SUMMARY OF THE U.S. NUCLEAR REGULATORY COMMISSION/U.S. DEPARTMENT OF ENERGY TECHNICAL EXCHANGE AND MANAGEMENT MEETING ON PRECLOSURE SEISMIC DESIGN METHODOLOGY AND PERFORMANCE DEMONSTRATION JUNE 7, 2006 LAS VEGAS, NEVADA

INTRODUCTION

On June 7, 2006, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) held a public Technical Exchange and Management Meeting to discuss preclosure seismic design methodology and performance demonstration. This meeting was held at the Atomic Safety and Licensing Board Panel Hearing Facility in Las Vegas, Nevada. The agenda for this meeting can be found in Enclosure 2.

To support staff and stakeholder interactions, the Technical Exchange and Management Meeting included video connections at NRC offices in Rockville, Maryland; the Bechtel SAIC Company, LLC facilities, in Las Vegas, Nevada; and the Center for Nuclear Waste Regulatory Analyses, in San Antonio, Texas. Teleconference connections were also made available to interested stakeholders.

Participants included representatives of NRC, DOE, Technical Review Board, State of Nevada, Affected Units of Local Government, Nuclear Energy Institute, other industry representatives, and members of the public. Enclosure 3 contains the list of attendees who were present at the above noted locations.

TECHNICAL EXCHANGE AND MANAGEMENT MEETING PURPOSE

The purpose of this Technical Exchange and Management Meeting was to discuss preclosure seismic design methodology and performance demonstration. The discussions focused on the Draft Interim Staff Guidance (ISG), HLWRS-ISG-01, *Review Methodology for Seismically Initiated Event Sequences*, that was issued for public comment on May 22, 2006 (71 FR 29369). This guidance supplements the Yucca Mountain Review Plan, NUREG-1804, Revision 2, for review of seismically initiated event sequences in the preclosure safety analysis (PCSA) of the proposed Yucca Mountain geologic repository. At this meeting, DOE presented its approach regarding seismic analyses to demonstrate preclosure performance. Enclosure 4 contains the NRC and DOE presentations.

BACKGROUND

Background information preceding the technical exchange and management meeting:

- DOE Topical Report YMP/TR-003-NP, *Preclosure Seismic Design Methodology for a Geologic Repository at Yucca Mountain*, Revision 2, August 1997;
- DOE Topical Report YMP/TR-003-NP, *Preclosure Seismic Design Methodology for a Geologic Repository at Yucca Mountain*, Revision 3, October 2004;
- DOE Letter providing summary of the preclosure seismic design methodology August 25, 2005;
- NRC Letter, *Preclosure Seismic Design Methodology and Performance Demonstration.* January 24, 2006; and
- NRC Draft HLWRS-ISG-01, *Review Methodology for Seismically Initiated Event Sequences*, May 16, 2006.

NRC KEY MESSAGES

NRC is committed to conducting effective and efficient prelicensing interactions with DOE to facilitate a timely review of a license application. Key messages were presented to DOE in NRC's presentations on June 7, 2006, to allow DOE to focus on issues of particular interest to the NRC staff participating in the Technical Exchange. These key messages provided the framework for discussions during the Technical Exchange and are listed below:

- DOE's proposed 2,000-year return period design basis ground motion, coupled with the proposed design criteria and the codes and standards, appear consistent with 10 CFR 63.112(f)(2).

- Seismic Margin Assessment, proposed by DOE to establish design margins of structures, systems, and components (SSCs) important to safety (ITS) against failures during a seismic event, is not a substitute for demonstrating compliance with 10 CFR 63.111.

- DOE should provide probabilistic seismic analyses to satisfy the performance objectives of Category 2 event sequences by determining the seismic performance of SSCs ITS, and the probabilities of occurrence of seismic event sequences.

- Seismic performance of SSCs ITS may be determined using a methodology outlined in the American Society of Civil Engineers (ASCE) Standard ASCE 43-05.

- Seismic Hazard curves for the PCSA should be characterized, using an appropriate site response model, to low enough values of annual probabilities of exceedance, such that the combination of the hazard with fragilities of SSCs ITS will result in reasonable estimates of event sequence probabilities of occurrence, as required for 10 CFR Part 63.

- Fragility curves for SSCs ITS should be developed using transparent technical bases and the failure criteria consistent with the SSCs ITS functional requirements.

- If more than one SSC ITS is relied on for evaluating an event sequence, individual fragility curves of the credited SSCs should be combined to determine the event sequence probability of occurrence.

