



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

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March 27, 1998

Dr. Stephan Brocoum  
Assistant Manager for Licensing  
U.S. Department of Energy  
Office of Civilian Radioactive Waste Management  
Yucca Mountain Site Characterization Office  
P.O. Box 30307  
North Las Vegas, Nevada, 89036-0307

SUBJECT: ISSUE RESOLUTION STATUS REPORT (KEY TECHNICAL ISSUE: IGNEOUS ACTIVITY)

Dear Dr. Brocoum:

As you know, the staff of the U.S. Nuclear Regulatory Commission has developed a program for early resolution of technical issues at the staff level (letters dated August 8, 1997; October 29, 1997; November 7, 1997; November 14, 1997; and November 13, 1997, from N. K. Stablein to S. Brocoum ). This Issue Resolution Status Report (IRSR) on the Key Technical Issue of Igneous Activity focuses on the probability that such processes and events will occur and affect a repository at Yucca Mountain. It is similar to, but slightly broader than, the U.S. Department of Energy's (DOE's) Repository Safety Strategy Hypothesis No. 18, which states that "Volcanic events within the controlled area will be rare and the dose consequences of volcanism will be too small to significantly affect waste isolation." The recognition by both NRC and DOE of this issue (igneous activity or the subset of volcanic activity) demonstrates that it is a matter that needs to be resolved.

Consistent with NRC regulations on prelicensing consultations and a 1992 agreement with DOE, staff-level issue resolution can be achieved during the prelicensing consultation period; however, such resolution at the staff level would not preclude the issue being raised and considered during the licensing proceedings. Issue resolution at the staff level during prelicensing is achieved when the staff has no further questions or comments (i.e. , open items) at a point in time regarding how the DOE program is addressing an issue. There may be some cases where the resolution at the staff level may be limited to documenting a common understanding regarding differences in NRC and DOE points of view. Further, pertinent additional information could raise new questions or comments regarding a previously resolved issue.

The enclosed IRSR summarizes an independent, pre-licensing review and analysis of the probability of igneous activity affecting the repository. Based on its analysis, the staff concludes that the probability of volcanic activity affecting the repository can be bounded between  $1 \times 10^{-8}$  to  $1 \times 10^{-7}$  volcanic events per year. There is no technical basis to discriminate between these values; therefore, NRC will be using a value of  $1 \times 10^{-7}$  per year in its performance assessment calculations to bound the impacts of volcanism. The staff further concludes that the site specific information necessary to calculate a probability for intrusive activity affecting the repository is lacking. Hence, based on analogy to work performed at the San Rafael field (Conway, et al., 1997), NRC will be using a factor of between 2 to 5 times the probability of

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volcanic activity as an interim value for the probability of intrusive igneous activity in performance assessment. This still results in a relatively low numerical value of  $5 \times 10^{-7}$  per year that the staff will be using for the probability of igneous intrusions affecting the repository in its performance assessment calculations. The staff is of the opinion that further refinement of these values may not be necessary, pending the results of ongoing consequence analysis and sensitivity studies. The methods presented in the IRSR provide a methodology that is acceptable to the NRC staff for probability analysis. These methods are slightly different than those used by DOE and result in slightly different values; however, these differences may not be significant to repository performance. DOE will be conducting at least one analysis in its performance assessment calculations assuming a  $10^{-7}$  probability value (letter dated June 4, 1997, from S. Brocoum to J. Greeves) that NRC can evaluate. Therefore, the NRC staff consider that the probability subissue is resolved.

As discussed in the IRSR, the staff have identified 20 out of 23 current open items under this key technical issue that have been resolved at the staff level. The majority of these issues reflect comments on study plans regarding additional work, which, due to program redirection, were never performed by DOE. As established in the IRSR, this work need not be carried out to obtain a defensible probability number for volcanic and intrusive activity affecting the repository that reflects the uncertainty of the present data base. The differences between the NRC and DOE approaches are clear, and use of the NRC value (letter dated June 4, 1997, from S. Brocoum to J. Greeves) in a DOE performance assessment will allow the NRC to evaluate the significance of these differences. The remaining three open items await completion of the consequence analysis or review of the planned DOE volcanism synthesis report.

Finally, the enclosure should be viewed as a status report that provides the staff's most current views on the probability of igneous activity affecting the repository at Yucca Mountain. This report will be updated later this year to address the consequence subissue. We welcome a dialogue on this subject with DOE, the U.S. Nuclear Waste Technical Review Board, State of Nevada, and other interested parties. If you have any questions about this letter, please contact John Trapp of my staff at (301) 415-8063, or via internet mail service (jst@nrc.gov).

Sincerely,

N. King Stablein, Acting Chief  
Engineering and Geosciences Branch  
Division of Waste Management  
Office of Nuclear Material Safety  
and Safeguards

Enclosure: As stated

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using for the probability of igneous intrusions affecting the repository in our performance assessment calculations. The staff is of the opinion that further refinement of these values may not be necessary, pending the results of ongoing consequence analysis and sensitivity studies. The methods presented in the IRSR provide a defensible methodology for probability analysis. While these methods are different than those used by DOE and result in slightly different values, the differences between the approaches being taken by the two agencies are clear. In addition, DOE will be conducting at least one analysis in its performance assessment calculations assuming a  $10^{-7}$  probability value (letter dated June 4, 1997, from S. Brocoum to J. Greeves) that NRC can use for evaluation. Therefore, the NRC staff consider that the probability subissue is resolved.

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