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

JUL 11 1994

Mr. Dwight E. Shelor
Associate Director for Systems and Compliance
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
Washington, DC 20545

Dear Mr. Shelor:

SUBJECT: STAFF EVALUATION OF OPEN ITEM RESPONSES ON SUBSTANTIALLY COMPLETE CONTAINMENT

In your letters to me dated March 30, 1994, May 17, 1994, and June 10, 1994, the U.S. Department of Energy (DOE) submitted supplemental responses to open comments and questions presented in the U.S. Nuclear Regulatory Commission's Site Characterization Analysis (SCA). Enclosed are the NRC staff's evaluations of those supplemental responses. For the reasons cited in the Enclosures, the staff considers SCA Comment 5 and SCA Question 46 to be resolved, SCA Comment 80 to be partially resolved (i.e. one issue has been resolved and one issue remains open), and SCA Question 47 to be open. These comments and questions and the staff's evaluation of them are summarized below.

In SCA Comment 5, the NRC staff had concerns about how the technological limitations and uncertainties associated with the performance of waste packages in a repository might impact DOE's demonstration of compliance with the Substantially Complete Containment (SCC) requirement in 10 CFR 60.113. In the DOE supplemental response to SCA Comment 5, DOE discusses how it intends to "dramatically" reduce the impact of these technological limitations and uncertainties and how it plans to demonstrate compliance with the performance goal. The staff finds DOE's discussion is satisfactory and that SCA Comment 5 is resolved.

In SCA Comment 80, the NRC staff had concerns that the various performance goals proposed by DOE were inconsistent among themselves and were inconsistent with the intent of the SCC requirement. DOE now proposes to replace its various performance goals with a single performance goal. Therefore, the NRC staff concerns about the inconsistencies among the various DOE performance goals are moot and the staff considers that part of SCA Comment 80 to be resolved. However, the consistency between the new DOE performance goal and the SCC requirement is an open item. In principle, the NRC staff considers that the new DOE performance goal is a reasonable implementation of the SCC requirement. However, the staff considers that information on the following topics is needed to completely resolve SCA Comment 80:

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- What will be the expected distribution, with respect to time, of the failures that occur during the containment period and what is the expected mean waste package lifetime?

- What are the expected consequences (in terms of estimated radionuclide releases) of the waste package failures that occur during the containment period?

- Has DOE allowed for waste package failure mechanisms in the containment period other than those discussed in NUREG-0804 when the substantially complete containment requirement was promulgated?

- What are DOE's plans concerning a comparative evaluation of alternatives, to the major design features of the waste packages, that would provide longer radionuclide containment during the containment period?

In SCA Question 46, the NRC staff requested the basis for a DOE statement that it is 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 post-containment period. In the DOE supplemental response to this question, DOE states that it is eliminating all containment period release rate performance goals. Accordingly, the staff considers that the specific issue posed in SCA Question 46 is moot. The staff still has concerns about the releases of radionuclides in the containment period, but has determined that SCA Comment 80 better expresses these concerns. Therefore, the staff considers SCA Question 46 to be resolved.

In SCA Question 47, the NRC staff requested additional information concerning DOE's proposed criterion for waste package failure. In the DOE supplemental response to this question, DOE supplied the requested additional information on DOE's previous waste package failure criterion, but it is not clear to the staff what failure criterion or criteria DOE will now use. In order to resolve Question 47, the staff needs to know what is DOE's current definition of waste package failure. Therefore, the staff considers this question to remain open.

In your letter to me dated June 10, 1994, you indicated a desire to quickly resolve the above open items. We share your desire to resolve these items as soon as possible. We recognize that interactions for the period of June through December 1994, have been scheduled. Regardless, the NRC staff would like an additional meeting on SCC when DOE has completed a response to the staff's request for additional information.

If you have any questions regarding this letter or would like to discuss these SCA comments and questions further, please contact Mark Delligatti, of my staff. Mr. Delligatti can be reached at (301) 415-6620.

