March 5, 2003

Joseph D. Ziegler, Acting Director
Office of License Application and Strategy
U.S. Department of Energy
Office of Repository Development
P.O. Box 364629 M/S 523
North Las Vegas, NV 89036-8629

SUBJECT: CONTAINER LIFE AND SOURCE TERM AGREEMENT 5.05 - Partly Received

Dear Mr. Ziegler:

During a Technical Exchange and Management Meeting held on October 23-24, 2000, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) reached agreement on criticality issues within the Radionuclide Transport (RT), Evolution of the Near-Field Environment (ENFE), and Container Life and Source Term (CLST) Key Technical Issues (KTIs). By letter dated September 27, 2002, DOE provided information to address CLST Agreement 5.05. The NRC staff has reviewed the information and the results of the staff's review are enclosed.

DOE indicated that CLST Agreement 5.05 can be closed based on the regulatory requirements outlined in 10 CFR 63.114(d) (i.e., the criticality consequences analyses only need to be performed if the probability of criticality is above the regulatory threshold). The NRC staff finds that completion of CLST Agreement 5.05 is not appropriate at this time for several reasons.

> Based on available information, DOE has not provided an acceptable basis for screening out in-package, near-field, or far-field criticality (Subject of CLST Agreement 5.03).
>
> In lieu of an acceptable basis for screening out in-package, near-field, or far-field criticality, DOE would need to analyze the consequences of criticality events. To do this, DOE could use the criticality consequence analysis methodology in the DOE's Disposal Criticality Analysis Methodology Topical Report. (Topical Report) (Subject of CLST Agreement 5.01). The NRC has an open item related to radiolysis with respect to DOE's criticality consequence methodology in the Topical Report, which states, "The DOE must also include other types of steady-state criticality consequences, especially with respect to internal criticality, in its consequence analysis approach".
>
> Preliminary analyses performed by DOE indicate that radiolysis from criticality events may affect the performance of the waste forms. Therefore, DOE needs to further evaluate the effects of radiolysis from a criticality event to determine whether radiolysis should be included in the criticality consequence analysis methodology or to provide a basis for excluding it. (Subject of CLST Agreement 5.05)

It is unclear to NRC why that DOE has referenced the preliminary scoping evaluations in Appendix J of the Technical Impact Letter Report (Appendix J,) when DOE asked the NRC to disregard Appendix J during several previous interactions. The NRC has repeatedly expressed reservations with Appendix J, which has not been subjected to a DOE QA review, and most recently a letter to DOE dated September 13, 2002.

In summary, CLST Agreement remains "Partly Received," which is unchanged from the status NRC identified in a letter to DOE dated February 14, 2002. Additional discussion of the above points along with a review of the DOE cover letter and KTI letter report is attached. If you have any questions regarding this matter, please contact Mr. Daniel Rom of my staff. He can be reached at (301) 415-6704.

Sincerely,

/RA/

Daniel S. Rom, Project Manager
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

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J. Charles, Ely Shoshone Tribe
D. Crawford, Inter-Tribal Council of NV
R. Quintero, Inter-Tribal Council of NV (Chairman, Walker River Paiute Tribe)
D. Eddy, Jr., Colorado River Indian Tribes
H. Jackson, Public Citizen
J. Wells, Western Shoshone National Council
R. Henning, BSC
I. Zabarte, Western Shoshone National Council

Attachment 1: NRC Review of DOE Documents Pertaining to Key Technical Issue Agreement CLST 5.05

The U.S. Nuclear Regulatory Commission (NRC) goal of issue resolution during the pre-licensing period is to assure that the U.S. Department of Energy (DOE) has assembled enough information on a given issue for NRC to accept a license application for review. Resolution by the NRC staff during pre-licensing does not prevent anyone from raising any issue for NRC consideration during the licensing proceedings. Also, and just as important, resolution by the NRC staff during pre-licensing does not prejudge what the NRC staff evaluation of that issue will be after its licensing review. Issues are resolved by the NRC staff during pre-licensing when the staff has no further questions or comments about how DOE is addressing an issue. Pertinent new information could raise new questions or comments on a previously resolved issue.

