U.S. NUCLEAR REGULATORY COMMISSION FOREIGN TRIP REPORT

Subject

Staff Participation in a European Commission (EC) Workshop on Design and Assessment of Packages for Radioactive Waste

Dates of Travel and Countries/Organizations Visited

Sponsored by the EC, Joint Research Center, Institute for Energy, Petten, The Netherlands, November 21-22, 2006 in Bergen, The Netherlands

Author, Title, and Agency Affiliation

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Background/Purpose

This was the second workshop on radioactive waste packages. At the first EC workshop (October 2005), participants from European Union countries, Japan and U.S. agreed to share information on ongoing research and development and best practices for the design and assessment of packages for radioactive waste. A desired outcome for this second workshop is to identify and plan international collaboration work.

At the workshop, Dr. Ahn: (i) presented an invited paper on "Issues in the Licensing Review of the Potential Yucca Mountain (YM) Repository: Container, Cladding and Waste Form;" and (ii) reviewed papers and participated in panel/group discussion on container/canister, waste form, and cladding. Dr. Ahn also participated in the planning of potential guidance documents and collaboration test work. The information shared at the workshop may be relevant to the safety analysis associated with the operation and the performance for waste isolation of the potential YM repository.

Abstract: Summary of Pertinent Points/Issues

Participants shared information on: (i) long-term design and performance of waste packages (WPs), waste forms and cladding; (ii) fabrication, welding and nondestructive evaluation of WP/canister; and (iii) mechanical (e.g., drop) behavior of WP/canister. Also, potential international collaboration work was identified and planned. Participants discussed development of guidance documents for packaging radioactive waste, jointly with the International Atomic Energy Agency (IAEA), the Organization for Economic Cooperation and Development (OECD)/Nuclear Energy Agency (NEA), and other consensus standardization organizations such as the International Standardization Organization (ISO) or American Society for Testing and Materials (ASTM). Participants also discussed and planned collaboration test work for the packaging.

Discussion

- Long-Term Design and Performance of WP: The Swedish high-level waste (HLW) repository program is currently under licensing review. This is also a joint work with Finland. H. Hänninen of Finland reviewed the design and performance of the engineered barrier system and the environmental conditions associated with the climate change. The licensing review questioned whether all features, events and processes have been properly considered.

H. Asano of Japan presented progress made in evaluating the long-term integrity of the closure weld of the carbon steel container. In addition to the previous fracture mechanics approach, potential corrosion-assisted mechanical failure was also considered. C. De Bock of Belgium presented progress made in the super container of carbon steel, controlling the environmental conditions (e.g., pH) by surrounding the container with a concrete buffer. Pavel Rüzicka of the Czech Republic presented the transportation and storage system of research reactor spent nuclear fuel (SNF) from 16 sites mainly in Eastern Europe. The packages will be transported next year to a Russian central storage site about 6000 km away.

- Welding and Fabrication: The subjects discussed include nondestructive testing (NDT) and acceptance criteria approach based on damage tolerance analysis and international standards in cast iron insert (Sweden), final closure weld methods in carbon steel (Japan), proficiency test by gamma systems in waste drums (The Netherlands), and various NDT techniques for detecting cracks and the use of standards and guides (United Kingdom).

- Drop Test: Bundesanstalt für Materialforschung und-prüfung (BAM) of Germany presented drop test results of bare casks. The tests were conducted mostly at 9 m and sometimes at 27 m. The analysis of the test results took two approaches of plastic collapse and fracture mechanics. The analysis results were discussed with respect to the IAEA requirements of cask drop and presented BAM guidelines for the safety assessment of casks. They also presented future test plans of bare WP/canister.

- Information Exchange and Collaboration Work: Most participants desired more information exchange and collaboration work. Smaller countries expressed this need more urgently. The participants have recommended knowledge transfer, initially as EC projects. The needs may include bibliographies, seminars or training. The participants also discussed more specific collaboration test work on high burnup cladding, radionuclide source term and WP/canister drop.

- Development of Guidance Document: Basic information on the methodology would benefit most participants in assessing the performance of SNF, cladding, and container/canister in long-term geologic time periods. More specifically, participants discussed development of guidance documents on WP corrosion, radionuclide source term, and cladding performance. The development of such guidance documents would be conducted with IAEA, OECD/NEA and other consensus standardization organizations such as the ISO or ASTM. The development may begin with existing general or related international standards/guidance.

- New Consideration in Interim Storage: The interim storage of WP/canister may impose additional requirements, if the interim storage time is extended (e.g., up to 300 years). WP/canister may need to be corrosion resistant for a longer period of time.

