

Exhibit 26

Exhibit 26

November 13, 2001

Mr. Robert G. Card, Under Secretary  
Energy, Science, and Environment  
U.S. Department of Energy  
1000 Independence Avenue, S.W.  
Washington, D.C. 20585-0001

Dear Mr. Card :

As required by Section 114(a)(1)(E) of the Nuclear Waste Policy Act of 1982, as amended (42 U.S.C. 10134(a)(1)(E)), I am providing you with the preliminary comments of the U.S. Nuclear Regulatory Commission (NRC) regarding a possible geologic repository at Yucca Mountain, Nevada. These comments concern "...the extent to which the at-depth site characterization analysis and waste form proposal for such site seem to be sufficient for inclusion in any application to be submitted by the Secretary for licensing of such site as a repository." As described in more detail below and in the enclosures to this letter, the NRC believes that sufficient at-depth site characterization analysis and waste form proposal information, although not available now, will be available at the time of a potential license application such that development of an acceptable license application is achievable.

There are two important constraints related to NRC's preliminary comments. First, in making these comments, the NRC is making no conclusions concerning the actual site suitability of the Yucca Mountain site. Rather, the NRC comments address whether sufficient information will exist to begin a potential licensing review should DOE submit a license application. Second, NRC's licensing decisions, in terms of a potential repository at Yucca Mountain, will not occur until DOE submits a high-quality license application, the staff completes its independent safety review and issues a safety evaluation report, NRC provides an opportunity for a hearing, and NRC makes its final determination of whether the DOE license application meets NRC regulations. Any NRC licensing decision will be based on all the information available at the time of decision.

The NRC's preliminary comments reflect many years of extensive pre-licensing interaction among the NRC staff, DOE, and various stakeholders, including the State of Nevada, Indian Tribes, affected units of local government, representatives of the nuclear industry, and interested members of the public. NRC staff activities included: (1) engaging DOE in an issue resolution process on key technical issues including obtaining DOE's agreement to provide acceptable responses by the time of the submission of any license application; (2) issuing numerous publicly available technical and program status reports, over the last several years, that reviewed DOE's ongoing site characterization, waste package and waste form, and preliminary design work, and identified additional information that DOE would need to provide in any license application; and (3) interacting with representatives of the State

## **ALTERNATIVE REPOSITORY DESIGNS**

DOE is exploring a flexible design concept to allow for the possibility of operating the repository over a range of thermal conditions. The DOE "Yucca Mountain Science and Engineering Report" describes the flexible design concept. The DOE "FY01 Supplemental Science and Performance Analyses" describes exploratory and scoping evaluations to support the proposed range of thermal operating modes. NRC has reviewed these evaluations and met with DOE to discuss a list of additional information needs. If the DOE were to adopt a lower temperature operating mode or the approach used in the FY01 Supplemental Science and Performance Analyses, then NRC will meet again with DOE to discuss specific additional information needs required for a potential license application. If additional information becomes available before any DOE site recommendation, NRC reserves the right to supplement these preliminary comments.

## **VIEWS OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE**

Finally, it is also worthwhile noting that the Commission's perspective on the adequacy of at-depth site characterization analysis and waste form proposal information is consistent with the NRC's Advisory Committee on Nuclear Waste. Specifically, in letters of September 18, 2001, and September 28, 2001, the Committee appears to agree with the NRC staff's approach to issue resolution and its use of analytical tools as a means to conduct the sufficiency review. The Committee did note, similar to the NRC staff, that substantial additional work by DOE is needed prior to the submission of a potential license application. However, it is our understanding that the issues raised in the Committee's letters are focused on the adequacy of a possible license application and that resolution of its concerns can be achieved in the intervening period between a possible site recommendation and a possible license application.

## **CONCLUSIONS**

NRC's preliminary comments are that DOE has obtained or has agreed to obtain sufficient at-depth site characterization analysis and waste form proposal information required for a possible license application. DOE will continue to develop information needed for a license application. DOE and NRC have reached numerous agreements, representing a broad scope of additional work DOE will complete before any license application. NRC believes the plans and schedules to collect more information represent a reasonable approach. Based on the agreements with DOE, the NRC has reasonable confidence DOE could assemble the information needed for a possible license application.

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**Department of Energy**  
Office of Civilian Radioactive Waste Management  
Office of Repository Development  
1551 Hillshire Drive  
Las Vegas, NV 89134-6321

QA: N/A  
Project No. WM-00011

**JUL 23 2004**

**OVERNIGHT MAIL**

**ATTN: Document Control Desk**  
Director, Division of High-Level Waste  
Repository Safety  
U.S. Nuclear Regulatory Commission  
11555 Rockville Pike  
Rockville, MD 20852-2738

**DISPOSITION OF KEY TECHNICAL ISSUE (KTI) AGREEMENTS AND ASSOCIATED  
"ADDITIONAL INFORMATION NEED" (AIN)**

Reference: Ltr, Ziegler to Reamer, dtd 4/2/04 (Key Technical Issue Agreement Response Schedule)

During the period from August 2000 to September 2001, 16 public meetings were held between the U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) specifically to address those issues most important to the performance of the geologic repository, or "Key Technical Issues." The purpose of these meetings was to resolve NRC staff questions and concerns related to the KTIs in the precicensing period to the extent practical, and thus help assure that DOE has assembled a sufficient level of information to allow NRC to accept the License Application (LA) for review. As a result of these meetings, 293 "KTI Agreements" were established in which DOE agreed to provide additional information to address remaining NRC staff questions and concerns.