SUMMARY AND CONCLUSIONS

NRC acknowledged that DOE has made significant progress with respect to understanding NRC expectations for the seismic design methodology and performance demonstration needed to support the PCSA, consistent with NRC's January 24, 2006, letter. DOE presentations and related discussions indicated that they understood NRC's feedback to DOE's proposed seismic design methodology (Topical report YMP/TR-003-NP, Rev. 3, October 2004), provided in the January 24, 2006, letter, and guidance presented in the Draft ISG HLWRS-ISG-01, *Review Methodology for Seismically Initiated Event Sequences.*

The following discussion highlights important issues discussed during the Technical Exchange:

- NRC stated that 10 CFR Part 63 is a risk-informed performance-based regulation, and as such, is focused on the results of the PCSA, identification of SSCs ITS, and categorization of event sequences. NRC also clarified that 10 CFR Part 63 does not require a probabilistic risk assessment (PRA).

- DOE presentations and related discussions illustrated that there is a general level of understanding of the information needed to support the staff's review of the PCSA. DOE also recognized that site-specific information and technical bases are necessary to describe the approaches used to develop site-specific seismic hazard curves, SSC ITS, fragility curves, and evaluate the occurrence and/or consequences of seismically initiated event sequences.

- NRC and DOE agreed that different approaches may be used to develop fragility information for SSCs, provided that sufficient technical bases are specified. DOE noted that the examples in the draft ISG use the median capacity and the logarithmic standard deviation to derive an SSC ITS fragility curve, whereas DOE proposes using the high-confidence low-probability of failure and the logarithmic standard deviation to derive an SSC ITS fragility curve.

- NRC stated that 10 CFR Part 63 does not require a PRA for demonstration of compliance with preclosure performance objectives. For Category 2 event sequences, 10 CFR Part 63 requires the evaluation of individual event sequences. Therefore, summation of Category 2 event sequences is not required for evaluation of preclosure performance.

- NRC and DOE agreed that non-seismic information (e.g., operational controls, non-seismic factors, or other mechanisms) may be incorporated in evaluating seismically initiated event sequences, provided that sufficient technical bases are specified.

- NRC noted that, as a policy, NRC does not specify tolerances in meeting performance objectives of 10 CFR 63.111, and that DOE has to provide sufficient technical bases to support the calculated probabilities and categorization of event sequences. Further, 10 CFR Part 63 does not specify any minimum expected margin or degree of uncertainty against performance goals of 10 CFR 63.111(b)(2).

- NRC suggested that NRC and DOE use consistent terminology to ensure effective and unambiguous communication (e.g., SSCs ITS in place of risk-significant SSCs).

- NRC noted that it was receptive to DOE comments on its Draft ISG HLWRS-ISG-01, *Review Methodology for Seismically Initiated Event Sequence.* NRC also indicated that examples clarifying these comments would be valuable.

- DOE stated that it was planning on revising its seismic methodology report (Topical report YMP/TR-003-NP, Rev. 3, October 2004) to include information related to performance demonstration, for submittal to NRC in Fall 2006. DOE also indicated that the report title will be changed to reflect the revised content, in response to NRC comments.

- DOE indicated that it was planning to develop a seismic hazard curve for the surface facilities, at appropriately low probabilities of annual exceedence. DOE also noted that it expects to provide preliminary information to NRC by the end of 2006 calender year.

- At the May 16-17, 2006, PCSA technical exchange and management meeting, DOE asked for feedback on the acceptability of using a conservative methodology for calculating preclosure dose (including uncertainty), supported by the appropriate technical justification, to demonstrate compliance with 10 CFR Part 63. During the preclosure seismic design methodology and performance meeting, NRC provided the following feedback:

  DOE has the flexibility to select an appropriate methodology (e.g., bounding type or probabilistic) to calculate dose. For preclosure, the 10 CFR Part 63 does not specify a particular approach to be used to estimate operational exposures in the PCSA. Whatever the approach selected, DOE must demonstrate that the chosen method is appropriate for assessing the safety of the preclosure activities. For bounding-type analyses, DOE will need to describe how single-parameter values appropriately consider the uncertainties in estimating the exposures (e.g., conservatism in certain parameters may be appropriate). Alternatively, if a probabilistic type analysis is used, DOE will need to describe how parameter ranges appropriately consider the uncertainties in estimating exposures. Provided that all the important processes are included in the analyses, NRC concludes that it would be appropriate to compare the expected value (mean) from the probabilistic analyses to the performance measure.

PUBLIC COMMENT

Mr. Rod McCullum, a representative from the Nuclear Energy Institute (NEI), stated that, as a general matter, NEI views ISGs as not being conducive to licensing and regulation of the repository. He stated that NRC should not develop ISGs because: (1) ISGs appear to be focusing on a single issue (or set of issues), without a comprehensive look at the entire review plan; (2) the guidance provided in the ISG appears to imply what DOE should be doing and therefore could be viewed as requirements; and (3) ISGs appear to change the regulatory framework outside the constraints of the regulatory process.

NRC responded that it did not agree with this comment, and that ISGs contribute to a predictable, stable, and transparent regulation of repository licensing by providing guidance to the NRC staff on how to perform a high-quality review of the license application.

ACTION ITEMS/COMMITMENTS

None.

Date 7/12/06

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Date 7/12/06

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