CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Nuclear Waste Technical Review Board Winter Meeting
Project Number 20.06002.01.081; AI 06002.081.309

DATE/PLACE: January 28, 2003
Las Vegas, Nevada

AUTHOR: D.S. Dunn

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PERSONS PRESENT: D.S. Dunn, Center for Nuclear Waste Regulatory Analyses (CNWRA), C. Grossman, U.S. Nuclear Regulatory Commission (NRC), Nuclear Waste Technical Review Board (NWTRB) and NWTRB Staff, and approximately 80 representatives from various organizations including the U.S. Department of Energy (DOE), Bechtel SAIC, Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories, Los Alamos National Laboratory, Catholic University, and Clark County.

BACKGROUND AND PURPOSE OF TRIP:

The purpose of the trip was to attend the NWTRB meeting. The agenda for the meeting is attached.

SUMMARY OF PERTINENT POINTS:

The meeting was called to order by NWTRB chairman Dr. Michael Corradini who introduced the NWTRB members and provided introductory remarks.

Dr. M. Chu, Director Office of Radioactive Waste Management, U.S. Department of Energy (DOE), provided an overview of the programmatic developments. The submittal of the license application is anticipated to occur in December 2004 and the DOE is working to have the Licensing Support Network in place by June 2004. Dr. Chu indicated that the DOE must develop a transportation plan in order to receive waste by the end of 2010. Key features of the transportation plan are shipping casks and emergency response. The transportation plan will be designed with flexibility and contingency with the following principles: (i) public safety and confidence, (ii) work with agencies and stakeholders, (iii) use private industry and their experience where possible and (iv) look for opportunities to enhance safety. In an answer to subsequent questions from the NWTRB, Dr. Chu indicated that a formal transportation plan was not required as part of the license application. The DOE wants to have a strategic level transportation plan in place by the end of 2003.

Dan Bullen from the NWTRB asked about the progress in the resolution of Key Technical Issue Agreements with the NRC. Dr. Chu replied that the process is on schedule but progress is

slow. In addition, Dr. Chu stated that she would like to see more focused interaction with NRC with faster decision-making.

Dr. Chu was also asked about how new developments from the Science and Technology program would be incorporated into the Total System Performance Assessment. Dr Chu indicated that there are a variety of ways these developments could be implemented including integration into performance confirmation activities.

Dr. J. Williams the Acting Director for the Office of Transportation at the DOE provided an overview of the operation of the waste management system with a focus on transportation to the proposed repository. Dr. Williams also stated the DOE has not developed neither an emergency plan nor a security plan for transportation. Rail transportation is preferred because of the larger capacity compared to truck. Even with a preference for rail transportation, some heavy haul truck transportation will be required to transport fuel from some reactors to the rail lines. It is anticipated that barge transportation will also be used. Target commercial spent nuclear fuel acceptance rates for the first five years of repository operation were reported to be 400 tons in 2010 and increase to 3,000 tons in 2014. Some question was raised about possible collaboration between the DOE and private industry for cask development. It was pointed out that the size of casks for dry storage are increasing and are now larger than the waste packages for disposal. Dr. Williams indicated that the multi purpose canister program has not been funded by the DOE for several years and indicated that the industry was better served by development of casks for dry storage.

Dr. W.J. Arthur, the Deputy Director for Repository Development provided some additional information on the Yucca mountain Project Status. Dr. Arthur recently joined the program and previously worked in the Waste Isolation Pilot Plant program. He emphasized that the operating culture must change and the repository program must shift from site characterization to license application.

Dr. Mark Peters from Bechtel SAIC Company, LLC/Los Alamos National Laboratory. Provided a science and engineering update that included results from the Exploratory Studies Facility tests. The update focused on tests in unsaturated and saturated zones, evaluation of igneous event and engineered barrier system studies. An update was provided on the drift scale test. An interesting observation in the test was the discovery of a red spot on the top of a floor heater approximately 32 meters from the bulkhead. The spot occurred between March 20 and September 18, 2002. The spot was analyzed and found to contain mostly iron oxide. The suspected source of the iron oxide is an overhead rock bolt. Dr. Peters presentation included more than 60 slides with numerous backup slides.

In the afternoon session, chaired by Dr. D. Duquette, Dr. R. Staehle an Adjunct Professor at the University of Minnesota and a consultant to State of Nevada presented the results of investigations of local environments on waste container surfaces conducted at the Catholic University of America. Distillation of the simulated unsaturated zone pore water resulted in very acidic concentrated solutions. Corrosion tests in these solutions were determined to be strongly correlated to pH. Alloy 22 corrosion rates in acidic condensates with pH < 1 were greater 400 μm/year [15.7 mils/year]. Dr. Staehle emphasized that the environment in the crevices of steam generators is very difficult to characterize even though the environment inside a steam generator is well controlled. Based on the difficulty encountered with steam generators,

Dr. Staehle suggested that it may not be possible to bound the range of possible conditions on the waste packages in the unsaturated zone in Yucca Mountain.

Dr. D. Shettel from Geosciences Management Institute Incorporated and also a consultant to State of Nevada presented additional information on the range of water compositions in the Yucca Mountain region including precipitation, unsaturated zone water, unsaturated zone pore water, ECRB pore waters and J-13 water. An illustration of possible in drift processes that may not have been considered by the DOE were also presented. These processes included the deposition of salt on the drip shield and damage to the drip shield by rock fall.

