Department of Energy
Washington, DC 20585

JUN 9 1993

Mr. Joseph J. Holonich, Director
Repository Licensing & Quality Assurance
Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Reference: (1) Ltr, Shelor to Linehan, dtd 12/14/90
(2) Ltr, Bernero to Bartlett, dtd 7/31/91

Dear Mr. Holonich:

On December 14, 1990, the U.S. Department of Energy (DOE) transmitted its responses to objections, comments, and questions presented in the U.S. Nuclear Regulatory Commission's (NRC) Site Characterization Analysis (SCA) (Reference 1). The NRC staff evaluated these responses on July 31, 1991, closing some of the items and creating open items of the remainder (Reference 2). Two of the items, identified above, have been addressed through various actions and progress in the program.

Enclosures 1 through 2 of this letter summarizes the administrative record with respect to SCA items Comment 47 and Question 12, which consist of: (1) DOE's December 14, 1990, response to the open item; (2) NRC's July 31, 1991, evaluation of this response; (3) any subsequent correspondence; and (4) a supplemental response with further explanation or additional information to resolve the open item.

On the basis of the information in the enclosure, DOE regards SCA Comment 47 and Question 12 as resolved.

If you have any questions, please contact Ms. Sheila Long at 202-586-1447 or Mr. Chris Einberg at 202-586-8869.

Sincerely,

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

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WM-11
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Enclosures:
1. Administrative Record for
   SCA Comment 47
2. Administrative Record for
   SCA Question 12

cc: w\enclosures
C. Gertz, YMPO
T. J. Hickey, Nevada Legislative Committee
R. Loux, State of Nevada
D. Bechtel, Las Vegas, NV
Eureka County, NV
Lander County, Battle Mountain, NV
P. Niedzielski-Eichner, Nye County, NV
W. Offutt, 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
C. Abrams, NRC

Enclosure 1

SCA Comment 47 and DOE Response (12/14/90)

NRC Evaluation of DOE Response (7/31/91)

Additional Information Relevant to SCA Comment 47 Open Item

ENCLOSURE 1

Section 8.3.1.8 Overview of the postclosure tectonic program Description of future tectonic processes and events required by the performance design issues

COMMENT 47

The approach to incorporating data derived in the postclosure tectonics program into an assessment of whether performance issues related to the waste package and engineered barrier system (EBS) requirements (10 CFR 60.113(a)) will be met is confusing and may result in an inaccurate assessment of performance.

BASIS

- 10 CFR 60.113(a) requires that containment of HLW be "substantially complete during the period when radiation and thermal conditions in the engineered barrier system are dominated by fission product decay," and that following the containment period any release from the EBS shall be a gradual process which results in small fractional releases to the geologic setting over long times.

- Faulting in the repository could result in releases to the geologic setting.

- Section 8.3.5.10.3 describing information need 1.5.3 (p. 8.3.5.10-55) indicates information is needed from the Postclosure tectonics program. Scenarios developed under Information Need 1.5.2 will also be used to describe the waste package near-field environment (p. 8.3.5.9-87).

- The characterization program specified in SCP Section 8.3.1.8 (Figure 8.3.1.8-1) does not directly address performance Issues 1.4 (Will waste package meet the performance objective), but relies on information needs generated by Issue 1.11.

- Fulfillment of information needs related to Issue 1.11 is largely accomplished through Activities 8.3.1.17.4.6.1 and 8.3.1.17.4.6.2 (Table 8.3.1.8-2b) that, at least in part, specify characterizing "potentially significant Quaternary faults" (8.3.1.17-158). "Potentially significant Quaternary faults" are defined as faults with > 1 m offset of Quaternary materials or with > 100 m of offset of Tertiary rocks (Table 8.3.1.17-4a). Swadley and others (1984, page 19) have indicated that faults in the vicinity of the repository with a "few meters or less" of pure strike-slip movement in the Quaternary may be undetectable with current technology.

- One characterization parameter for addressing Issue 1.11 (Table 8.3.1.8-2b) indicates that faults with > 10 m of offset will be characterized. The tentative goals for establishing fault descriptions for positioning the underground facility (Table 8.3.2.2-5) are locations within ± 30 m and displacements of ± 2 m.

- Faults that have had episodes of movement > 5 cm (performance parameter for fault displacement) may be of significant to fulfilling the requirements of 10 CFR 60.113(a).

RECOMMENDATION

Consideration should be given to establishing a direct path for the integration of data collected in the Postclosure Tectonics program into issues 1.4 (Will waste package meet the performance objective) and 1.5 (Will the waste package and repository engineered barrier system meet the performance objective.)

REFERENCES

Swadley, W.C., Hoover, D.L., and Rosholt, J.N., 1984, Preliminary report on late Cenozoic faulting and stratigraphy in the vicinity of Yucca Mountain, Nye County, Nevada: U.S. Geological Survey Open-File Report 84-788, 42 p.

