

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: International Conference on Geologic Repositories (20.01402.158)

DATE/PLACE: October 31–November 3, 1999; Denver, CO

AUTHOR(S): Budhi Sagar

ATTENDANCE: Participants came from 23 countries—see attendance list; Secretary Bill Richardson, Undersecretary Ernie Moniz and Denver Mayor Wellington Webb were present in some of the sessions. Commissioner Dicus and Bill Reamer from the U. S. NRC also attended the meeting.

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BACKGROUND AND PURPOSE OF TRIP:

The International Conference on Geologic repositories was proposed by Mr. Richardson, Secretary of the U. S. Department of Energy (DOE) in a statement at the International Atomic Energy Agency (IAEA) in September 1998. The object of the conference was to discuss international cooperation and sharing of information regarding geologic repositories.

No handout or papers were distributed at the meeting, so the following description is based on my sketchy notes and the actual words and phrases used by the various speakers most likely were different than those used in this report.

DESCRIPTION OF CONFERENCE:

In his opening address, Secretary Richardson emphasized the importance of working together at the international level by developing a common strategy and by sharing ideas so that the mission of protecting public health and safety could be accomplished. He said that 150,000 metric tons of spent fuel has accumulated around the world and that it must be managed safely. The U. S. is committed to a once-through commercial fuel cycle, but some of the wastes in the U. S. will require special treatment. He called the geologic repository the corner stone of the U. S. strategy for management of spent fuel and high-level wastes. Mr. Richardson reiterated the U.S. position regarding (i) full commitment to environmental protection, (ii) full disclosure, and (iii) a decision on Yucca Mountain based on sound science and not on politics. He cited the rate of water movement through the repository block as the main point of study at the Yucca Mountain site. The DOE is currently on schedule to meet its commitment to complete Site Recommendation by the summer of 2001. The DOE is simultaneously researching the transmutation technology; the knowledge gained will be shared with others. A joint declaration by countries attending the conference regarding cooperation on geologic repositories was developed a day before the conference began.

Dr. Evgeny Adamov, Minister of the Russian Federation for the Atomic Energy advocated that a geologic repository should be built only for nuclear waste and not for spent fuel, which should be processed for reuse. He was in favor of breeder reactors and closed fuel cycles in which a balance can be achieved between the initial and final activity. He said that the existing technologies were non-optimal for civilian power

production because these were derived from military technology. He emphasized the special responsibilities of the U.S. and Russia towards non-proliferation and management of the fuel cycle.

The Director-General of IAEA, Dr. El Baradei foresaw a decreasing share of nuclear power in the next 20 years, even though this is a clean and sustainable source of power. He cited economic non-competitiveness, nuclear waste problems, public non-confidence, and potential military misuse as contributing to the decreasing share of nuclear power. He described the role of IAEA vis a vis geologic repositories; this role included the joint convention on nuclear waste and the IAEA reviews of several national repository programs. The IAEA sponsored conference in Cordoba, Spain, in 2000 was billed as a follow-on to the Denver conference.

Peter Nygard, President of SKB, provided a status of the waste program in Sweden, which depends on nuclear for about 50% of its power needs. He said that the Swedish KBS-3 concept of using multiple barriers, built-in retrievability options, and gradual implementation—including consultation with all affected parties—was found to be satisfactory. Sweden plans to use its CLAB interim central storage facility for 30 years before moving the spent fuel into the repository. Sweden plans to use its Aspo underground laboratory to carry out full scale tests of some of the new technological concepts such as encapsulation. He estimated the total cost of the waste disposal program (canister manufacturing, encapsulation plant, and repository) to be about SEK 20 billion (about 3 billion US dollars). Sweden plans to conduct preliminary characterization of at least two sites by 2008 before selecting a site for detailed characterization and evaluation by 2015. The repository will be operated for 20–30 years and closed by about 2040. He emphasized the principle that each country should be responsible for its own waste (thus negating the idea of international repositories) and that the nuclear waste must not be allowed to become a commodity to be traded.

Dr. Berndt Reiner-Martens, Scientific Director, German Federal Ministry of Environment presented the most pessimistic picture of the future of nuclear power. He said that according to their estimate, the cumulative risk of a large accident (one such accident costing several trillion German marks) in fifty years assuming 20 operating power plants was about 1%, which was too large to be acceptable. In Germany, an argument has been advanced that this risk can be reduced by an order of magnitude through technical improvements but the German safety authorities are unable to accept such arguments in the absence of evidence. Therefore, a decision has been made to phase out nuclear power in Germany. Dr. Reiner-Martens cited many reasons for not accepting geologic repositories, which included lack of measurable safety indicators, problem of possible criticality, inefficient barrier characteristics, and very high costs. Germany will also prohibit all reprocessing as it is deemed to not have any economical value. The policy of the current German government is to stop any further exploration at the Gorleben site and look for one “best” site for a repository.