As of the date of this letter, DOE has submitted responses to 264 of the 293 agreements, and NRC has determined that 105 of the agreements are complete. By the end of August 2004, DOE plans to submit responses for the remaining agreements, along with supplemental responses for those 17 previously submitted agreement responses that were identified by the NRC staff prior to April 2, 2004, as AIN. This is consistent with our schedule provided to you by the referenced letter. We believe that the previously submitted and forthcoming responses to the agreements are responsive to your staff's questions and concerns.

NM5507

**JUL 23 2004**

During the prelicensing period, the KTI resolution process has served an important role in facilitating resolution of many of NRC staff questions and concerns. With the submission of information pertaining to the last remaining set of outstanding KTI agreements by the end of August 2004, DOE believes that the intended purpose of the KTI agreement process will be met and the process complete for DOE. The DOE would, however, appreciate NRC feedback on agreements that NRC has categorized as "high risk significance" as soon as possible. This will facilitate any necessary DOE actions as we proceed to the licensing process.

Once submitted, the LA and its supporting documentation will be the authoritative source of information upon which the NRC staff will base their review. Since the provision of information from DOE to the NRC in response to the KTI agreements is at a close, DOE expects that any questions or concerns of the NRC will be addressed within the context of the licensing process.

In the May 11, 2004, DOE/NRC Management Meeting, DOE proposed that any future questions or AINs related to KTI agreements that are not closed by the NRC by this summer be addressed after DOE submittal of the LA. Therefore, DOE does not intend to provide direct responses to any additional KTI agreement AINs received after the date of this letter. However, if the NRC staff has any remaining questions or concerns, DOE will evaluate those questions or concerns and determine an appropriate way to address the NRC staff's issue. For example, DOE may elect to address the issue directly in the LA, or in any future modifications to documents supporting the LA. In either case, the NRC staff will have the opportunity to review DOE's technical basis. We believe this approach is appropriate and necessary at this point in time, and in accord with our intent to continue open and productive interactions with the NRC staff during the prelicensing period on matters relating to DOE's LA.

This letter contains no new regulatory commitments. Please direct any questions concerning this letter to Timothy C. Gunter at (702) 794-1343 or e-mail [timothy\\_gunter@ymp.gov](mailto:timothy_gunter@ymp.gov).

  
Joseph D. Ziegler, Director  
Office of License and Application Strategy

OLA&S:TCG-1613

JUL 23 2004

cc:

D. D. Chamberlain, NRC, Arlington, TX  
A. C. Campbell, NRC, Rockville, MD  
L. L. Campbell, NRC, Rockville, MD  
G. P. Hatchett, NRC, Rockville, MD  
N. K. Stablein, NRC, Rockville, MD  
R. M. Latta, NRC, Las Vegas, NV  
J. D. Parrott, NRC, Las Vegas, NV  
D. B. Spitzberg, NRC, Arlington, TX  
B. J. Garrick, ACNW, Rockville, MD  
H. J. Larson, ACNW, Rockville, MD  
W. C. Patrick, CNWRA, San Antonio, TX  
Budhi Sagar, CNWRA, San Antonio, TX  
J. R. Egan, Egan & Associates, McLean, VA  
J. H. Kessler, EPRI, Charlotte, NC  
M. J. Apted, Monitor Scientific, LLC, Denver, CO  
Rod McCullum, NEI, Washington, DC  
W. D. Barnard, NWTRB, Arlington, VA  
R. R. Loux, State of Nevada, Carson City, NV  
Pat Guinan, State of Nevada, Carson City, NV  
Alan Kalt, Churchill County, Fallon, NV  
Irene Navis, Clark County, Las Vegas, NV  
George McCorkell, Esmeralda County, Goldfield, NV  
Ron Damele, Eureka County, Eureka, NV  
Michael King, Inyo County, Edmonds, WA  
Andrew Remus, Inyo County, Independence, CA  
Mickey Yarbrow, Lander County, Battle Mountain, NV  
Spencer Hafen, Lincoln County, Pioche, NV  
Linda Mathias, Mineral County, Hawthorne, NV  
L. W. Bradshaw, Nye County, Pahrump, NV  
Mike Simon, White Pine County, Ely, NV  
R. I. Holden, National Congress of American Indians, Washington, DC

