

SUMMARY OF
U.S. NUCLEAR REGULATORY COMMISSION/U.S. DEPARTMENT OF ENERGY
TECHNICAL EXCHANGE ON
PRECLOSURE AND POSTCLOSURE CRITICALITY

August 16, 2007
Rockville, Maryland

INTRODUCTION

On August 16, 2007, U.S. Nuclear Regulatory Commission (NRC) and Department of Energy (DOE) met in Rockville, Maryland, to discuss DOE's approach for "Preclosure and Postclosure Criticality" at a potential geologic high-level waste repository at Yucca Mountain, Nevada. The meeting was held at NRC Headquarters, Executive Boulevard Building, and was open to the public.

To support staff and stakeholder interactions, the meeting included teleconference connections for interested stakeholders. Participants and attendees, in person and by teleconference, included representatives of the NRC, DOE and its contractors, the Center for Nuclear Waste Regulatory Analyses, State of Nevada, Affected Units of Local Government, Nuclear Energy Institute, Electric Power Research Institute, and members of the public.

The meeting agenda, list of attendees, and an NRC memorandum discussed by DOE at the meeting are available with this meeting summary on the NRC website, at <http://www.nrc.gov/waste/hlw-disposal/public-involvement.html>.

PURPOSE OF THE MEETING

The meeting was intended to help NRC staff gain a better understanding of DOE's planned approach for analyzing possible criticality events in a potential repository, during both the preclosure and postclosure periods. DOE also sought clarification from NRC staff on how generally accepted criticality practices and methodologies fit within the context of the risk-informed, performance-based regulation that would apply to a geologic repository at Yucca Mountain (10 CFR Part 63). As is the policy for Technical Exchanges, no commitments were made at the meeting.

In advance of the meeting, DOE made public on its website two documents to support discussions, *Preclosure Criticality Analysis Process Report* and *Technical Work Plan for Development of Technical Data Needed to Justify Full Burnup Credit in Criticality Safety Licensing Analyses Involving Commercial Spent Nuclear Fuel*.

TOPICS OF DISCUSSION

Discussions covered three general areas: the overall approach to criticality, preclosure methodology, and postclosure methodology.

In opening remarks, NRC stated that good criticality safety practices, including the use of current codes, standards, accepted industry practices, and principles such as defense in depth, are consistent with risk-informed regulations. NRC expects that DOE's treatment of criticality

event sequences in its Preclosure Safety Analysis (PCSA) should address the reliability and uncertainty of structures, systems, and components important to safety, consistent with the approach for other preclosure event sequences. In the postclosure analysis, criticality is a Feature, Event, or Process (FEP) that may be screened from consideration in the performance assessment on the basis of probability or consequences. The screening arguments should provide sufficient technical basis to justify calculations.

DOE indicated that its discussions would focus on its proposed methodology, and not specific results for preclosure or postclosure analyses. For preclosure, DOE stressed its review of numerous NRC and industry documents in developing their approach. As an example, DOE provided for discussion an NRC memorandum from August, 1998 ("Kopp letter"), which presented staff guidance on criticality analysis for spent fuel pools at 10 CFR Part 50 facilities. Further preclosure discussion considered the specific requirements of 10 CFR 63.112, which states that the PCSA must include "means to prevent and control criticality." Under 10 CFR Part 63, an appropriate design for surface facilities at a geologic repository should demonstrate the prevention of criticality events for normal operations, as well as for Category 1 (expected occurrence one or more times before permanent closure) and Category 2 (at least one chance in 10,000 of occurrence before permanent closure) event sequences.

DOE outlined its approach for preclosure, where it plans to model all commercial spent nuclear fuel (CSNF) as fresh fuel with 5% enrichment, as a bounding and conservative assumption. DOE's analysis will not rely on burnup credit for any fuel handling in preclosure. For CSNF in the Wet Handling Facility, DOE will take credit for soluble boron in the pool. DOE expects that its PCSA will show that all event sequences that may compromise criticality controls are beyond Category 2. Discussions also covered treatment of damaged fuel, which DOE expects will be evaluated on a case-by-case basis, and the appropriate use of criticality alarms and radiation monitors in the surface facilities.

For postclosure, DOE's approach is to screen out criticality as a FEP over 10,000 years, based on probability. Probability screening in the nominal (non-disruptive) scenario will be done for all fuel types without use of burnup credit, except possibly for early waste package failure if stress corrosion cracking is not screened out. DOE expects to rely on burnup credit for disruptive scenarios involving seismic or igneous activity, to screen out criticality as a FEP. DOE plans to obtain additional data for burnup credit over the next several years. In its license application, DOE plans to present loading curves for CSNF canisters based on existing data and specific canister designs, and expects to recalculate these curves as additional data and designs become available. Further postclosure discussions covered details of the data collection program, use of reactor records in determining CSNF burnup, propagation of uncertainties, use of an appropriate K_{eff} (effective neutron multiplication factor), and DOE's plans for revising and updating its supporting documents.

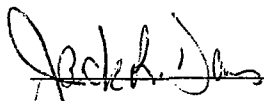
In closing remarks, NRC staff acknowledged that the discussions had improved its understanding of DOE's planned approach to criticality analysis for both preclosure and postclosure.

PUBLIC COMMENTS

Three members of the public spoke during the public comment period. Mr. Everett Redmond, of the Nuclear Energy Institute, noted that the nuclear industry expects that DOE will be able to accept all commercial spent nuclear fuel, but that damaged fuel will not necessarily be considered explicitly in the license application at the time of initial submittal. He further noted that in some instances, administrative margin has not been required in criticality calculations for existing spent fuel pools. Ms. Judy Treichel, of the Nevada Nuclear Waste Task Force, expressed concern with what she felt were large uncertainties, and potentially missing information, on many aspects of the criticality methodologies. Mr. Mike Thorne, a consultant to the State of Nevada, drew a distinction between aspects of the proposed analysis which he felt "get done well" such as calculations of K_{eff} , and less well-constrained aspects, such as analyses in the geochemical model reports.

ACTION ITEMS / COMMITMENTS

None.



Date 9/26/07

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U.S. Nuclear Regulatory Commission



Date 9/26/07

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