Mr. Akio Morishima, Professor of Law at the Sophia University in Japan stated that nuclear contributed 30% of Japan’s power supply and that Japan will continue to depend on this source of power. Japan will continue its research and development effort in Fast Breeder Reactors. Japan also plans to continue to reprocess its spent fuel. He opposed the idea of an international repository and stressed that every country must take care of its own waste. Regarding high-level waste, Japan’s plans are to vitrify the waste and cool it for 30 - 50 years before disposal in a repository. The current estimate of costs range from 2700 to 3100 billion yen. The current schedule is to begin operation of a repository in the mid 2040s. An implementing agency is expected to be established in 2000.

Dr. John Holdren, Professor at the Kennedy School of Government, Harvard University discussed the issue of non-proliferation with respect to the geologic repositories. His conclusion was that the danger of theft of spent fuel from closed repositories was minimal. Danger of theft was greater during the retrievability period

(easier the retrievability, greater the danger of theft). However, much greater proliferation risks were associated with the decision to process the spent fuel because once the plutonium was separated, it presented a much more attractive target for theft.

Commissioner Dicus of the U.S. NRC spoke about the role of the regulator in licensing a geologic repository. She stated that the NRC remains convinced that a geologic repository is appropriate for managing spent fuel and high-level waste. The regulator is completely independent of the implementor and is charged with developing and implementing appropriate regulation to assure protection of public health and the environment. She described the current NRC emphasis on risk informed and performance based regulations. She also emphasized the NRC efforts to obtain more complete openness of the licensing process through greater public scrutiny and involvement.

Mr. Y. Le Bars, president of ANDRA, also opposed the concept of an international repository. With respect to waiting for future advances, he said that we should not gamble with the future and not leave the waste problem to the future generations to solve. He wanted the repository concept to have flexibility to allow future generations to intervene if they wanted to, but the design to be such that future generations are not obliged to intervene. Thus, he advocated adopting the safest solution right now without waiting for future advances. In France, separation and transmutation are also being studied. He also suggested that the "memory" of the repository be increased through well distributed archives and preservation of a technical and scientific culture.

Dr. Tom Cochran of the Natural Resource Defense Council reviewed the history of the high-level waste program in the U. S. starting with the initial suggestion in 1957 of using salt domes for disposal. In the process, he commented on various delays in developing the regulatory framework, some of the credit (blame?) for which was given to the NRDC and the EPA, which agency he said moved very slowly indeed. He expressed his view that the licensing process was not integrated (no elaboration on this point.) He was firmly against transmutation. Commenting on Commissioner Dicus's earlier presentation, he said that while the U.S. NRC was indeed quite open in soliciting public comments, it did not have an adequate process to consider such comments. Compared to Japan and Russia, he said the process was infinitely more open (this didn't please the Japanese whom I happened to talk to at lunch).

Dr. Steven Brown of the U.K. Department of the Environment (DoE) provided a status of the program in the U.K. The U.K. government is currently developing a response to the recommendations from a Select Committee of the House of Lords. Early next year, the government will initiate a major review of the entire waste program as recommended by the committee.

Dr. Moniz, Under Secretary of the U.S. DOE reviewed the progress made in the U.S. Repository program. He lauded the success of the Waste Isolation Pilot Project (WIPP). He said that performance assessment modeling was the main tool in obtaining the certification for WIPP. A lesson learned from WIPP was also that articulation of science to the public took time and patience. He also acknowledged the value of international peer reviews; citing one such review of WIPP. He said that 16 years of technical work on Yucca Mountain was presented in the Viability Analysis (VA). A DOE Panel has been created to assure that decisions are based on science and engineering. He claimed the Yucca Mountain site to be the best characterized because of 16 years of work. Rate of seepage is the major issue and he said that according to the most recent information, the seepage rate is less than that used in the VA . He said that the selected design features (e.g., lower heat load, drip shields, and backfill) will reduce uncertainties and decrease the probability of common-cause failure. The design is flexible, incorporates options such as ventilation powered by solar panels, and allows future generations the opportunity to make decisions for hundreds of years. He

said that the regulatory standard for Yucca Mountain should be site specific and flexible as some uncertainties may take decades to resolve during the performance confirmation period. He asked for input from the international community on the question of "how much is enough" suggesting that much higher confidence will be required at the time of closure than at the time of beginning construction.