RESPONSE

The Site Characterization Plan (SCP) emphasized the concern that the need to restrict the emplacement of waste in zones of identified faulting hazard could alter the design of the repository or affect the repository's capability to accommodate the specified 70,000 MTU, if a number of such zones were identified. Issue 1.11 (configuration of underground facilities) was identified in the SCP because this issue is primarily concerned with the repository layout and meeting specified volume requirements that would be affected by the identification of fault zones where waste could not be emplaced. The U.S. Department of Energy agrees that there is another factor to be considered in addition to avoiding recognized faults: the effects of unrecognized or new faults on waste package performance. The mechanism for addressing this concern was not well expressed in the SCP. Study Plan 8.3.1.8.2.1 (Analysis of waste package rupture due to tectonic processes and events) would provide an expanded discussion of this concern and provides a link to Issue 1.4 (Waste package performance objective for containment), Activity 1.4.4.1 (Estimates of the rates and mechanisms of container degradation in the repository environment for anticipated and unanticipated processes and events, and calculation of container failure rate as a function of time). Activity 1.4.4.1 is described in SCP Section 8.3.5.9.4.1.

REFERENCES:

DOE (U.S. Department of Energy), 1990. Study Plan 8.3.1.8.2.1, Revision 0, Analysis of Waste Package Rupture due to Tectonic Processes and Events. Yucca Mountain Project Office, Las Vegas, Nevada. (In Preparation)

Section 8.3.1.8 Overview of the postclosure tectonics program: Description of future tectonic processes and events required by the performance design issues

SCA COMMENT 47

The approach to incorporating data derived in the postclosure tectonics program into an assessment of whether performance issues related to the waste package and engineered barrier system (EBS) requirements (10 CFR 60.113(a)) will be met is confusing and may result in an inaccurate assessment of performance.

EVALUATION OF DOE RESPONSE

- The response to this comment indicates that the concerns expressed will be addresssed in study plan 8.3.1.8.2.1 (Analysis of waste package rupture due to tectonic processes and events) and activity 8.3.5.9.4.1.1 (Deterministic rates of container degradation in the repository environment for anticipated and unanticipated processes and events).
- Closure of this comment must await DOE's submittal and NRC staff evaluation of the referenced documents.
- The NRC staff considers this comment open.

Additional Information Relevant to SCA Comment 47 Open Item

The transmittal on December 23, 1992 (letter, Shelor to Holonich) of Study Plan 8.3.1.8.2.1 (Analysis of Waste Package Rupture Due to Tectonic Processes and Events) provides the basis for resolving this comment. The study analyzes the tectonic processes and events that may have an impact on the design and performance of waste packages and engineered barrier system (EBS) during the postclosure period. The analysis generated and impacts identified will be used in the design of the repository, the waste packages, and the EBS.

Enclosure 2

SCA Question 12 and DOE Response (12/14/90)

NRC Evaluation of DOE Response (7/31/91)

Additional Information Relevant to SCA Question 12 Open Item

ENCLOSURE 2

Section 8.3.1.8.1.1.1 Activity: Location and timing of volcanic events

QUESTION 12

Why has the Lunar Crater area not been included as a possible natural analog for detailed study of the processes related to basaltic volcanism in the Death Valley-Pancake Range volcanic belt?

BASIS

o 10 CFR 60.21 requires that models, including tectonic models, be supported by an appropriate combination of such methods as field tests, in situ tests, laboratory tests which are representative of field conditions, monitoring data, and natural analog studies.

o Both the Crater Flat and Lunar Crater basaltic fields are part of the Death Valley-Pancake Range volcanic zone.

o The 70 km limit on volcanic activities (Section 8.3.1.8.5) appears to exclude the Lunar Crater volcanic field from consideration.

o Section 8.3.1.8.5.1.5 implies that similar trends in geochemistry and eruptive patterns have been noted between the Yucca Mountain area and Lunar Crater.

o The Lunar Crater volcanic field has 110 volcanic centers of probable Quaternary age (Crowe and others, 1983) and provides an opportunity to study basaltic volcanism in great detail.

o Crowe and others (1986) indicate that they have completed geologic mapping in the Lunar Crater volcanic field, but the mapping is unpublished.

RECOMMENDATIONS

o The 70 km limit on activities to investigate volcanic processes should be reconsidered.

o The Lunar Crater volcanic field should be considered as a possible natural analog important to the understanding of volcanic processes in an area where numerous Quaternary volcanic events have occurred.

REFERENCES

Crowe, B.M., Vaniman, D.T., and Carr, W.J., 1983, Status of volcanic hazard studies for the Nevada Nuclear Waste Storage Investigations: Los Alamos National Laboratory, LA-9325-MS, 47 p.

