



UNITED STATES
NUCLEAR REGULATORY COMMISSION

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July 16, 1999

Dr. Stephan Brocourn
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, REVISION 2)**

Dear Dr. Brocourn:

As you know, the staff of the U.S. Nuclear Regulatory Commission (NRC) has developed a program for early resolution of technical issues at the staff level. Revision 0 of this Issue Resolution Status Report (IRSR) on the Key Technical Issue of Igneous Activity focused on the probability that such processes and events will occur and affect a repository at Yucca Mountain (letter from N. K. Stablein to S. Brocourn dated March 27, 1998). Revision 1 focused on development of acceptance criteria for evaluating consequences of igneous activity (letter dated July 16, 1998, from N. K. Stablein to S. Brocourn). While this revision provides new information on interactions between magma and the repository, waste package, and waste form (Section 4.2.3, and 4.2.4), the primary focus is to assess the analysis of Igneous Activity performed in the U.S. Department of Energy (DOE) Total System Performance Assessment for the Viability Assessment (TSPA-VA) and provide comments for DOE consideration in the context of prelicensing consultations.

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.

In our comments on DOE's Viability Assessment (VA) (Ltr. dated June 2, 1999, from C. Paperiello to L. Barrett) and the TSPA-VA, the staff indicated that: (1) the analyses are based on assumptions of physical conditions that are not representative of Yucca Mountain basaltic volcanism; (2) data are insufficient to evaluate waste package and high-level waste behavior under appropriate physical conditions; and (3) model assumptions are incongruent with those used elsewhere in TSPA-VA, for example, in enhanced source-term analyses. In

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TSPA-VA, the DOE concludes that there are no risks from volcanism during the first 10,000 years postclosure. The DOE conclusion appears to be primarily based on the assumption of waste package survivability and non-degradation of the waste form under volcanic conditions.

The NRC staff notes that the alloy-22 used in the VA waste package design is a low-temperature alloy, and there are no data on the performance of this material at the temperatures expected during volcanism. As discussed in IRSR Section 4.2.4.3.1, waste package temperature could exceed 1000° C under igneous conditions. When combined with the other physical conditions expected, it is the staff's opinion that the TSPA does not demonstrate that waste package survivability can be assumed. In addition, when considering waste form grain size, the NRC notes that available tests under much less severe mechanical and thermal conditions result in severe grain size reductions (See Section 4.2.4.3.2). As this is a key factor in determining transport, the TSPA-VA does not, in the staff's view, provide support for the fuel grain size values used in the analysis. Other concerns are discussed throughout Sections 4 and 5 of this IRSR.

The IRSR also contains comments in the area of probability. The NRC staff believes that: (1) The use of "source zone" models cannot be supported by most tectonic models and any geophysical data (see IRSR Section 4.1.5); and (2) the DOE should update its analysis to include information developed since the DOE-sponsored PVHA elicitation (see IRSR Section 4.1.8). The NRC considers that the DOE values represent, at best, the extreme low end of acceptable probability values.

Since publication of the TSPA-VA, there have been informal interactions between the DOE and NRC at Appendix 7 meetings and DOE-sponsored workshops where NRC concerns have been discussed. The NRC has been encouraged with the response of the DOE and its contractors and its apparent willingness to address NRC concerns. While these types of interactions do not represent a formal agreement by either party, the NRC believes that if DOE continues forward in the spirit of the discussion at these meetings, resolution of the NRC concerns related to igneous activity can be achieved.

The enclosure should be viewed as a status report that provides the staff's most current views on the probability and consequences of igneous activity potentially affecting the repository at Yucca Mountain. NRC plans to update this report in FY2000 to reflect progress on both of these subissues. The revised IRSR will also reflect changes in the NRC program, such as the change from the "Key Element of Subsystem Abstraction" (KESA) to "Integrated Subissues" (ISI) approach for performance assessment abstraction activities. This change is not functionally different than our current approach, but it will enhance integration, help in the development of the Yucca Mountain License Application Review Plan, and more closely tie our review activities to a performance assessment framework.

We welcome a dialogue on the potential effects of igneous activity on the repository with DOE, the U.S. Nuclear Waste Technical Review Board, State of Nevada, and other interested parties.

S. Broccum

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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,

[Original signed by:]

C. William Reamer, Chief
High-Level Waste and
Performance Assessment Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

cc: See attached list

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S. Brocoum

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Sincerely,

[Original signed by:]

C. William Reamer, Chief
High-Level Waste and
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Enclosure: As stated

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