Mr. Reamer and I attended the panel session on "Technical Framework for Assessing Repository Safety/Performance," which was chaired by Arnold Bonne of the IAEA and cochaired by George Basabilvazo (USA-WIPP). Panel members were Sumio Mesuda (Japan), Piet Zuidema (Switzerland), Tonis Papp (Sweden), Alan Hooper (UK), Juhani Vira (Finland), Claudio Pescatore (NEA), and Robert Andrews (Duke Engineering and M&O). Each panel member was asked to address the key issues of (i) approach to defense-in-depth, (ii) treatment of uncertainties, (iii) approach to setting an overall performance standard, and (iv) identification of breakthrough technical advances. However, all the panel members spent the time available to them providing a status of the performance assessment activities of their respective programs. There was agreement among the participants that defense-in-depth was an essential principle that has to be included in repository design, although there was not a common understanding of its meaning; there being a range from redundancy to robustness, a term that was often used, but not defined. It was also argued that robustness of the actual repository system and of the safety case were both important. A large amount of discussion dealt with difficulty of communicating with diverse audiences such as the public, politicians, regulators, and technical peers.

Lake Barrett (U.S. DOE) closed the meeting by again emphasizing the role of international cooperation and information sharing in successful implementation of repository programs. He said that the collective mission of the international community was to protect health and assure safety of the present and future generations. While the need for a geologic repository is clear, he advocated abandoning 'technical arrogance' and leaving room for future generations to make subsequent decisions by incorporating retrievability into the design. He emphasized the importance of public acceptance and cited the success of Finland as an example. He also said that "doing it right" is necessary but not sufficient as those involved must also "appear to be doing right." He said that before international repositories can be considered, each country must first attain success at the national level. He ended by praising the "world class science" currently being employed at the Yucca Mountain project and also took great pride in the success of the WIPP project, which involved 25 years of hard struggle.

PROBLEMS ENCOUNTERED:

None.

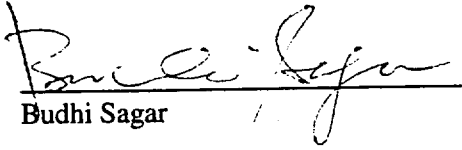
PENDING ACTIONS:

None.

RECOMMENDATIONS:

None.

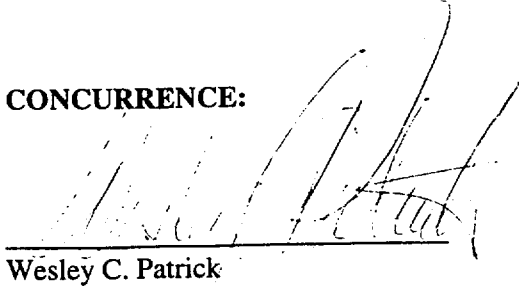
SIGNATURES:



Budhi Sagar

11/29/05
Date

CONCURRENCE:



Wesley C. Patrick

11/29/05
Date

CONFERENCE AGENDA

INTERNATIONAL CONFERENCE ON GEOLOGIC REPOSITORIES OCTOBER 31 – NOVEMBER 3, 1999

“Geologic Repositories: Facing Common Challenges”

Sunday, October 31, 1999

6:30 pm **Evening Welcome Reception at the Marriott City Center**

Monday, November 1, 1999

7:30-4:00 **CONFERENCE CHECK-IN**

7:30-9:00 **Continental Breakfast**

9:00-9:15 **OPENING and WELCOME REMARKS**
Dr. Ernie Moniz - Opening Remarks
Mayor Wellington Webb - Welcoming Remarks

9:15-9:40 **KEYNOTE ADDRESS: U.S. DOE SECRETARY RICHARDSON**
The Emerging Nuclear Era—Confronting the Challenges
The keynote address will expand on Secretary Richardson's September 1999 statements at the IAEA General Conference in Vienna. It will emphasize geologic disposal activities including the success at the Waste Isolation Pilot Plant in New Mexico, and the characterization of a potential repository at Yucca Mountain in Nevada, highlighting the connection to non-proliferation, safeguards, security, and transparency.

9:40-10:05 **Promoting International Cooperation In the Final Disposition of Nuclear Materials**
(E. Adamov, Russian Federation)

10:05-10:45 **Break**

10:45-12:30 PLENARY SESSION I - “GEOLOGIC REPOSITORIES: GLOBAL PERSPECTIVES”

Chair: J. Roberson, U.S.

10:50-11:15 **The IAEA Perspective on Geologic Repositories (Dr. ElBaradei, IAEA)**

11:15-11:40 **Sweden's Long-Term: Commitment to Nuclear Waste Management: Overview of Swedish Repository Program and of the Public Process for Site Selection (P. Nygard, Sweden)**

11:40-12:05 **A Changing Paradigm: The German Repository Program (B. Rainer-Martens, Germany)**

12:05-12:30 **Safety and Public Acceptance of Repositories in Japan (A. Morishima, Japan)**

- 12:30-2:00 **Lunch**
- 1:00-1:30 **Lunch Speaker: International Collaboration in Radioactive Waste Management (Dr. Echavarri, NEA)**

2:00-5:40	PLENARY SESSION II – “INTERNATIONAL POLICY AND STANDARDS: BUILDING INTERNATIONAL CONSENSUS”
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Global Safety, Safeguards, Security and Transparency in the Emerging Nuclear Era

Chair: C. Shank, U.S.

