting of IGSC

- Three proposals made
- Waste form modelling including transient phase and monitoring issues (to be addressed on website, see below)
- Priority 1: Observations regarding the safety case in recent Peer Reviews on safety assessment studies, plus final Safety Case Brochure discussion and approval
- Safeguards design requirements (no support expressed)
- Site selection criteria (no support expressed)
- Proposal for a virtual topical session: First one to be on waste form modelling approaches, references and data needs, to be posted on website, US will make first contribution by December 2002, ask for others to do same, then online posting of comments and questions and responses

MAIN OUTCOMES OF THE TOPICAL SESSION ON "POTENTIAL IMPACTS ON REPOSITORY SAFETY FROM A POTENTIAL P & T PROGRAM"

P + T will not eliminate the need for geologic disposal but has the potential to reduce volume, radiotoxicity and heat production of highest activity wastes.

P + T shows potential only if nuclear energy generation is continued beyond the middle of this century and a commitment to reprocessing is made.

Design studies and small-scale experiments have led to progress in P + T. The topical session could give only a rough overview. The potential increase, and the radiological consequences, of LLW and ILW have not been specifically addressed.

From the IGSC point of view no showstoppers for the new reactor concepts appeared. On the other hand from the IGSC point of view there is not sufficient information on new waste types, on their characterisation and especially on their long-term behaviour and in-situ performance. Characterisation programmes should be started in due time if necessary.

Few, if any, full system studies have been performed to get the full picture, including costs. From the IGSC point of view it is necessary to perform comprehensive systems studies and not to restrict the considerations to inventories and heat production of the highest activity waste, if one is to understand the implications of introducing this technology in the future including from a societal viewpoint.

Suggested interaction between RWMC and NDC is highly appreciated on the last two points.