Sincerely,

Joseph J. Holonich, Chief
High-Level Waste and Uranium
Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

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NRC STAFF EVALUATION OF DOE RESPONSES TO SITE CHARACTERIZATION ANALYSIS COMMENTS AND QUESTIONS

ENCLOSURE

Section 8.2.2.1.1.4 Summary of waste package containment.
Issue 1.4: Will the waste package meet the performance objective for containment as required by 10 CFR 60.113?

Section 8.3.5.9 Issue resolution strategy for Issue 1.4: Will the waste package meet the performance objective for containment as required by 10 CFR 60.113?

SCA COMMENT 5

The SCP's revised technical interpretation of "substantially complete containment (SCC)" is closer to NRC's use of the phrase than the interpretation in the CDSCP but it adds a qualifier ("allowing for recognized technological limitations and uncertainties") and introduces a new term ("the set of waste packages") which in turn require explanation.

EVALUATION OF DOE SUPPLEMENTAL RESPONSE

- In the December 14, 1990, DOE response to this comment, DOE did clarify that "the set of waste packages" applies to the entire set of waste packages, rather than individually to each package. That portion of SCA Comment 5 was (and still is) considered resolved by the NRC staff.

- In the December 14, 1990, DOE response to this comment, DOE amplified the phrase "allowing for technological limitations and uncertainties", but did not explain how these technological limitations and uncertainties might impact its demonstration of compliance with 10 CFR 60.113.

- In the May 17, 1994, DOE supplemental response this comment, DOE discusses how it intends to dramatically reduce the impact of the technological limitations and uncertainties by a multi-barrier approach and how it plans to demonstrate compliance with the performance goal by waste package development efforts, comprehensive design verifications, performance assessments, and performance confirmation programs.

- The NRC staff considers this comment resolved.

Section 8.3.5.9 Issue resolution strategy for Issue 1.4: Will the waste package meet the performance objective for containment as required by 10 CFR 60.113 (Tentative goals for release from the waste packages)? p. 8.3.5.9-19, Para. 3

SCA COMMENT 80

Some performance goals related to the requirement for substantially complete containment do not appear to be consistent with DOE's revised interpretation of the containment requirement and the intent of the rule.

EVALUATION OF DOE SUPPLEMENTAL RESPONSE

- In the March 30, 1994, supplemental response to this comment, DOE proposes a new performance goal in place of its previously stated goals. This new goal is to achieve mean waste package lifetimes that are well in excess of 1,000 years through the use of a multibarrier approach. DOE predicts that the multibarrier approach will yield failures on the order of one percent at the end of the containment period.

- DOE's new performance goal resolves the NRC staff concerns about the inconsistent DOE performance goals, but does not completely address the NRC staff concerns about the consistency between the DOE performance goal and the intent of the rule. In principle, the NRC staff considers that the new DOE performance goal is a reasonable implementation of the SCC requirement. However, the staff considers that the following additional information is needed to completely resolve SCA Comment 80:

  - Has DOE allowed for waste package failure mechanisms in the containment period other than those discussed in NUREG-0804 when the substantially complete containment requirement was promulgated? In NUREG-0804 it was stated that "it is realized that a small fraction of the approximately 100,000 packages will be breached before 1000 years due to variations in materials, manufacturing processes, etc. that can only be estimated using statistical procedures." It was also recognized that some projected failures might be attributable to modeling uncertainty - particularly as it relates to the long-term extrapolation from prelicensing accelerated corrosion tests. The NRC staff would be concerned about causes for waste package failure other than those contemplated when the rule was promulgated.

  - 10 CFR 60.21(c)(ii)(D) requires an analysis of the effectiveness of engineered barriers against release of radioactive material to the environment, including a comparative analysis of alternatives to the major design features that would provide more radionuclide containment. What are DOE's plans concerning a comparative analysis of the alternatives to the major design features of waste packages that would provide more containment during the containment period?

  - What will be the expected distribution, with respect to time, of these predicted failures and the expected mean waste package lifetime? In

generation rate and the fission product contributions to hazard can be compensated for by containment times in the range of several hundred to 1,000 years." Therefore, the NRC staff is particularly concerned about the potential for waste package failures that might occur shortly after permanent closure when these uncertainties might be still be very significant.

