Department of Energy
Washington, DC 20585

Susan: Pls enter. Thanks. Pauline Brooks 6/13/94

June 10, 1994

Mr. Joseph J. Holonich, Chief
High-Level Waste and Uranium
Recovery Project Branch
Division of Waste Management
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) Ltr, Shelor to Linehan, dtd 12/14/90
(2) Ltr, Bernero to Bartlett, dtd 7/31/91
(3) Ltr, Shelor to Holonich, dtd 3/30/94
(4) Ltr, Shelor to Holonich, dtd 5/17/94

Dear Mr. Holonich:

On December 14, 1990, the U.S. Department of Energy (DOE) transmitted its responses (Reference 1) to objections, comments, and questions presented in the U.S. Nuclear Regulatory Commission's (NRC) Site Characterization Analysis (SCA). The NRC staff evaluated these responses, closing some of the items and creating open items of the remainder (Reference 2).

The purpose of this letter is to present the supplemental response to Question 47, the final SCA open item related to the Substantially Complete Containment (SCC) requirement; to summarize the proposed resolution for the other SCC related open items (complete supplemental responses were provided in References 3 and 4); and to request the NRC review these responses and provide confirmation that the responses are adequate to close these items. The enclosure provides the supplemental response to the NRC staff evaluation and the administrative record for Question 47.

In Comments 5 and 80 and Questions 46 and 47 on the DOE Site Characterization Plan (SCP), the NRC staff noted inconsistencies between the goals for waste package performance and the SCC requirement in 10 Code of Federal Regulations (CFR) 60.113. These comments and questions requested that the DOE provide additional explanation of the impact of technological limitations and uncertainties on compliance with this requirement. This additional information is summarized below.

102.8
WM-11
NH03

Summary of SCC Open Items:

Comment 5:

The comment stated that NRC was concerned that between the Site Characterization Plan Consultation Draft and the final SCP, DOE's concept of SCC allowed for "recognized technological limitations and uncertainties."

Proposed Resolution for Comment 5:

The program's evolution from a disposal concept that included a thin-walled, single barrier, vertically-emplaced waste package to a multibarrier disposal approach in drifts where each barrier is subject to independent processes will dramatically reduce the uncertainty that the substantially complete containment requirement will be met. DOE's plans for the development of the waste package, detailed in the Waste Package Implementation Plan, include consideration of design alternatives and takes into account technological limitations and uncertainties. This approach to meeting the SCC requirement is consistent with the NRC's emphasis on containment during the initial postclosure period.

Comment 80:

The comment stated that NRC was concerned that some performance goals related to the SCC requirement did not seem consistent with DOE interpretation of the containment requirement and the intent of the rule.

Proposed Resolution for Comment 80:

The performance goal for the waste package is to achieve a mean waste package lifetime well in excess of 1,000 years. A multibarrier disposal approach with a drift-emplaced, multipurpose canister permits the peak of the failure distribution of the combined waste package to be reduced and the distribution itself extended in time.

Question 46:

The NRC asked the basis for the SCP statement that considered it appropriate to require that release of isotopes with long half-lives from the waste packages be controlled at a stricter standard during the containment period than during the isolation period.

Proposed Resolution for Question 46:

DOE has eliminated release goals from performance goals for SCC and the concern over stricter controls of long-lived isotopes has been overtaken by events.

Question 47:

The NRC asked the origin of the quantitative SCP definition of waste package failure and the basis for applicability of the definition to high-level waste.

Proposed Resolution for Question 47:

The definition of failure in the SCP was qualitative, conservative, and based on an American National Standards Institute standard. The performance goal of achieving mean waste package lifetimes well in excess of 1,000 years through use of a multibarrier approach will yield failures on the order of one percent at the end of the containment period.

Waste package design is an important element of the advanced conceptual design of the potential repository at Yucca Mountain, Nevada. Demonstrating compliance with the substantially complete containment requirement, 10 CFR 60.113(a)(1)(ii)(A), is a key aspect of waste package design. The DOE intends to meet a performance goal of a mean waste package lifetime well in excess of 1,000 years and, by meeting this goal, demonstrate compliance with the SCC requirement.

On August 24, 1993, the DOE and the NRC held a Technical Exchange on Substantially Complete Containment and Waste Package/Engineered Barrier System Design Concepts. At that meeting, the DOE informed the NRC of its intent to use the 1,000-year waste package performance goal of a mean waste package lifetime, which will provide reasonable assurance that the SCC requirement is met. The DOE described the approach it will use to demonstrate compliance with the containment requirement at the August 24, 1994, technical exchange.

