



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 1, 1998

Dr. Stephan J. 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:
CONTAINER LIFE AND SOURCE TERM, REVISION 1)

Dear Dr. Brocoum:

As you know, the staff of the U.S. Nuclear Regulatory Commission (NRC) has developed a process for early resolution of technical issues at the staff level, which involves the preparation of Issue Resolution Status Reports (IRSRs) for the 10 Key Technical Issues (KTIs) most important to performance. Revision 0 of the IRSR on Container Life and Source Term (CLST) was issued on March 13, 1998. The U.S. Department of Energy (DOE) commented on Revision 0 on May 12, 1998. DOE's letter did not necessitate any changes to the IRSR as staff developed Revision 1. The enclosed Revision 1 of the IRSR covers work done by the staff and its contractor (Center for Nuclear Waste Regulatory Analyses) after the issuance of Revision 0.

Revision 0 focused on four subissues related to the adequacy of the engineered barrier subsystem (EBS) to provide long-term radionuclide containment and limited release at the proposed Yucca Mountain repository. The four subissues addressed included: (1) effects of corrosion on performance of engineered barriers; (2) effects of materials stability and mechanical failure on performance of engineered barriers; (3) effects of spent fuel degradation on performance of engineered barriers; and (4) effects of high-level waste glass degradation on performance of engineered barriers. Revision 1 includes two additional subissues dealing with: 1) criticality within the waste packages (WPs) (Subissue 5); and 2) alternate EBS design features (Subissue 6). Revision 0 addressed acceptance criteria for Subissue 1 and status of resolution for one of its components, namely, the significance of dry oxidation of container materials during the early, dry period of repository performance. Revision 0 concluded that dry oxidation is not a significant failure mode or degradation process for container materials. This version (Revision 1) addresses acceptance criteria for all subissues and the status of resolution of all components of all subissues. All the components addressed here are important because they potentially impact the performance of the repository.

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Consistent with NRC regulations on precicensing consultation and a 1993 agreement with DOE, staff-level issue resolution can be achieved during the precicensing consultation period. However, such resolution at the staff level will not preclude the issue being raised and considered during the licensing proceedings. Issue resolution at the staff level during precicensing is achieved when the staff has no further questions or comments (i.e., open items) at a selected point in time, regarding how DOE's program is addressing an issue. In some cases resolution at the staff level may be limited to documenting a common understanding regarding differences in the staff's and DOE's points of view. Pertinent additional information could raise new questions or comments regarding a previously resolved issue.

Thus far, several components of the six subissues have been resolved, or have been determined to be of minimal importance to performance in relation to the current WP design and materials selection. For Subissue 1, Corrosion Effects, three components have been resolved: 1) dry-air oxidation; 2) hydrogen embrittlement of the outer overpack; and 3) the effect of humid air corrosion on the outer overpack (low importance). For Subissue 2, Materials Stability and Mechanical Failure, one component has been resolved, thermal stability of the outer overpack. For Subissue 3, Spent Nuclear Fuel (SNF) Dissolution, one component has been resolved, dry oxidation as a process for SNF degradation.

For Subissues 1 through 4, three components are currently of primary interest to the staff in the effort to achieve issue resolution. First, corrosion of Alloy C-22 (Subissue 1) is expected to be important to performance, since the choice of Alloy C-22 for the inner overpack greatly extends projected WP lifetime. Details are provided in Section 5.1.4 of the enclosed IRSR. Secondly, cladding integrity (Subissue 3) is expected to be important, if cladding is to be considered as a significant barrier to radionuclide release. Many aspects of cladding degradation need to be addressed, including completion of an evaluation of the range of expected cladding temperatures. See Section 5.3.5 of the enclosed IRSR for details. Finally, solubility limits of Np species (Subissue 3) need to be re-evaluated by DOE. This concern is discussed in Section 5.3.4. Staff expects that mechanical failure of containers caused by disruptive events may be important to performance, however, the effects of disruptive events are not considered in this revision. Estimation of the number of juvenile failures may also impact performance, and this will be addressed in a future revision of the IRSR. Because the Alloy C-22 inner overpack is projected to be long-lived, juvenile failure of containers could be a major contributor to dose to the critical group during the compliance period. Other concerns are also discussed in Section 5 of the IRSR, but work to resolve these issues is only recommended at this time.

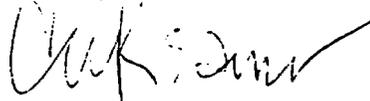
For Subissue 5, criticality within WPs, NRC is currently reviewing DOE's technical approach and assumptions for evaluating disposal criticality safety. As such, resolution of this subissue will be addressed in Revision 2 of this IRSR. Subissue 6, evaluation of DOE alternate design features, will also be discussed in Revision 2.

As discussed in the IRSR, staff has also updated the status of open items from "NRC Staff Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain Site, Nevada," NUREG-1347, August 1989, related to all components of the aforementioned six subissues.

Finally, the enclosure should be viewed as a status report that provides the staff's most current views on the CLST KTI. The report is scheduled to be updated in the future as additional information becomes available. After DOE has had a chance to review this document and comment, as appropriate, we welcome a dialogue regarding it with DOE, the U.S. Nuclear Waste Technical Review Board, State of Nevada, and other interested parties. We would like to note that we have had very useful interactions with DOE project personnel on the testing of container materials and waste form, and on modeling of radionuclide containment and release, and on disposal criticality issues. This IRSR should help facilitate the exchange of ideas between NRC and DOE, as well as provide DOE with an understanding of the criteria that NRC will be using to evaluate the information presented on this subject in DOE's Total System Performance Assessment-Viability Assessment and, ultimately, on DOE's license application for construction authorization.

If you have any questions about this letter, please contact Jennifer Davis of my staff at (301) 415-5874, or via Internet mail service (bjd1@nrc.gov).

Sincerely,



C. William Reamer, Acting Chief
Engineering and Geosciences Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

cc: See attached list

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