Exhibit 28

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Description	Document Number	Baseline Complete
Simulation of Net Infiltration for Present-Day and Potential Future Climates	MDL-NBS-HS-000023	06/17/07
Data Analysis for Infiltration Modeling: Extracted Weather Station Data used to Represent Present and Potential Future Climate Conditions within the Vicinity of Yucca Mountain	ANL-MGR-MD-000015	12/22/06
Data Analysis for Infiltration Modeling: Development of Soil Units and Associated Hydraulic Parameter Values	ANL-NBS-HS-000055	12/21/06
UZ Flow Models and Submodels	MDL-NBS-HS-000006	09/08/07
Calibrated UZ Properties	ANL-NBS-HS-000058	06/04/07
Radionuclide Transport Models Under Ambient Conditions	MDL-NBS-HS-000008	09/23/07
Particle Tracking Model and Abstraction of Transport Processes	MDL-NBS-HS-000020	09/23/07
Alcove 8 - Niche 3 Seepage and Transport Models	ANL-NBS-HS-000056	12/01/06
Saturated Zone Flow and Transport Model Abstraction	MDL-NBS-HS-000021	Concurrent with TSPA AMR
Hydrogeologic Framework Model for the Saturated-Zone Site-Scale Flow and Transport Model	MDL-NBS-HS-000024	04/19/07
Saturated Zone Site Scale Flow Model	MDL-NBS-HS-000011	05/20/07
Site Scale Saturated Zone Transport	MDL-NBS-HS-000010	06/30/07
Saturated Zone In-Situ Testing	ANL-NBS-HS-000039	05/16/07
Biosphere Model Report	MDL-MGR-MD-000001	10/07/07
Soil-Related Input Parameters for the Biosphere Model	ANL-NBS-MD-000009	Completed 10/11/2006
THC Sensitivity Study of Repository Edge and Heterogeneous Permeability Effects	ANL-NBS-HS-000047	09/03/07
Abstraction of Drift Seepage	MDL-NBS-HS-000019	Concurrent with TSPA AMR
Pitzer Database Expansion to Include Actinides and Transition Metal Species (DATA0.YPF.R1)	ANL-WIS-GS-000001	9/30/2007
In-Drift Precipitates/Salts Model	ANL-EBS-MD-000045	04/02/07
Thermal Testing Measurements Report	TDR-MGR-HS-000002	03/23/07
Drift-Scale THC Seepage Model	MDL-NBS-HS-000001	07/08/07
Near Field Chemistry Model	TBD	9/30/2007
Engineered Barrier System: Physical and Chemical Environment	ANL-EBS-MD-000033	09/30/07
Thermal Management Flexibility Analysis	ANL-EBS-MD-000075	09/14/06
Post-Closure Thermal Envelope Study	ANL-NBS-HS-000057	10/27/07
Analysis of Invert Hydrologic Properties	ANL-NBS-HS-000053	9/30/2007
Multiscale Thermohydrologic Model	ANL-EBS-MD-000049	09/30/07
In-Drift Convection and Condensation	MDL-EBS-MD-000001	09/10/07
Qualification of Thermodynamic Data for Geochemical Modeling of Mineral-Water Interactions in Dilute Systems	ANL-WIS-GS-000003	05/30/07

Russ Dyer → Bob Lux  
3/30/07

In-Package Chemistry Abstraction	ANL-EBS-MD-000037	8/1/2007
Dissolved Concentration Limits of Elements with Radioactive Isotopes	ANL-WIS-MD-000010	09/24/07
Waste Form and In-Drift Colloids-Associated Radionuclide Concentrations: Abstraction and Summary	MDL-EBS-PA-000004	09/24/07
MOX Spent Nuclear Fuel and LaBS Glass for TSPA-LA	ANL-WIS-MD-000022	03/16/07
Radionuclide Screening	ANL-WIS-MD-000006	03/23/07
Waste Package Inventory Allocation Analysis	ANL-WIS-MD-000025	Concurrent with TSPA AMR
Stress Corrosion Cracking of the Drip Shield, the Waste Package Outer Barrier, and the Stainless Steel Structural Material	ANL-EBS-MD-000005	04/19/07
General Corrosion and Localized Corrosion of Waste Package Outer Barrier	ANL-EBS-MD-000003	05/05/07
HIC of Drip Shield	ANL-EBS-MD-000006	06/23/07
Analysis of Mechanisms for Early Waste Package/Drip Shield Failure	ANL-EBS-MD-000076	05/12/07
Analysis of Dust Deliquescence for FEP Screening	ANL-EBS-MD-000074	10/28/07
Cladding Degradation Summary	ANL-WIS-MD-000021	07/12/07
Mechanical Assessment of the Waste Package Subject to Vibratory Ground Motion	MDL-WIS-AC-000001	08/24/07
Seismic Consequence Abstraction	MDL-WIS-PA-000003	08/30/07
Criticality Input To Canister Based System Performance Specification for Disposal	TDR-DS0-NU-000002	01/02/07
Evaluate Probability of Post-Closure Criticality	ANL-DS0-NU-000001	10/26/07
Drift Degradation Analysis	ANL-EBS-MD-000027	02/25/08
Dike/Drift Interactions	MDL-MGR-GS-000005	05/04/07
Atmospheric Dispersal and Deposition of Tephra from a Potential Volcanic Eruption at YM NV	MDL-MGR-GS-000002	11/27/07
Number of Waste Packages Hit by Igneous Intrusion (Rev. 3)	ANL-MGR-GS-000003	07/27/07
Magma Dynamics at YM, Nevada	ANL-MGR-GS-000005	05/23/07
Magma Dynamics at YM, Nevada	ANL-MGR-GS-000005	03/10/08
Characterize Eruptive Processes at YM, Nevada (EPPR)	ANL-MGR-GS-000002	02/26/07
The Development of the TSPA-LA FEPs - Criticality	TDR-WIS-MD-000003	11/01/07
The Development of the TSPA-LA Features, Events and Processes	TDR-WIS-MD-000003	07/20/07
Postclosure Nuclear Safety Design Bases Document	ANL-WIS-MD-000024	08/31/07
TSPA Model/Analysis for the LA	MDL-WIS-PA-000004	TBD
WAPDEG Analysis of Waste Package and Drip Shield Degradation	ANL-EBS-PA-000001	05/31/07
EBS Radionuclide Transport Abstraction	ANL-WIS-PA-000001	08/01/07

Exhibit 29

Exhibit 29



U.S. Department of Energy  
Office of Civilian Radioactive Waste Management



[www.ocrwm.doe.gov](http://www.ocrwm.doe.gov)

# Seismic Design Considerations

Presented to:  
**NRC/DOE Technical Exchange on Layout and Operations**

Presented by:  
**Michael A. Darlington**  
Civil/Structural Engineering Services  
Engineers, Inc.