Conclusion:

With resolutions for Comments 5 and 80 and Question 46 (References 3 and 4), and with the proposed resolution for Question 47 in the enclosure to this letter, DOE's responses are complete with respect to resolving outstanding NRC open items on SCC.

The DOE requests that the NRC review supplemental responses to SCA Comments 5 and 80 and Questions 46 and 47, and provide confirmation that the responses are adequate to close these items. With closure of these open items and agreement on the adequacy of this approach, the advanced conceptual design effort will be allowed to proceed without excessive regulatory risk. DOE will know that the overall approach to demonstrating compliance with the SCC requirement is adequate before additional commitment of project resources.

In order to proceed with the repository advanced conceptual design, we request that the NRC's review of these open items be completed and returned by August 1, 1994.

If you have any questions, please contact Chris Einberg of my staff at (202) 586-8869.

Sincerely,

Dwight E. Shelor
Associate Director for
Systems and Compliance
Office of Civilian Radioactive
Waste Management

Enclosure:
Administrative Record
for SCA Question 47

cc: w/enclosure:

R. Nelson, YMPO
R. Loux, State of Nevada
W. Offutt, Nye County, NV
T. J. Hickey, Nevada Legislative Committee
D. Bechtel, Las Vegas, NV
Eureka County, NV
Lander County, Battle Mountain, NV
P. Niedzielski-Eichner, Nye County, NV
L. Bradshaw, Nye County, NV
C. Schank, Churchill County, NV
F. Mariani, White Pine County, NV
V. Poe, Mineral County, NV
J. Pitts, Lincoln County, NV
J. Hayes, Esmeralda County, NV
B. Mettam, Inyo County, CA
M. Knapp, NRC

Enclosure

SCA Question 47 and Original DOE Response

NRC Evaluation of Original DOE Response

DOE Supplemental Response to NRC Question 47

DOE Supplemental Response to Question 47

The definition of "substantially complete containment" was addressed in the response to SCA Comment 80. In that response, the DOE stated that a new performance goal has been established which focused on containment of radionuclides. The goal is to achieve mean waste package lifetimes well in excess of 1,000 years. This means that the number of failures at the initial tail of the failure distribution over time, i.e., during the containment period, will be very small. The DOE will achieve this performance goal through the use of multiple barriers with more than one failure mode. This permits the peak of the failure distribution of the combined waste package to be reduced and the distribution itself to be extended in time. Thus, the fraction failed at 1,000 years will be extremely small, on the order of 1%. This new approach, which focused on containment, is consistent with the NRC's emphasis on containment rather than release during the containment period.

The definition of failure originally provided in the Site Characterization Plan (air flow of 1×10^{-4} atm-cm^3/s) was qualitative and conservative. It was based on ANSI N 14.5 (American National Standard for Radioactive Materials - Leakage Tests on Packages for Shipment), recognizing that acceptance testing would be performed at significantly lower allowable leakage rates, usually less than 1×10^{-7} atm-cm^3/s. This latter level of testing is applicable for spent fuel shipping casks. For reasonable assumptions of waste package failures, the SCP leakage rate yielded release of C-14 well below the one part in 100,000 release rate limit and well below the offsite dose limits given in 40 CFR Part 191.

The DOE plans for the development of the current waste package designs provide for obtaining a substantial body of technical and scientific information, including short- and long-term materials testing, *in situ* testing, model development, environmental studies, and performance evaluation, as well as fabrication studies and prototype testing. These studies are detailed in the Waste Package Implementation Plan (YMP/92-11 Rev. 0, ICN 2).

The DOE plans to demonstrate compliance with its performance goal, and therefore with the containment requirement, will include the waste package development effort, comprehensive design verification, performance assessment, and performance confirmation programs.

The DOE therefore believes that the multi-barrier design approach will provide adequate confidence that the containment requirements will be met. The DOE approach to meeting the NRC SCC requirement is focused on containment with a performance goal of extended waste package lifetimes. This approach is consistent with NRC's emphasis on containment during the initial postclosure

period. The DOE believes that this approach, which does not contain goals for container failures but embodies a very conservative waste package design, will provide the NRC with the basis required for it to find that compliance has been achieved with reasonable assurance.