SUMMARY OF
U.S. NUCLEAR REGULATORY COMMISSION/U.S. DEPARTMENT OF ENERGY
TECHNICAL EXCHANGE ON INFILTRATION
April 2, 2008
Las Vegas, Nevada

INTRODUCTION

On April 2, 2008, U.S. Nuclear Regulatory Commission (NRC) and U.S. Department of Energy (DOE) met in Las Vegas, Nevada, to discuss DOE's approach to infiltration at Yucca Mountain, Nevada . The meeting was held at the NRC Las Vegas Hearing Facility, and was open to the public.

To support staff and stakeholder interactions, the meeting included video connection to NRC offices in Rockville, Maryland, and the Center for Nuclear Waste Regulatory Analyses (CNWRA) in San Antonio, Texas. Teleconference connections were also available to interested stakeholders. Participants included representatives of the NRC, DOE, State of Nevada, Affected Units of Local Government, Nuclear Energy Institute, other industry representatives, and members of the public.

The meeting agenda, list of attendees, and meeting presentations are available on the NRC web site, at http://www.nrc.gov/waste/hlw-disposal/public-involvement.html.

PURPOSE OF THE MEETING

The purpose of this meeting was to discuss DOE's modeling approach for infiltration at Yucca Mountain, Nevada, for a potential geologic high-level waste repository. Net infiltration is the quantity of water that enters the unsaturated zone from the surface and passes below the root zone.

TOPICS OF DISCUSSION

In its opening remarks. NRC clarified the purpose of the technical exchange was to gain an improved understanding of DOE's infiltration model and its expected use in TSPA. It also noted that NRC and DOE had committed to hold a Technical Exchange on infiltration in September, 2005, following questions raised about DOE's earlier models by e-mails in its collection on the Licensing Support Network. NRC also noted that, since this was not a management meeting, no commitments would be made. DOE, in its opening, stated that its presentations at the meeting would focus on the technical aspects of its current approach.

In the first presentation, DOE provided an overview of its activities on infiltration, including background information, and lists of supporting technical products and evaluations of the model. The next DOE presentation explained how the infiltration model outputs are used in DOE Total System Performance Assessment (TSPA) for Yucca Mountain, for both the 10,000-year and post-10,000-year calculations, including performance results and some sensitivity analyses. NRC and CNWRA staff questions concerned DOE's anticipated methodology for implementing in TSPA the post-10,000-year percolation rates specified in the proposed revision to 10 CFR 63, and the importance of uncertainty in net infiltration to calculated dose.

DOE's next presentation summarized the current net infiltration model, MASSIF, developed at Sandia National Laboratory. The presentation covered the conceptual model, model parameters, treatment of uncertainty, model validation, and results for three climate states (modern day, monsoon, and glacial transition). NRC and CNWRA staff questions focused on several specific aspects of the MASSIF model, including the definition of net infiltration in the three-layer model, and DOE's validation exercises using both site observations and a model based on the Richards equation. Other questions and discussion concerned the distribution of soil depths used, particularly for the thin soil depth category, which draws on relatively sparse observational data. Further discussion addressed the significance of fracture-filling material (e.g., soil or mineralization) for model results.

The next presentation, by NRC, summarized the status of the eighteen Key Technical Issue Agreements related to infiltration. NRC stated that it did not view the new work as significantly impacting its consideration of the nine previously closed Agreements, or its consideration of the eight Agreement responses that had been held in 2005 pending DOE's investigation of the e-mail questions. NRC expressed its intent to close, by letter, those eight Agreements. DOE asked about the status of the one infiltration-related Agreement previously considered in need of additional information. NRC replied that the status of this Agreement remains unchanged, until DOE provides the information previously requested or a written justification for closing the Agreement.

The final presentation of the day, by DOE, covered its integration of the infiltration and unsaturated-zone flow models in TSPA. DOE used Generalized Likelihood Uncertainty Estimate (GLUE) methodology to weight MASSIF infiltration maps for each climate state, for sampling in TSPA. The GLUE algorithms used observations of temperatures and chloride concentrations in boreholes to calculate weighting factors for the modern-climate infiltration maps for four selected percentiles (10th, 30th, 50th and 90th). DOE's calculated average final weighting factors strongly favored the 10^{th} percentile maps. The same weighting factors are applied in TSPA for future climate states, for both the 10,000-year and post-10,000-year cases. DOE stated that its treatment for post-10,000 years is consistent with NRC's proposed rule for this time period. NRC and CNWRA staff questions concerned the uncertainties in the temperature and chloride measurements, and the rationale for, and differences among, the variations of GLUE algorithms used. Other questions and discussion concerned the DOE rationale for qualifying a limited number of the older data sets for use in the GLUE weighting.

The meeting closed with comments from NRC and DOE. NRC thanked the presenters for the informative presentations, and noted the importance of traceability and transparency of the data and models for its efficient review and for public confidence. DOE expressed its appreciation for NRC's questions, and looked forward to its anticipated license application submittal in June 2008.

PUBLIC COMMENTS

A public comment period was provided at the end of the day. Ms. Judy Treichel, of the Nevada Nuclear Waste Task Force, asked first about some of the TSPA results shown in DOE's second presentation, particularly for the disruptive event cases. DOE responded that these would be discussed in more detail during the TSPA Technical Exchange on the next two days. She then asked about the values used for surface runoff in the MASSIF model, noting that observed runoff during rainstorms at Yucca

Mountain can be quite pronounced. DOE replied that this was considered, and noted that some infiltration can occur during storms even on exposed bedrock. Mr. Marty Malsch, representing the State of Nevada, asked if non-qualified data were available that may have been relevant for use in the GLUE weighting, and if an effort was made to qualify these data. DOE responded that existing data were considered, and some efforts were made for qualifying. Mr. Malsch then asked if DOE had plans for alternative analyses of infiltration during the post-10,000-year period if the final rule differs from the proposed rule. DOE responded that it would consider the final rule when issued.

ACTION ITEMS / COMMITMENTS

None.

Stephen Mulligan for Date 5/12/08

Jack Davis, Deputy Director
Technical Review Directorate
Division of High-Level Waste Repository Safety
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

for William R. Wilkins Date 5/8/08

William Boyle, Director
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U.S. Department of Energy