Presented by:  
**Michael A. Darlington**



# Seismic Analysis Approach

- **Tier-1 Analysis**
  - Determine response of structures for seismic loads
  - Determine seismic forces and design structural members
  - Demonstrate Compliance with Nuclear Safety Design Bases in License Application
  - Development of In-Structure Response Spectra (ISRS) for component qualification
  - Demonstrate safety of ITS facilities
- **Tier-2 Analysis**
  - Basis of Detailed Design Calculations
  - Confirm Tier-1 Analysis Results
  - Available May 2008



Exhibit 30

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## U.S. Nuclear Regulatory Commission

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### **CNWRA 2006-02, Rev. 1, "Summary of Current Understandings of Drift Degradation and Its Effects on Performance at a Potential Yucca Mountain Repository."**

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**CNWRA 2006-02 Revision 1**

# **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 Contract NRC-02-02-012**

***Prepared by***

**Center for Nuclear Waste Regulatory Analyses San Antonio, Texas**

**August 2006 Revised January 2007**

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**CNWRA 2006-02 Revision 1**

# **SUMMARY OF CURRENT UNDERSTANDING OF DRIFT DEGRADATION AND ITS EFFECTS ON PERFORMANCE AT A POTENTIAL YUCCA MOUNTAIN REPOSITORY**

***Prepared for***

shield. The model considers dynamic amplification of loads due to seismic ground motions. If collapsed, the ability of the drip shield to divert water could be compromised. Initially, the abstraction assumes that collapsed drip shields are capable of diverting some of the incoming seepage. Over time the capability of the drip shield to divert seepage diminishes at a constant rate until the drip shield is fully corroded, at which time no further water diversion is considered.

If the drip shield collapses, then seepage water may contact the waste package during the thermal period, possibly leading to the formation of evaporative brines on the waste package and inducing localized corrosion. Detailed descriptions of the proposed evaporative brine chemistry and localized corrosion abstractions have been provided by Dunn, et al. (2005) and Pensado, et al. (2006). Based on numerical simulations of evaporation of waters present in the repository host rock in the unsaturated zone, pH and concentrations of ionic species in potential brines were estimated. Localized corrosion could initiate if the Alloy 22 corrosion potential exceeds the repassivation potential (both potentials are computed as functions of the ionic concentrations, temperature, and pH). If the drip shield fails to divert water only after the thermal period, the waste package temperature may not be sufficient to support localized corrosion.

A collapsed drip shield may transfer accumulated rubble loads to the waste package, possibly resulting in mechanical breaching of the waste package. Details of the proposed abstraction are described in Ibarra, et al. (2006), which focused on the transfer of rubble loads through drip shield bulkheads and longitudinal stiffeners. Similar to the drip shield collapse abstraction, the transferred accumulated rubble load is compared to the structural capacity of the waste package. When the demand exceeds the capacity, waste package breaching is assumed to occur. The abstraction also considers amplification of static loads from seismic events. Once the drip shield plates are fully corroded, accumulated rubble loads are assumed redistributed over a wider area than bulkheads and stiffeners. Load redistribution is assumed sufficient to lower the demand below the waste package capacity. Therefore, mechanical breaching of the waste packages could occur until the drip shield plates are fully corroded, and not at all afterward. Similar to the drip shield collapse abstraction, the model implements an initial breaching fraction on the waste package surface, which may grow at an assumed constant rate (e.g., later seismic events may cause the breached area to grow) until waste package materials are completely corroded, after which no further water diversion by the waste package is considered.

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## 7 SUMMARY AND RECOMMENDATIONS

The current staff understanding of drift degradation at a potential Yucca Mountain repository and its possible effects on repository performance are summarized in this report. Independent analyses show that potential degradation of the emplacement drifts after permanent closure likely affects the mechanical integrity of engineered barriers and thermohydrologic parameters important to corrosion and seepage. These effects appear potentially important to waste isolation, depending on the extent, timing, and rate of drift degradation. This report examines DOE information characterizing the degradation of emplacement drifts after permanent closure. DOE use of the information to support disposition of features, events, and processes related to drift degradation also was examined. The report focused on understanding the DOE information, staff views of the information, and independent CNWRA staff analyses relevant to the information. The use of drift degradation information in performance assessments was discussed, considering the DOE approach and the staff independent performance assessment. Staff questions regarding uncertainties in DOE information for drift degradation and potential effects on repository performance are highlighted. The following observations arise from information presented in the report.

