Center for Nuclear Waste Regulatory Analyses

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U. S. Nuclear Regulatory Commission ATTN: Mr. Melvin Silberberg RES/WMB NLS260 Washington, D. C. 20555

Subject: DOE/NRC Research Program Interactions

Dear Mr. Silberberg:

Based on your request of last week, the attached summaries have been prepared for the first five proposed DOE/NRC interactions on the Research Program which directly involve the Center for Nuclear Waste Regulatory Analyses (CNWRA). These are focused topical meetings that build upon the more general material that was provided to you in my letter of October 19, 1989. We understand that these interactions will be characterized as "mini-workshops," and that there will be no discussions regarding policy, licensing matters, etc. at these sessions.

Please contact me if you have any questions regarding this matter. We look forward to participating in the meetings and encourage early coordination between the DOE, NRC, and CNWRA to establish specific meeting dates and locations.

Sincerely yours

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/bsc

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Topic: Thermohydrologic Behavior

Technical Area: Physical Modeling of Hydrologic Transport

The purpose would be to exchange technical information on laboratory and/or field-scale experimental approaches which may be used to determine the nature of heat and fluid flow in unsaturated media. Investigations of thermohydrological phenomena at scales varying from an individual waste package to the composite effect of all HLW in a geologic repository are of interest. Laboratory and field experiments would be discussed with a focus on design of experiments (including scaling relationships) to study liquid- and vapor-phase flow in variably saturated media. Instrumentation and techniques for measurement and visualization of heat and fluid content and flow in synthetic and natural media would also be discussed. Discussions of numerical modeling in the design of thermohydrologic experiments would be limited in this meeting with a planned subsequent meeting on this topic.

It is requested that the technical exchange include a tour of laboratories where examination of pertinent experimental apparatus would occur. This technical exchange would include discussions by the CNWRA's technical staff performing work on the Center's Thermohydrology Research Project and related technical assistance activities which are being conducted for NRC.

Topic: Waste Package Testing

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Technical Area: Short-Term Test Methods

As a result of the scoping and literature studies performed by the NRC in the area of waste package experiments, several technical issues have come to focus. One of these issues that merits early discussion is short-term test methods.

Despite wide-spread industry application, the use, reproducibility, and interpretation of various techniques for measuring corrosion phenomena remains a question, particularly where extrapolation to long time periods is required. For example, potentiodynamic polarization techniques have been used by DOE and NRC contractors, but with different operating parameters and varying laboratory procedures. The resolution of technical issues related to this topic requires the involvement of technical experts in presenting and discussing the merits of the pertinent measurement techniques that are in use at the various laboratories. Also, there may be a need to develop new research concepts and test methods to resolve related technical uncertainties.

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Discussions would focus on test methodology, including use of standard test procedures, sample preparation, and formulation of test solutions. Sensitivity of test results to operating parameters (such as scan rate) will also be discussed, based on experience to date. Data reproducibility, use of standardized samples for calibration, and related quality-control factors would also be considered. Discussions on data interpretation would be limited to direct evaluation of data collected from such short-term tests; projection or extrapolation of such data to longer times would be the subject of a separate meeting. This "mini-workshop" would provide an opportunity for indepth technical discussion among the key research staff from the NRC, DOE, and their principal contractors.

Topic: Geochemistry Experimentation

Technical Area: Mineralogical Characterization

The purpose would be to begin a broad exchange of technical information on investigations pertinent to the HLW repository program which Los Alamos National Laboratories (LANL) is performing in geochemistry, mineralogy, petrography/petrology, sorption studies, and water-rock interactions, as a contractor to the DOE. Small-group discussions of recent work conducted at LANL, which represents the state-of-the-art in the mineralogical characterization of Yucca Mountain, would be the starting point of these exchanges. Such information will benefit the geochemistry research program at the CNWRA in both the modeling and experimental areas.

Discussions would focus on mineralogical compositions and associations, which are critical inputs to mass transfer and phase equilibrium modeling of the controls on the ambient and perturbed system chemistry, including groundwater chemistry. Experimental phase equilibrium studies among zeolites, which are proposed in a CNWRA geochemistry research project, would be discussed in the context of the ongoing LANL analyses of the paragenesis of these phases in the Yucca Mountain system. This information will help to define appropriate test conditions. An exchange of knowledge and an evaluation of the techniques used in mineralogical characterization would be obtained through interaction with LANL researchers.

Discussions of past and present LANL investigations in these technical areas would occur and the CNWRA's technical staff would describe laboratory studies performed in the Center's Geochemistry Research Project and related technical assistance activities which are being conducted for NRC. It is anticipated that a tour of appropriate LANL laboratories supporting investigations in these technical areas would be made.

Topic: Geochemical Modeling

Technical Areas: Mass Transfer Modeling of Water-Rock Interactions.

The purpose would be to begin a broad exchange of technical information on investigations pertiment to the HLW repository program which Lawrence Livermore National Laboratory (LLNL) is performing in geochemistry, mass transfer modeling of water-rock interactions, thermodynamic database development and validation, and waste package-groundwater interactions as a contractor to the DOE. Small group discussions regarding the EQ3/6 geochemical modeling software package, which has been under development for more than a decade at LLNL, would be the starting point of these exchanges. These discussions will be of benefit because the codes and database in this package are being evaluated, modified and utilized in the CNWRA geochemistry research program. Furthermore, the NRC has submitted a request to obtain formally the latest version of EQ3/6, and it is anticipated that it will be used in an NRC/CNWRA workshop on EQ3/6 modeling. Interactions with the developers of the codes and database will enhance the technical content of the workshop and improve use of EQ3/6 in the Center's geochemistry research program.

Aqueous speciation and solubility calculations which are being used by the CNWRA to design experiments for sorption and phase equilibrium studies would be discussed. Modifications which have been introduced by the CNWRA to the EQ6 code to enable equilibrium gas fractionation and nonisothermal kinetic mass transfer computations would also be a focal point of this exchange. A new version of this software package with a reorganized database, which is now under development at LLNL and will be available for release shortly, would be examined.

Discussions of past and present LLNL investigations in this technical area would occur and the CNWRA's technical staff would describe work performed in the Center's geochemistry research project and related technical assistance activities which are being conducted for the NRC. It is anticipated that a tour of LLNL experimental and computer modeling laboratories would be made, and would include examination of the equipment and techniques used in investigations of waste package-groundwater interactions and in the collection and storage of reference groundwaters.

Topic: Repository Design and Performance

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Technical Area: Rock Mechanics Properties

The purpose of this exchange meeting would be to initiate discussions regarding the in situ properties of tuff, techniques for characterizing such properties, and the analytical models that DOE intends to use to evaluate the pre-closure and post-closure performance of underground openings.

This first exchange meeting would focus on the dynamic properties of tuff joints. Approaches to selection and collection of fracture samples, including techniques, equipment, and procedures used to date, as well as those currently under development, would be discussed. Laboratory methods in use by DOE, NRC, and their contractors to characterize and physically test such joints, including the use and/or adaptation of standard tests, are of particular interest. The discussions would also extend to include use of laboratory data in the formulation of joint deformation models. Discussions regarding the capabilities and limitations of currently available analytical models/computer codes that may be used to predict seismic performance of underground excavations will be deferred for a subsequent meeting.

Visits to appropriate laboratory testing facilities and/or field collection sites would be part of the meeting, to the extent practical.