- 2:05-2:30 Non-Proliferation Aspects of Geologic Repositories (**J. Holdren, U.S.**)
- 2:30-2:55 The Role of the Regulator in Gaining Public Confidence (**G. Dicus, NRC Commissioner**)
- 2:55-3:20 Building Trust on Nuclear Proliferation and Safety Issues (**J. Goldemberg, Brazil**)
- 3:20-3:35 **Break**

Intergenerational and Environmental Issues

Chair: J. Turner, U.S.

- 3:35-4:00 Acting Today with Due Respect for the Future (**Y. Le Bars, France**)
- 4:00-4:25 The Status of China's Research on Geologic Disposal of High Level Radioactive Waste (**P. Xu, China**)
- 4:25-4:50 Environmental Views on the Geologic Disposal of Nuclear Materials (**T. Cochran, Natural Resources Defense Council**)
- 4:50-5:15 Repository Technologies in the Next Millennium (**A. Colino, International Association for Environmentally Safe Disposal of Radioactive Materials**)
- 5:15-5:40 Issues and Challenges in the New Millennium (**S. Brown, United Kingdom**)
- 5:45-6:00 Closing

Tuesday, November 2, 1999

7:00-12:00 **CONFERENCE CHECK-IN**

7:00-8:00 **Continental Breakfast**

8:00-9:30 **PLENARY SESSION III – “EXPERIENCES IN THE DEVELOPMENT OF GEOLOGIC REPOSITORIES”**

Chair: J. Owendoff, U.S.

8:10-8:40 Technical Issues Associated with Geologic Disposal (N. Laverov, Russian Federation)

8:40-9:10 Scientific Basis of the U.S. Repository Programs (E. Moniz)

9:10-9:25 **Break**

9:30-1:00 **CONCURRENT PANEL DISCUSSIONS:** (Panel presentations with follow-on facilitated discussion with all Session attendees)

Session A: Underground Research Facilities: Enhancing Public Confidence for Geologic Repositories

Underground research facilities are essential for the evaluation of the hydrological, thermal, mechanical, chemical, biological characteristics and coupled processes that control the long-term performance of geologic repositories. This session will explore current and proposed efforts in the development of underground research facilities with the goal of identifying and stimulating international cooperation that will enhance understanding of the technical and socioeconomic factors associated with the siting and long term performance of a repository.

Session B: Impacts of Fuel Cycle/Waste Form on Repository Development

This session will examine how variations in the waste type that will be dispositioned within geologic repositories will impact the repository development process. These variations result from long-term storage, reprocessing, accelerator transmutation of waste, direct disposal, and other alternatives. The session will deliberate issues and considerations that may result from implementation of these alternative approaches along with the potential impacts on long term safety and cost. The goal of this session will be an agreement, in principle, on the variety of valid disposal forms and the implication of each for geologic disposal.

Session C: Technical Framework for Assessing Repository Safety/Performance

This session will compare and contrast the repository programs of several nations in order to identify technical areas of common interest for assessing repository safety. The goal of this session is to promote international technical cooperation in repository safety assessment research that will benefit those nations with existing or planned repository programs.

Session D: Safeguards, Security, and Transparency Monitoring of Nuclear Materials in Repository Systems: The Role of International Collaboration

This session will provide a basis for developing internationally accepted principles, practices, and technologies for the safe, secure and transparent disposition of defense and civilian nuclear materials. The goal of the session is to provide a forum for key non-proliferation and safeguard issues as they relate to the disposition of nuclear materials in deep geologic repositories.

1:00-2:30 **Lunch**

1:30-2:00 **Lunch Speaker:** Siting of a Spent Fuel Repository in Finland: Progress Through Long Term Objectives and International Collaboration (**V. Ryhanen, Finland**)

2:30-4:00	PLENARY WRAP-UP: REPORTS FROM BREAKOUT SESSIONS COMMENTATORS FROM SESSIONS A, B, C, D
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Chair, L. Barrett, U.S.

4:00-4:30 **Break**

4:30-5:00 **CLOSING STATEMENT**

6:00 pm **Closing Reception**

Wednesday, November 3, 1999

Optional tours of the Waste Isolation Pilot Plant (WIPP) in New Mexico and Yucca Mountain in Nevada

***DOE International Conference on Geologic Repositories
October 31 - November 3, 1999
Registered Participants***

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