DOE analysis indicates significant drift degradation may result from low probability seismic events, but the effects of repository thermal loading and time-dependent rock weakening on drift degradation would be insignificant for 10,000 years. Therefore, the DOE performance assessment (i) does not intend to include any effects of drift degradation in the basecase (or nominal) scenario, (ii) would include the effects of rubble accumulation in the analysis of seepage and thermohydrologic parameters for the seismic scenario, and (iii) would exclude accumulated-rubble loading from the seismic scenario because DOE intends to design the drip shield to withstand such loading. Consequently, DOE performance assessment does not intend to consider potential drip shield mechanical collapse in assessing the integrity of drip shields and waste packages.

Based on current staff understanding, the apparent DOE approach to accounting for the potential effects of drift degradation in Total System Performance Assessment does not include a complete range of credible failure modes for the engineered barriers. Independent analyses by the Center for Nuclear Waste Regulatory Analyses (CNWRA) suggest (i) repository thermal loading (based on current DOE design concept) alone could cause degradation of the emplacement drifts and significant accumulations of rock rubble within approximately 1,000 years after closure and (ii) the drip shield, as currently designed, could collapse onto the waste package as a result of static or seismic loading and creep from the accumulated rock rubble. Staff currently are evaluating the risk significance of these results in the NRC Total-system Performance Assessment. The central concern, however, is that potentially significant failure modes of the engineered barriers are not being appropriately considered by DOE. For example, analysis of the current drip shield design indicates that an assessment of the mechanical performance of the waste package would need to consider a range of potential loading from a collapsed drip shield. Independent CNWRA analyses suggest mechanical breaching of the waste package under static loading conditions appears unlikely, but the effects of seismic loading warrant additional consideration. A first-order CNWRA analysis of loading during seismic events at a mean annual frequency of exceedance of  $1 \times 10^{-5}$  per year or lower indicates the waste package safety margin against mechanical failure may be significantly reduced, and for some realizations it may be less than unity. Additional analyses are warranted to understand how potential static or seismic loading may affect the mechanical integrity of a

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waste package subjected to loading from a collapsed drip shield. The current DOE approach, however, does not consider a complete range of loading conditions and processes such as creep that may affect the performance of the drip shield or waste package, and DOE has not planned to conduct additional analyses in these relevant areas.

Staff raised several questions during DOE and NRC technical exchanges and management meetings to address uncertainties in DOE information for drift degradation and its potential effects on repository performance. To address the staff questions, DOE performed laboratory and field tests and analyses using several different numerical modeling techniques. The DOE testing and analyses still showed appreciable uncertainties regarding drift degradation processes. These uncertainties were resolved by a DOE commitment to develop a drip shield design that would be structurally competent to withstand the effects of drift degradation. Staff relied on this commitment in recommending closure of several key technical issue agreements related to drift degradation, mechanical performance of the drip shield, and the effects of drift degradation on seepage and thermohydrologic near-field parameters.<sup>1,2</sup> Available information, however, indicates that the current DOE drip shield design apparently does not accomplish the DOE-established design objective in response to the full range of loadings associated with drift degradation processes.

The presence or absence of an intact drip shield affects the performance of the engineered barrier system, with the most sensitive effects likely occurring during the thermal period of postclosure. Thus, an understanding of drip shield performance appears necessary for developing a complete understanding of the total system performance of the potential repository system. Based on their evaluations, staff recommend an interaction with DOE to discuss the mechanical performance of the drip shield design. This interaction would include discussion of the drift degradation parameters used to assess drip shield performance and the approaches used to assess the mechanical performance of waste packages in the event of drip shield collapse for both nominal and seismic scenarios.

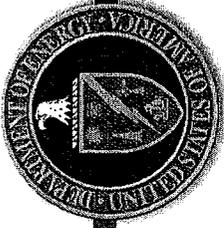
DOE also needs to clarify the duration of ventilation during the preclosure period. Current DOE analyses indicate the emplacement drifts and other underground openings would be stable for 50 years after waste emplacement, if the drift thermal load is reduced by 90 percent through active ventilation of the emplacement drifts. DOE should clarify whether active ventilation would continue if the preclosure period should extend beyond 50 years. Alternatively, DOE could provide information to assess the stability of the underground openings under a full thermal load (i.e., if not ventilated). Stability of underground openings through the preclosure period appears relevant to staff reviews of a potential license application in areas including performance confirmation, implementation of design assumptions used in performance assessment, and aspects of repository operations before permanent closure.

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<sup>1</sup>Pre-licensing Evaluation of Agreements in "Technical Basis Document Number 4, Mechanical Degradation and

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U.S. Department of Energy  
Office of Civilian Radioactive Waste Management



[www.ocrwm.doe.gov](http://www.ocrwm.doe.gov)

# Probabilistic Volcanic Hazard Analysis Update

Presented to:  
**Nuclear Waste Technical Review Board**

Presented by:  
**Kevin J. Coppersmith**  
**Consultant to Lead Laboratory Disruptive Events Group**

**May 15, 2007**  
**Arlington, Virginia**

**Predecisional - Preliminary**

# History Leading to PVHA-U

- Following completion of the PVHA, new aeromagnetic and ground magnetic data became available suggesting possible buried volcanic centers in Crater Flat
- DOE sensitivity study indicated a modest increase in the mean annual frequency of intersection of the repository; transmitted to NRC for review
- The NRC staff concluded DOE did not provide an adequate technical basis and that additional information was needed
- DOE made a regulatory commitment to complete a program of field studies (aeromagnetic survey, drilling, and sampling), data analysis, and to plan an update to the PVHA; final documentation is planned for Fiscal Year 2008 during License Application review



