March 14, 2007

Mr. Mark H. Williams, Director
Regulatory Authority Office
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1551 Hillshire Drive
North Las Vegas, NV 89134-6321

SUBJECT: REQUEST FOR INTERACTIONS ON THE ISSUES RELATED TO DRIFT DEGRADATION

Dear Mr. Williams:

The purpose of this letter is to bring to your attention U.S. Nuclear Regulatory Commission (NRC) concerns involving U.S. Department of Energy (DOE) design and performance considerations related to drift degradation scenarios at the potential Yucca Mountain High-Level Waste Repository. Independent analyses conducted by the Center for Nuclear Waste Regulatory Analyses (CNWRA) on behalf of the NRC suggest, drift degradation could occur in the first several hundred years of waste emplacement (copy enclosed). Such an occurrence could significantly affect the response of the repository over the expected performance period. In light of the results of our independent analyses, the NRC requests near-term technical interactions with DOE to discuss this issue.

The current publicly available DOE design for the underground facility specifies cylindrical waste packages arranged horizontally in emplacement drifts that are covered by inverted U-shaped drip shields. The design provides a stainless steel ground support system to facilitate safe waste emplacement operations during the preclosure period. DOE estimates that after permanent closure of the repository, the emplacement drifts will remain largely stable for thousands of years, unless the site experiences a disruptive natural event. DOE design stipulates a drip shield that is competent to withstand mechanical loading resulting from the potential effects of rockfall and rubble accumulation that would be expected from seismic events and thermal stresses. The DOE excludes mechanical failure of drip shields from the assessment of engineered barrier performance in the DOE Total System Performance Assessment (TSPA) model. Furthermore, DOE expects to exclude the effects of accumulated rubble on thermal-hydrological parameters from its base case of the TSPA model because DOE estimates that a low probability seismic event would be necessary to cause significant rubble accumulation.

In contrast, independent analyses conducted for the NRC using an alternative conceptual model suggest that repository thermal loading alone could significantly degrade the emplacement drifts during the first several hundred years. Structural analyses of the drip shields under accumulated rubble suggest that some of the static and seismic loads may cause

drip shields to collapse and mechanically interact with waste packages. These analyses considered: (1) the current drip shield and waste package designs presented in publicly available DOE reports; (2) post-closure seismic events; and (3) parameters that may modify performance of the engineered barriers (e.g., degraded drift configuration, rock rubble properties and creep processes for the engineered barriers). The NRC staff recognizes the uncertainties of these analyses, particularly with respect to establishing the extent and timing of rubble accumulation. Nevertheless, these results suggest a need to further evaluate the technical bases for the timing and extent of drift degradation, and its potential effects on the performance of the engineered barriers. The central concern is that some potential failure modes of the drip shields and waste packages may not have been fully considered by DOE in its current design and performance assessments.

Dr. Mysore Nataraja, of my staff, will work with appropriate members of your staff to arrange a technical interaction on this subject. If you have any questions or concerns, please feel free to call me at (301) 415-7275 or by e-mail at jrd1@nrc.gov.

Sincerely,

/RA/

Jack R. Davis, Deputy Director
Division of High-Level Waste Repository Safety
Office of Nuclear Material Safety
and Safeguards

Enclosure: Center for Nuclear Waste Regulatory Analyses, *Summary of Current Understanding of Drift Degradation and Its Effects on Performance at a Potential Yucca Mountain Repository*; Prepared for U.S. Nuclear Regulatory Commission, January 2007, San Antonio, TX.

cc: See attached list.

Letter to M. Williams from J. Davis dated: March 14, 2007

cc:

A. Kalt, Churchill County, NV

R. Massey, Churchill/Lander County, NV

I. Navis, Clark County, NV

E. von Tiesenhausen, Clark County, NV

G. McCorkell, Esmeralda County, NV

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J. Raleigh, SNL

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J. Birchim, Yomba Shoshone Tribe

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E. Hiruo, Platts Nuclear Publications

G. Hernandez, Las Vegas Paiute Tribe

K. Finfrock, NV Congressional Delegation

P. Johnson, Citizen Alert

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J. Williams, DOE/Washington, DC

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M. Plaster, City of Las Vegas

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D. Buckner, Ely Shoshone Tribe

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P. Nair, SNL

B. Neuman, Carter Ledyard & Milburn L.L.P.

E. Bonano, SNL

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Office of Nuclear Material Safety
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cc: See attached list.

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