- What are the expected consequences (in terms of estimated radionuclide releases) of the waste package failures that occur during the containment period? The NRC staff considers that waste package "failures" that result in a substantial portion of the radionuclides remaining contained within the waste packages during the containment period is closer to the intent of the SCC requirement than catastrophic waste package failures that result in substantial releases of radionuclides during the containment period. The NRC staff also considers that the release of radionuclides during the containment period should, at least for long lived isotopes, be significantly less than the release of radionuclides permitted during the post-containment period.

o The NRC staff considers this comment resolved as to the inconsistency between DOE performance goals, but open as to the possible inconsistency between the DOE performance goal and the intent of the rule.

Section 8.3.5.9 Issue resolution strategy for Issue 1.4: Will the waste package meet the performance objective for containment as required by 10 CFR 60.113 (Tentative goals for release from the waste packages)? p. 8.3.5.9-19, Para. 3

SCA QUESTION 46

It is stated that DOE considers 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 post-containment period.

What is the basis of this statement?

EVALUATION OF DOE SUPPLEMENTAL RESPONSE

- In the May 17, 1994, supplemental response to this question, DOE has eliminated release goals from its performance goals for substantially complete containment and instead proposes a new performance goal. This new goal is to achieve mean waste package lifetimes that are well in excess of 1,000 years. DOE predicts that this new goal will result in the number of waste package failures during the containment period being on the order of one percent.

- The NRC staff considers that DOE's new performance goal is a reasonable implementation of the SCC requirement. However, the NRC staff also considers that, to satisfy the intent of the SCC requirement, DOE should provide reasonable assurance that the new performance goal will ensure that releases of radionuclides during the containment period will be limited to a small fraction of the inventory present. The NRC staff further considers that the release of radionuclides during the containment period should, at least for long lived isotopes, be less than the release of radionuclides during the post-containment period.

- The specific issue posed in SCA Question 46 is moot. The staff still has concerns about the releases of radionuclides in the containment period, but has determined that SCA Comment 80 better expresses these concerns. Therefore, the staff considers SCA Question 46 to be resolved.

Section 8.3.5.9 Issue resolution strategy for Issue 1.4: Will the waste package meet the performance objective for containment as required by 10 CFR 60.113 (Performance allocation) p. 8.3.5.9-23, Para. 2

SCA QUESTION 47

It is stated that some preclosure container breaches will escape detection and that a very small fraction of containers will breach during containment. Further, it is stated that these breaches may not constitute failure since failure is defined as a breach large enough to allow significant air flow (1 x 10^{-4} atm-cm^3/s) into the container. It is also stated that this test is a general standard accepted by the nuclear industry.

What is the origin of the stated definition of failure? What is the basis for its applicability for canisters containing HLW? What segment of the nuclear industry accepts it as a general standard? For which component(s) is this standard used?

EVALUATION OF DOE SUPPLEMENTAL RESPONSE

- In the June 10, 1994, supplemental response to this question, DOE has clarified that the SCP definition of waste package failure was based on American National Standards Institute (ANSI) standard N 14.5 (American National Standard for Radioactive Materials - Leakage Tests on Packages for Shipment), but has not clarified what definition of failure will be used with DOE's new performance goal or the basis of this new definition of failure for waste packages containing HLW.

- The NRC staff considers this question open. Since waste package lifetimes can not be computed without at least one criterion for failure, the NRC staff considers that it is incomplete to develop a goal for waste package lifetimes without a criterion or criteria for waste package failure. The current view of the NRC staff is that one possible criterion for waste package failure is any penetration through all of the waste package barriers. However, other criteria for waste package failure (e.g. the SCP criterion based on ANSI standard N 14.5) might also be acceptable, providing the consequences of the failure (see the administrative record for Comment 80) are reasonable. In order to resolve Question 47, the staff needs to know what is DOE's current definition of waste package failure.