# Schedule

Activity	Schedule
Planning	July to September 2004
Select and Retain Experts	August to September 2004
Distribute Information to Experts for Review	September 2004
Workshop 1 Key Issues and Available Data	October 11 to 15, 2004
Workshop 2 Alternative Models	February 15 to 18, 2005
Workshop 2A Approaches to Volcanic Hazard Modeling	August 30 to 31, 2005
Field trip to event-definition analogue sites	May 2 to 4, 2006
First Round of Elicitation Interviews	July to August 2006
Workshop 3 Preliminary Expert Assessments	September 26 to 27, 2006
Second Round of Elicitation Interviews	November to December 2006
Preliminary Hazard Calculations and Sensitivity Analyses	January to April 2007
Workshop 4 Feedback	May 10-11, 2007
Experts Finalize Elicitation Summaries	July 2007
Final Hazard Calculations and Aggregation of Expert Assessments	July 2007 to January 2008
Report Preparation/Finalization	November 2007 to June 2008

Complete



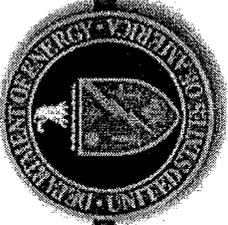
# Summary

- **PVHA-U methodology consistent with guidance for formal expert elicitation processes within regulated environment**
- **PVHA-U takes advantage of the lessons learned and opportunities for refinement**
- **Process structured around workshops and expert interactions**
- **PVHA-U results will be documented in Fiscal Year 2008 during the NRC's License Application review**



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U.S. Department of Energy  
Office of Civilian Radioactive Waste Management

[www.ocrwm.doe.gov](http://www.ocrwm.doe.gov)

# Root Cause Analysis and Action Plan In Response to USGS Email Issues

Presented to:  
**Nuclear Regulatory Commission**

Presented by:  
**Ward Sproat**  
Director  
Office of Civilian Radioactive Waste Management (OCRWM)

March 27, 2007  
Rockville, Maryland

# Extent of Condition

- **Extent of condition was assessed through**
  - **Keyword searches of over 900,000 emails**
  - **Physical review of more than 50,000 LSN-relevant and non-relevant emails from 14 million email records in the OCRWM email warehouse**
  - **Review of over 7,000 documents related to the Corrective Action Program**
  - **Review of 1,138 records from the employee concerns programs**



Exhibit 33

Exhibit 33

**SUMMARY OF THE  
U.S. NUCLEAR REGULATORY COMMISSION / U.S. DEPARTMENT OF ENERGY  
QUARTERLY MANAGEMENT MEETING  
IN ROCKVILLE, MARYLAND  
NOVEMBER 22, 2004**

**Introduction**

The U.S. Nuclear Regulatory Commission (NRC) and U.S. Department of Energy (DOE) held a public quarterly management meeting on November 22, 2004. The purpose of this meeting was to discuss the overall progress of the project at the proposed geologic repository site at Yucca Mountain (YM), Nevada. The meeting was hosted at the NRC Headquarters in Rockville, Maryland, with audio connections to the Center for Nuclear Waste Regulatory Analyses (CNWRA) in San Antonio, Texas, and to the DOE offices in Las Vegas, Nevada. Other participants included representatives from NRC Region IV, the State of Nevada, the Nevada Nuclear Waste Task Force, Public Citizen, the press, and interested members of the public.

The NRC issued the notice for this public meeting on November 4, 2004. The meeting notice is available in the NRC Agencywide Documents Access and Management System (ADAMS) at Accession No. ML043090582.

**NRC Opening Remarks**

Mr. Jack Strosnider, Director, Office of Nuclear Materials Safety and Safeguards, NRC started the meeting by welcoming DOE managers, members of the public, and all other stakeholders.

He acknowledged that DOE might not be able to submit a license application (LA) for a geologic repository at Yucca Mountain, Nevada, by December 2004. He said that EPA had not specifically stated when and how it would revise its YM standard. He also said NRC would amend 10 CFR Part 63 to be consistent with any EPA revisions to the YM standard and that interested parties would have the opportunity to submit public comments in any rulemaking.

Mr. Strosnider noted that in August 2004 the Pre-license Application Presiding Officer (PAPO) Board granted the State of Nevada's motion to strike DOE's licensing support network (LSN) certification, and in September 2004, DOE filed a Notice of Appeal with the Commission to overrule a portion of the PAPO Board's August 31, 2004 order. He said DOE had indicated it would comply with those portions of the order that it did not appeal. On November 10, 2004, the Commission issued an order holding DOE's appeal in abeyance. Mr. Strosnider reminded the audience that, according to NRC regulations in 10 CFR Part 2, the staff cannot docket the LA until at least 6 months have elapsed from the time of DOE certification. He said NRC is interested in hearing from DOE about DOE's schedule for completing activities leading up to a DOE LSN certification and for submitting an LA.