This enclosure addresses one NRC/DOE agreement. Container Life and Source Term Agreement (CLST) 5.05 was made during the Criticality Technical Exchange and Management Meeting on October 23-24, 2000 (see NRC letter dated October 27, 2000, which summarized the meeting). By letter dated September 27, 2002, DOE submitted information to address the agreement. This enclosure discusses the submitted information and associated Key Technical Issue (KTI) agreement below:

Wording of CLST Agreement 5.05:

Provide information on how the increase in the radiation fields due to the criticality event affects the consequence evaluation because of increased radiolysis inside the waste package and at the surfaces of nearby waste packages or demonstrate that the current corrosion and dissolution models encompass the range of chemical conditions and corrosion potentials that would result from this increase in radiolysis. DOE stated that the preliminary assessment (calculation) of radiolysis effects from a criticality event will be available to the NRC prior to LA during February 2001. The final assessment of these conditions will be available to NRC prior to LA.

Summary of DOE Information:

In response to CLST Agreement 5.05, DOE provided a letter report entitled, "KTI Letter Report Agreement CLST 5.05, Revision 02," dated September 2002. This material was sent under a DOE cover letter dated September 27, 2002. In the letter report, DOE stated that consistent with the methodology documented in the Disposal Criticality Analysis Methodology Topical Report (Topical Report) (YMP/TR-004Q, Revision 01), it plans to address CLST Agreement 5.05 by demonstrating that the probability of criticality is below the regulatory threshold and that based on 10 CFR 63.114(d), no consequence evaluation of criticality events would be required. If screening of criticality cannot be demonstrated in accordance with 10 CFR 63.114(d), then DOE indicated that criticality consequence evaluations, including radiolytic effects, would be performed consistent with the Topical Report.

NRC Evaluation of DOE Information:

The NRC staff finds that closure of CLST Agreement 5.05 is not appropriate at this time for several reasons.

> Based on available information, DOE has not provided an acceptable basis for screening out in-package, near-field, or far-field criticality (Subject of CLST Agreement 5.03).
>
> In lieu of an acceptable basis for screening out in-package, near-field, or far-field criticality, DOE would need to analyze the consequences of criticality events. To do this, DOE could use the criticality consequence analysis methodology in the DOE's Disposal Criticality Analysis Methodology Topical Report. (Topical Report) (Subject of CLST

Agreement 5.01). The NRC has an open item related to radiolysis with respect to DOE's criticality consequence methodology in the Topical Report, which states, "The DOE must also include other types of steady-state criticality consequences, especially with respect to internal criticality, in its consequence analysis approach."

Preliminary analyses performed by DOE indicate that radiolysis from criticality events may affect the performance of the waste forms. Therefore, DOE needs to further evaluate the effects of radiolysis from a criticality event to determine whether radiolysis should be included in the criticality consequence analysis methodology or to provide a basis for excluding it. (Subject of CLST Agreement 5.05)

Each of the above points are addressed in more detail below.

1. **Based on available information, DOE has not provided an acceptable basis for screening out in-package, near-field, or far-field criticality** (Subject of CLST Agreement 5.03).

DOE suggests that based upon preliminary scoping evaluations, which indicate that criticality events will be screened from the performance assessment, no consequence evaluation will be required and the Agreement can be closed. However, the scoping evaluations that DOE is referring to are those in Appendix J of the Technical Update Letter Report (Appendix J), which has not been subjected to a QA review. The NRC has repeatedly expressed significant reservations about the approach used in Appendix J, included in a letter from J. Schlueter to J. Ziegler, dated September 13, 2002. These reservations include, but are not limited to, DOE inappropriately analyzing mechanisms that could lead to the introduction of water into the waste package and misapplying example (non-QA) analyses. These analytical deficiencies, if unresolved, could result in a calculated probability of criticality several orders of magnitude higher than in the DOE analyses and well above the regulatory threshold for consideration for inclusion in the performance assessment. The DOE has asked the NRC staff to disregard Appendix J, including instructing the NRC not to review Appendix J, during several interactions. Nonetheless, DOE again referenced Appendix J in its submittal for CLST Agreement 5.05. DOE needs to be consistent on the use of Appendix J, and if appropriate, cease referencing Appendix J.