Crowe, B.M., Wohletz, K.H., Vaniman, D.T., Gladney, E., and Bower, N., 1986, Status of volcanic hazard studies for the Nevada Nuclear Waste Storage Investigations: Los Alamos National Laboratory, LA-9325-MS, V. II, 101 p.

RESPONSE

The Lunar Crater area will be studied as part of the volcanism investigation for the Site Characterization Plan. The 70 km limit noted for Activity 8.3.1.8.1.1.1, Location and timing of volcanic events, applied to maps that will be compiled on the location, volume, and chronology of volcanic centers in the Yucca Mountain region. Studies of the Lunar Crater area are described in Activities 8.3.1.8.5.1.2, Geochronology studies, 8.3.1.8.5.1.3, Field geologic studies, and 8.3.1.8.5.1.5, Geochemical cycles of basaltic volcanic fields). The discussion of Activity 8.3.1.8.1.1.1, has been revised and expanded in Study Plan 8.3.1.8.1.1, Probability of volcanic eruption penetrating the repository, to eliminate any possible confusion that the Lunar Crater Volcanic Field would not be studied.

REFERENCES:

DOE (U.S. Department of Energy), 1990. Study Plan 8.3.1.8.1.1, Probability of Magmatic Disruption of the Repository. Yucca Mountain Project Office, Las Vegas, Nev.

Section 8.3.1.8.1.1.1 Activity: Location and timing of volcanic events

SCA QUESTION 12

Why has the Lunar Crater area not been included as a possible natural analog for detailed study of the processes related to basaltic volcanism in the Death Valley-Pancake Range volcanic belt?

EVALUATION OF DOE RESPONSE

- The response to this question indicates that Lunar Crater will be studied as part of the volcanism investigation for the Site Characterization Plan. The response indicates that activities in Study Plan 8.3.1.8.5.1 (i.e., Characterization of volcanic features) describe the studies of the Lunar Crater area.

- However, the criteria used in Study Plan 8.3.1.8.5.1 for the selection of volcanic fields for study suggest, however, that Lunar Crater will not necessarily be investigated. Specifically, the selection criteria state that:

  1) Preference will be given to volcanic fields of closest proximity to the Yucca Mountain region. Lunar Crater is greater than 100 km from Yucca Mountain;

  2) Emphasis will be placed on selecting volcanic fields most analogous to Crater Flat volcanic field (small volume, alkali basalt). Lunar Crater has over 100 Quaternary volcanic centers and may not be classified as a field of small volume; and

  3) Emphasis will be placed on choosing volcanic fields that exhibit evidence of being extinct. Lunar Crater is considered to be the youngest and most active field in the Death Valley-Pancake Range belt, and data suggest that the field is still active (Crowe and others, 1986).

- The response to this question indicates that the "70 km limit noted for Activity 8.3.1.8.1.1.1, Location and timing of volcanic events, applied to maps that will be compiled on the location, volume, and chronology of volcanic centers in the Yucca Mountain region" and that Study Plan 8.3.1.8.1.1 would eliminate any possible confusion that the Lunar Crater Volcanic Field would not be studied. However, the basis point referred, not to the citation in 8.3.1.8.1.1.1 as indicated in the response, but to the listing of parameters for Investigation 8.3.1.8.5 (p. 8.3.1.8-105), Studies to provide the information required by the analysis and assessment investigations of the tectonics program, which contains the 70 km limitation.

- The NRC staff considers that active volcanic fields (e.g., Lunar Crater) in the Basin and Range Province which may not meet the criteria specified in Study Plan 8.3.1.8.5.1 should also be given emphasis for investigation.

- Closure of this question must await evidence that the 70 km criteria specified in the parameters for Investigation 8.3.1.8.5 is not an arbitrary limit on investigations of volcanic processes.

- The NRC staff considers this question open.

REFERENCE

Crowe, B.M., Wohletz, K.H., Vaniman, D.T., Gladney, E., and Bower, N., 1986, Status of volcanic hazard studies for the Nevada Nuclear Waste Storage Investigations: Los Alamos National Laboratory, LA-9325-MS, V. II, 101 p.

Additional Information Relevant to SCA Question 12 Open Item

The transmittal on March 29, 1993 (letter, Shelor to Holonich) of Study Plan 8.3.1.8.1.1, Rev. 2 (Probability of Magmatic Disruption of The Repository) and the transmittal on March 10, 1993 (letter, Shelor to Holonich) of Study Plan 8.3.1.8.5.1, Rev. 1 (Characterization of Volcanic Features) provide the basis to resolve this open item. The Lunar Crater is now explicitly included as part of the volcanism investigation on page 59 of Study Plan 8.3.1.8.5.1. The results of that study will be analyzed in Study 8.3.1.8.1.1.