Mr. Strosnider concluded by noting that the President's budget request for FY 2005 includes significant increases for the NRC's LA review, for the high level waste information technology and information management (IT/IM) metasystem, and for the NRC public hearing. He stated

and the complete text of the ASLB decision. Since then, new internal requirements have been established, the budget has been realigned, and DOE is proceeding with additional work. DOE expects to recertify the LSN in the spring of 2005 timeframe.

Mr. Arthur noted that DOE would not submit the LA in 2004. In September 2004 DOE and Bechtel SAIC Company (BSC) completed a major management review of the draft LA. This review indicated that the science and design work completed in support of the LA was technically sound, was adequate for its intended purpose, and meets quality assurance requirements. This work supports robust safety analyses for the preclosure (operational) period through 10,000 years after permanent closure and was thoroughly cross-referenced against the requirements in 10 CFR Part 63 and the guidance in the YMRP.

Mr. Arthur said that DOE needs to refine the presentation of this technical work for licensing. Also, DOE needs to assure the transparency, traceability, and the self-sufficiency of the LA; and if necessary, clarify the presentation of technical, analytical, and compliance information; improve the readability of the document; provide more details, particularly in distinguishing structures, systems, and components that are important to safety or important to waste isolation; verify document-to-document consistency between the LA and underlying technical documents that were in revision during the development of the draft LA (principally Analysis and Modeling Reports, System Description Documents, Facility Description Documents, and the Preclosure Safety Analysis); and document some additional preclosure and design detail, consistent with discussions between DOE and NRC in the September 2004 technical exchange and based in part on DOE internal design reviews (in particular, important-to-safety Electrical Systems and the Aging Facility.)

Following the September management review, DOE and BSC produced an interim consolidated draft LA. This will form the basis for the final application. By the next NRC/DOE quarterly management meeting, DOE expects to discuss detailed plans and present a revised estimate for completing and submitting the LA to the NRC.

With respect to key technical issues, Mr. Arthur stated that on August 31, 2004, DOE submitted the remaining 17 of the 293 agreement item responses to the NRC. With this submission of information, the intended purpose of the KTI process has been met and the process completed for DOE. The KTI process has served an important role in facilitating resolution of many of the NRC staff's questions and concerns. Although the NRC has not yet evaluated and closed all of the agreements, DOE expects that any additional NRC staff questions or concerns regarding these agreement topics will be addressed during the licensing process.

With respect to Analysis and Model Reports (AMRs) supporting the LA, Mr. Arthur said that Phase II of the Regulatory Integration Team's (RIT) phase activities were almost complete. DOE has reviewed and is revising the AMRs to assure that they are suitable for the intended technical and regulatory audiences. To date, 87 of the 89 AMRs have been approved. The remaining two documents are scheduled for completion in November 2004. Quality metrics and quality assurance oversight indicate that this process has been effective based on the number of insignificant issues and unresolved items found during checking. Overall Mr. Arthur noted that the intent of DOE letter of May 28, 2004, to the NRC was being achieved.

Mr. Arthur then reported that for preclosure analyses, a Preclosure Design Integration Team was initiated to ensure that the preclosure safety basis is well defined, understandable,

Exhibit 34

Exhibit 34

# **TECHNICAL GUIDANCE FOR LICENSE APPLICATION PLANNING (Plan B: Compliance-Focused Program)**

## **1. INTRODUCTION**

The purpose of this document is to provide a consistent set of technical guidance to the organizations involved in the planning for the license application (LA) under the compliance-focused program (Plan B). Plan B focuses on identifying the minimum but sufficient scope of work required to submit an LA that is considered to be docketable, should the Yucca Mountain site be recommended and approved. This work scope will be sharply focused using a risk-informed, performance-based approach to define the work necessary to defend the preclosure and postclosure licensing arguments. This top-down approach to ensure regulatory compliance differs from the bottom-up approach used to develop the initial Detailed Work Plan (DWP). The approach is expected to result in a reduction in the amount of work necessary to prepare a docketable LA. Therefore, Plan B results will need to be communicated to the NRC in planned follow-on KTI-related technical exchanges to ensure that NRC understands and accepts the basis for any proposed changes.

The area of greatest challenge in this planning effort is the area of performance assessment (PA), which includes the testing program as well as process model analyses and modeling. Recent organizational changes at Bechtel SAIC Company (BSC) will facilitate the planning in this area. The PA Strategy/Scope organization is currently developing a postclosure compliance strategy to be used in defining and conducting the total system performance assessment (TSPA) and identifying the information needs. This strategy will be reviewed by a new TSPA Oversight Group that reports directly to the BSC Manager of Projects, and will be subsequently validated by the Postclosure Strategy Board recently formed. This strategy will drive the planning for the scope of work to be conducted to fulfill the needs of the TSPA.

The approach to planning has been broken into eight components. The first component is the overarching general guidance that must be considered in developing more detailed plans by all areas of the Project. The next seven components consist of the individual guidance related to the different areas of the Project (License Application/Licensing; Design; Preclosure Safety Assessment; Performance Assessment; Special Projects; Site Operations; and Business, Technical Support, and Programmatic Areas) that must work together to support development and submittal of a docketable LA.