- Low-Level Waste: Concerns for low-level waste WP/canister are less significant compared with HLW WP. Efforts should be more focused on HLW WP/canister.

Pending Actions/Planned Next Steps for U.S. Nuclear Regulatory Commission

A third workshop is planned for next year to discuss details of the guidance development and the collaboration test work. The collaboration work may involve the Office of Nuclear Material Safety and Safeguards, and the Office of Nuclear Regulatory Research. In the mean time, a few expert groups will continue to have dialogue on the guidance development and collaboration test work throughout the year. Continued U.S. Nuclear Regulatory Commission (NRC) participation in this activity is recommended.

Points for Commission Consideration/Items of Interest

It is noted that Dr. Ahn's presentation engendered a letter from the State of Nevada objecting to the information presented. Dr. Ahn presented information that has been publicly available for several years. Staff is currently preparing a response to the State's Letter. Also, potential collaboration work with EC, IAEA, OECD/NEA and others may be of interest to the Commission.

Attachments

1. Final Program of the Workshop

2. Guide to Website to Retrieve Presentation Slides

3. Business Cards

"On the Margins"

None

From: Tae Ahn
To: ForeignTravel
Date: 11/30/2006 7:58:28 AM
Subject: **Quick-Look Trip Report: Bergen, The Netherlands**

FOREIGN TRAVEL TO BERGEN, THE NETHERLANDS, TO PARTICIPATE IN A EUROPEAN COMMISSION WORKSHOP ON DESIGN AND ASSESSMENT OF PACKAGES FOR RADIOACTIVE WASTE

Travel Dates: November 21-22, 2006

Location: Bergen, The Netherlands

Organization/Committee: The European Commission (EC), Joint Research Center, Institute for Energy, Petten, The Netherlands

Desired Outcome:

Participants from European Union countries, Japan, Korea and U.S. intended to share ongoing information on research and development and best practices for the design and assessment of packages for radioactive waste. This was the second EC workshop. The first workshop was held in Petten, The Netherlands in October 2005. A desired outcome for this second workshop is to identify and plan international collaboration work.

Results Achieved:

Participants shared new information on (i) long-term design and performance of waste packages (WPs), waste forms and cladding, (ii) fabrication, welding and nondestructive evaluation of WP/canister, and (iii) mechanical (e.g., drop) behavior of WP/canister. Also, potential international collaboration work was identified and planned. Specifically, participants discussed development of guidance documents on WP corrosion, radionuclide source terms, and cladding performance. The development of such guidance documents would be conducted jointly with the International Atomic Energy Agency (IAEA), the Organization for Economic Cooperation and Development (OECD)/Nuclear Energy Agency (NEA), and other consensus standardization organizations such as the International Standardization Organization (ISO) or American Society for Testing and Materials (ASTM). Participants also discussed and planned collaboration test work on high burnup cladding, radionuclide source term and WP/canister drop.

Summary of Trip:

This Workshop was sponsored by the EC, Joint Research Center, Institute for Energy, Petten, The Netherlands. At the workshop, Dr. Ahn (i) presented a paper on "Issues in the Licensing Review of the Potential Yucca Mountain (YM) Repository: Container, Cladding and Waste Form;" and (ii) reviewed papers and participated in panel/group discussion on container/canister, waste form, and cladding. Dr. Ahn also participated in the planning and discussions on the development of guidance documents and collaboration test work.

The information shared at the workshop may be relevant to the safety analysis associated with the operation and the performance for waste isolation of the potential Yucca Mountain repository.

Pending Actions/Planned Next Steps for NRC

A third workshop is planned for next year to discuss details of the guidance development and the collaboration test work. The collaboration work may involve the Office of Nuclear Material Safety and Safeguards, and the Office of Nuclear Regulatory Research. In the mean time, a few expert groups will continue to have dialogue on the guidance development and collaboration test work throughout the year. The NRC participation in this activity is recommended to be continued.

It is noted that Dr. Ahn's presentation engendered a letter from the State of Nevada objecting to the information presented. Staff is currently preparing a response to the State's Letter. Also, potential collaboration work with EC, IAEA, OECD/NEA and others may be of interest to the Commission. Therefore, Dr. Ahn plans to prepare a 30 day Foreign Travel Report.

Points for Commission Consideration/Items of Interest

It is noted that Dr. Ahn's presentation engendered a letter from the State of Nevada objecting to the information presented. Staff is currently preparing a response to the State's Letter. Also, potential collaboration work with EC, IAEA, OECD/NEA and others may be of interest to the Commission.

Policy Issues: No policy issues were raised at this meeting.

Contact Information:

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