Dr. J. Farmer from LLNL presented results of tests on the chemical environment evolution of Alloy 22. The types of water expected to contact the waste package include deliquescence brines from dust-water interaction and seepage brines. Concentrated calcium chloride brines and condensed acid gas evolved from calcium chloride brines were studied because they are believed to represent a bounding case, however, these solutions are not expected to occur in the repository system. The deliquescence brines from dust-water interaction have a pH ranging from 6 to 9. No localized corrosion of Alloy 22 was observed in tests with these solutions at temperatures up to 150 °C [302 °F]. Seepage brines from fracture flow may have a higher pH (9 to 12.5) as a result of grout interactions. No crevice corrosion was observed for Alloy 22 in these solutions in tests conducted at boiling {110 °C [230 °F]}. Although electrochemical testing suggest that localized corrosion of Alloy 22 would not occur in concentrated calcium chloride solutions at temperatures below 140 to 160 °C [284 to 320 °F], it is believed that the calcium chloride brines are unstable in open systems at high temperatures. Acid gas from concentrated calcium chloride solutions would likely be removed by drift ventilation causing the pH of the remaining solutions to increase.

Jerry Cogar described changes to the waste package design and the schedule for waste package prototype procurement. A position paper on the use of the ASME code is expected to be completed in approximately one month. The current plan is to have the inner 316 nuclear grade stainless steel container nuclear stamped and constructed using the requirements for subsection NC class 2 components. The outer Alloy 22 container will be constructed using the same requirements but it will not be a nuclear stamped since it is intended to be a corrosion resistant barrier.

Dr. G. Fogg from the University of California presented the results of studies and modeling of paleosols on fluid flow in an alluvial fan. The area investigated was the Kings River Fan southeast of Fresno California. Alluvial heterogeneity was cited as a cause of ground water dispersion which has implications for estimating groundwater ages and modeling groundwater travel times.

Dr. Peter Swift from Sandia National Laboratories/Bechtel SAIC Company LLC presented the results of barrier capability analyses. The presentation was described as a continuation of a previous presentation to the NWTRB. The analyses was conducted using several approaches including system level regression, one-on and one-off and neutralization analyses. The nine barriers are proposed for consideration in the license application are surface soils and topography, unsaturated zone above the repository, drip shield, waste package, cladding, waste form, invert, the unsaturated below the repository and the saturated zone. An analyses of each of the barrier capabilities was provided. Each of the nine barriers was determined to reduce the movement of either water or radionuclides.

Hard copies of all the presentations except those of Dr. M. Chu and Dr. W.J. Arthur are available.

SUMMARY OF ACTIVITIES:

None.

CONCLUSIONS:

The presentations were high level and there was not sufficient time to provide significant detailed information. Nevertheless the information presented provided a useful update to DOE activities.

PROBLEMS ENCOUNTERED:

None.

PENDING ACTIONS:

None.

RECOMMENDATIONS:

Attendance at future NWTRB meetings is highly recommended.

SIGNATURES:

Darrell S. Dunn
Senior Research Engineer

2/6/2003
Date

CONCURRENCE:

Vijay Jain, Manager
Corrosion Science & Process Engineering, Element

2/6/2003
Date

Budhi Sagar
Technical Director

2/5/2003
Date

Attachment

DD:jg

UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
2300 Clarendon Boulevard, Suite 1300
Arlington, VA 22201

Winter 2003 Board Meeting
January 28, 2003

Crowne Plaza Hotel
4255 South Paradise Road
Las Vegas, NV 89109
Tel: (702) 369-4400
Fax: (702) 369-3770

8:00 a.m. **Call to order and Introductory Statements**
Michael Corradini, Chairman,
Nuclear Waste Technical Review Board (NWTRB)

8:20 a.m. **Overview of Programmatic Developments**
Margaret Chu, Director
Office of Radioactive Waste Management (OCRWM)
Department of Energy (DOE)

8:40 a.m. *Questions, discussion*

8:50 a.m. **Operating the Waste Management System (waste acceptance, packaging, transportation, repackaging, emplacement)**
Jeff Williams, OCRWM

9:10 a.m. *Questions, discussion*

9:20 a.m. **Yucca Mountain Project Status**
W. John Arthur III, Deputy Director for Repository Development
Office of Repository Development (ORD), OCRWM

9:40 a.m. *Questions, discussion*

9:50 a.m. **BREAK**

10:05 a.m. **Science and Engineering Update**
Mark Peters
Bechtel SAIC Company, LLC/Los Alamos National Laboratory (BSC/LANL)

11:15 a.m. *Questions, discussion*

11:45 a.m. **Public Comments**

12:00 noon **LUNCH**

1:10 p.m. **Session Introduction**
David Duquette, NWTRB

1:15 p.m. **Nevada-Sponsored Corrosion Studies**
Roger Staehle, Consultant to State of Nevada
Don Shettel, Geosciences Management Inst., Inc.

1:55 p.m. *Questions, discussion*

2:15 p.m. **Materials Testing Update**
Greg Gdowski, BSC/Lawrence Livermore National Laboratory

2:45 p.m. *Questions, discussion*

3:00 p.m. **Waste Package Manufacturing and Closure Welds**
Jack Cloud, BSC

3:15 p.m. *Questions, discussion*

3:25 p.m. **BREAK**

3:40 p.m. **Influence of Paleosols on Fluid Flow and Solute Transport**
Graham Fogg, University of California, Davis

4:15 p.m. *Questions, discussion*

4:30 p.m. **Planned Barrier Capability Analyses**
Peter Swift, BSC/Sandia National Laboratories

5:00 p.m. *Questions, discussion*

5:15 p.m. **Public Comments**

5:30 p.m. **Adjourn**