Note that the NRC concerns identified with DOE probability calculations do not imply that the NRC has determined that criticality events should be included in the performance assessment, which is dependent on several factors which have not been completely evaluated. Rather, the NRC is concerned that DOE has repeatedly submitted reports which calculate the probability of criticality events, including Appendix J and "Probability of Criticality in 10,000 Years", that use methods inconsistent with those previously proposed by DOE and accepted by the NRC and which contain significant potential deficiencies. DOE also should not reference reports which have been withdrawn. The Safety Evaluation Report (SER) for the Disposal Criticality Analysis Methodology Topical Report, Rev. 0, dated June 2000, documents NRC acceptance of a method to calculate the probability of criticality events.

2. **In lieu of an acceptable basis for screening out in-package, near-field, or far-field criticality, DOE would need to analyze the consequences of criticality events. To do this, DOE could use the criticality consequence analysis methodology in the DOE's Disposal Criticality Analysis Methodology Topical Report. (Topical Report) (Subject of CLST Agreement 5.01). The NRC has an open item related to radiolysis with respect to DOE's criticality consequence methodology in the Topical Report, which states, "The DOE must also include other types of steady-state criticality consequences, especially with respect to internal criticality, in its consequence analysis approach".** (Subject of CLST Agreement 5.01).

In the Topical Report, DOE requests approval of its criticality consequence analysis methodology. DOE indicated that this methodology in the Topical Report would be used, implicitly in the cover letter and explicitly in the KTI letter report, should DOE be unable to

screen criticality events from the performance assessment. However, the methodology does not include the effects of radiolysis. Preliminary information provided by DOE after the issuance of the Topical Report in "Radiolytic Species Generation from Internal Waste Package Criticality," dated September 2001, indicates that the effects of radiolysis should be incorporated into the Topical Report. As the NRC is currently reviewing the Topical Report, concerns with the omission of radiolysis effects and related technical issues may be included in a Request for Additional Information. Note that the completion of the NRC staff review of revision 1 of the Topical Report is awaiting the submittal of updates identified by DOE to the Topical Report.

3. **Preliminary analyses performed by DOE indicate that radiolysis from criticality events may affect the performance of the waste forms. Therefore, DOE needs to further evaluate the effects of radiolysis from a criticality event to determine whether radiolysis should be included in the criticality consequence analysis methodology or to provide a basis for excluding it.** (Subject of CLST Agreement 5.05 and this letter).

In the DOE report, "Radiolytic Species Generation from Internal Waste Package Criticality," dated September 2001, DOE concluded that radiolysis might increase the degradation rate of cladding in the waste package and indicated that further analyses were needed, including the evaluation of potential mitigating effects. In a letter dated February 14, 2002, the NRC agreed that the analyses should be updated, and if appropriate, incorporated into DOE's criticality consequence analysis methodology. The NRC also identified several points that should be considered in the updated analyses or another assessment. In the information provided by DOE for CLST Agreement 5.05, DOE did not address the points previously identified by the NRC and did not provide either the updated radiolysis analyses or incorporate the effects of radiolysis into the Topical Report.

Summary:

In summary, as DOE has not fully addressed CLST Agreement 5.05 and the points identified in the February 14, 2002, NRC letter, CLST Agreement 5.05 remains "Partly Received." The DOE needs to provide any updates to the Topical Report and the related model validation reports to address the criticality related agreements. The information provided with the Topical Report may address CLST Agreement 5.05 if DOE incorporates radiolytic effects into the consequence analysis methodology in the Topical Report. DOE may also address CLST Agreement 5.05 separate from the Topical Report. Finally, as DOE's approach to evaluating criticality events involves relying heavily on demonstrating that the probability of criticality events will be below the threshold for inclusion in the performance assessment, DOE needs to make progress in developing, validating, and applying a methodology for determining the total criticality probability.

Additional Information Needed: The NRC identified its information needs for CLST Agreement 5.05 in a February 14, 2002 letter. This letter does not identify the need for any additional information beyond that already identified in the February 14, 2002 letter. Therefore, no additional information is needed at this time.

Status of Agreement: CLST Agreement 5.05 will continue to be characterized as "Partly Received."