This guidance also contains two appendices. Appendix A contains a listing of the key assumptions upon which the planning of this work is based. Appendix B discusses the strategic approach to be used in identifying the information to be contained in the Licensing Support Network (LSN) and activities required to support LSN certification. A strategic planning schedule is being issued separately as a companion to this technical guidance. That schedule is a top-down schedule that summarizes the key activities and milestones that serve as the overall framework for this planning, consistent with the DOE goal of an LA submittal in December 2004. The dates in the strategic planning schedule should not be interpreted as the definitive

Existing quality issues must be resolved expeditiously and appropriate measures taken to prevent recurrence. Resolution of these issues will be conducted in accordance with the Performance Improvement Transition Plan, which will be incorporated into this planning effort.

The technical basis for the LA, which will support LA preparation and any eventual NRC review, must be essentially complete eight months prior to LA submittal to support BSC's initial LSN certification process. BSC will complete the initial certification of the LSN to the DOE seven months prior to LA submittal so that DOE has one month to prepare their initial certification to the NRC six months prior to LA submittal as required by 10 CFR Part 2, Subpart J. Adequate time is provided for the certification processes to allow for implementation of corrective actions, if needed. It is expected that some development of technical information will continue through submittal of the LA and afterwards, and consequently there will be incremental certification coincident with amendments of the LA.

This technical basis will build on the final technical basis for a possible SR decision, to the extent possible. Doing this should provide both schedule and cost benefits for completion of the LA and its supporting technical basis. This approach should also facilitate NRC review and completion of the staff Safety Evaluation Report (SER) within the 18-month period described in the schedule for the LA proceedings in Appendix D of 10 CFR Part 2. This is because the NRC reviewed the preliminary technical documents for a possible SR decision as one basis for developing its preliminary sufficiency comments. Any significant changes to the technical basis existing at the time of a possible SR decision must be justified in terms of their relevance to meeting the primary objective for submittal of a complete and defensible LA and any potential cost impacts. Since the NRC's preliminary sufficiency comments were largely based on the site characterization and design information supporting a possible SR decision, significant changes to this information may require additional NRC review.

Development of the technical documents that provide information needed to prepare the LA will take place in parallel only when that approach will not affect the quality of downstream products (e.g., development of Process Model Reports (PMRs) in parallel with the Total System Performance Assessment (TSPA), assuming that the TSPA is based on the Analysis and Model Reports (AMRs)). Adequate review time must be provided to ensure that the information incorporated in downstream products, including draft LA chapters, is consistent with the final source material. Version control of all documents must be maintained and a structured process adhered to for document development and review.

The technical work conducted following a possible site recommendation and prior to completion of the technical basis for the LA must clearly focus on:

- Providing additional design-specific information needed as part of the technical basis for the LA that was not needed for a possible SR decision;
- Improving confidence in or refining models and other elements of the existing SR technical basis to develop the technical basis for the compliance case presented in the LA for NRC review.

carefully evaluated based on the final NRC requirements to ensure that the plan described in the LA is limited to what is adequate and necessary to satisfy these regulatory requirements. If the YMRP is issued by June 2002, an evaluation will be made as to the best method of presenting the information in the LA that takes into account the YMRP. This will be captured in the Management Plan for the Development of the Yucca Mountain License Application. Significant changes to the LA Guidance, LA Products List, and LA format and content due to the YMRP are not included in the plan.

To support the DOE goal of submitting the LA to the NRC by December 2004, inputs to the LA will be conducted in a phased manner. As illustrated in the strategic planning schedule, the first drafts of the programmatic sections of the LA need to be completed by December 2003. The draft sections on design, science, preclosure safety assessment, and total system performance assessment need to be completed by March 2004. The LA review schedule has been shortened to 38 weeks. Technical and regulatory reviews of draft LA sections by the affected offices within the DOE, as well as Naval Reactors, must occur in parallel to make the initial review process as efficient as possible. The review of draft sections must be sufficiently complete along with the essential supporting technical basis documents before the initial BSC LSN certification process begins, eight months prior to LA submittal. DOE management review of and concurrence on the integrated LA, and production of the final document, will take place during the six months following initial LSN certification. Changes and additional information developed during the DOE management review will be included in the LSN with a supplementary certification at the time of LA submittal.

In addition to having overall responsibility for LA development, the BSC License Application Project will also be the prime author for selected sections of LA Chapters 1 (Introduction), 2 (Conformance with Technical Criteria), and 11 (Conduct of Operations and Related Topics).

To help ensure docketing of the LA and completeness of the LSN for significant safety matters, plans will be developed for phased NRC review of project technical documentation that provide the basis for the safety case. Pre-licensing interactions with the NRC will be clearly linked to the completion of documentation to address the KTI agreement items. Additional meetings will be considered, as appropriate, to reach early agreement with the NRC on the LA format and content, resolution of preclosure safety and design-detail issues, and selected approaches and methodologies critical to the licensing case. Interactions will continue on the topical reports currently under NRC review or for which DOE has committed to provide additional information (e.g., seismic design basis, criticality).

With respect to the LSN, Appendix B discusses the approach to be used to streamline the identification and loading of the documentary material required by 10 CFR Part 2, Subpart J, as well as the timing for the different activities needed to ensure LSN certification by June 2004.

The License Application Project will develop a Licensing Strategy and a Regulatory Guidance Matrix to ensure consistent approaches to design and analysis. The Licensing Strategy will incorporate the postclosure compliance strategy discussed in Sections 1 and 6.