July 1, 2002

Joseph D. Ziegler, Acting Assistant Manager
Office of Licensing and Regulatory Compliance
U.S. Department of Energy
Yucca Mountain Site Characterization Office
P.O. Box 364629
North Las Vegas, NV 89036-8629

SUBJECT: TOTAL SYSTEM PERFORMANCE A5SSESSMENT AND INTEGRATION KEY TECHNICAL ISSUE AGREEMENT 4.05

Dear Mr. Ziegler:

During a Technical Exchange and Management Meeting held on August 6-10, 2001, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) reached agreement on a number of issues within the Total System Performance Assessment and Integration Key Technical Issue (KTI). By letter dated May 7, 2002, DOE provided information pertaining to TSPAI Agreement 4.05. The NRC staff has reviewed this information as it relates to the agreement and the results of the staff's review are enclosed.

By providing the update to the DOE model validation procedures, DOE has satisfied the intent of TSPAI Agreement 4.05. Therefore, the NRC staff considers TSPAI Agreement 4.05 "complete." The NRC staff has six observations that DOE should consider as it implements the new procedure. The NRC staff will evaluate the implementation of this approach as it follows DOE's progress towards satisfying TSPAI Agreements 4.06 and 4.07. If you have any questions regarding this letter, please contact Mr. James Andersen of my staff. He can be reached at (301) 415-5717.

Sincerely,
/RA/

Janet Schlueter, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated
cc: See attached distribution list

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Letter to J. Ziegler from J. Schlueter dated July 1, 2002

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A. Bacock, Big Pine Paiute Tribe of the Owens Valley

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M. Bengochia, Bishop Paiute Indian Tribe

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D. Crawford, Inter-Tribal Council of Nevada

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G. Runkle, DOE, Washington, DC

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H. Jackson, Public Citizen

NRC Review of DOE Documents Pertaining to Key Technical Issue Agreements

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 it's 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 DOE and NRC agreement made during the Total System Performance Assessment and Integration (TSPAI) Technical Exchange and Management Meeting (see letter dated August 23, 2001, which summarized the meeting). By a letter dated May 7, 2002, DOE submitted information to address agreement TSPAI.4.05. The information submitted for this agreement is discussed below.

Total System Performance Assessment and Integration Agreement 4.05

Wording of the Agreement:

DOE will document the process used to develop confidence in the Total System Performance Assessment (TSPA) models (e.g., steps similar to those described in NUREG–1636). The detailed process is currently documented in the model development procedures that are being evaluated for process improvement in response to the model validation Corrective Action Report CAR–BSC–01–C–001. The upgraded model validation procedures will be available for NRC review in fiscal year 2002.

NRC Review:

During its review of the information pertaining to the Total System Performance Assessment for Site Recommendation (TSPA-SR), the NRC staff questioned the steps DOE performed to build confidence in its total system assessment models. Confidence building in models includes, but is not limited to, demonstrating that: (i) the processes are properly formulated mathematically and correctly parameterized following accepted theories, (ii) numerical schemes used have acceptable convergence properties, and (iii) space and time dimensionality is appropriate. DOE Office of Quality Assurance audits in 2000 and 2001 resulted in five Deficiency Reports and the initiation of a Suspect Trend Investigation Report (BSC-01-004) in March 2001 that pertain to model validation deficiencies (model confidence). The Suspect Trend Investigation Report resulted in Corrective Action Request (CAR) BSC-01-C-001. In conducting its review of the potential license application, the NRC staff will need to evaluate, for example, whether the Total System Performance Assessment (TSPA) model provides a credible representation of repository performance. In order for DOE to provide the information necessary to allow a detailed review of this part of the potential license application, DOE would need to provide information supporting the credibility of its models. One step in making this information available is for DOE to document the process that it would use to develop confidence in its models. Agreement TSPAI.4.05 addresses this process, which DOE would then use to develop confidence in its models.

Enclosure

Two other agreements address the implementation of the DOE confidence-building activities. Agreement TSPAI.4.06 addresses DOE's documentation of its implementation of the process for model confidence building (i.e., the procedure provided in response to agreement TSPAI.4.05) and its demonstration of compliance with model confidence criteria in accordance with their applicable procedures. Agreement TSPAI.4.07 addresses: (i) the procedure DOE would follow to conduct systematic and uniform verification — all areas of a code analyzed at a consistent level, (ii) the process DOE would follow to ensure correct implementation of algorithms, (iii) the process it would follow for the full disclosure of calculations and results, and (iv) the documentation of DOE's compliance with the improved process in the verification documentation required by Procedure AP–SI.1Q.

By letter dated May 7, 2002, DOE provided Procedure AP–SIII.10Q, "Models," Revision 0 Interim Change Number (ICN) 2 and indicated that it believes that this procedure fulfills agreement TSPAI.4.05. Procedure AP–SIII.10Q, "Models," supercedes Procedure AP–3.10Q in the context of this agreement. In the letter dated May 7, 2002, DOE indicated that it believes that confidence building in models is no longer a post-model development activity but is an integral part of the model development process. The NRC staff believes that this approach may improve DOE's ability to succeed in developing the information necessary to document the credibility of the DOE models.

For those models used in the TSPA, the DOE procedure requires confidence to a level commensurate with the model's relative importance to the potential performance of the repository system. Model confidence can be achieved through comparisons against data acquired from the laboratory, field experiments, analog studies, or other relevant observations, which have not been previously used to develop or calibrate the model. Other approaches to corroborate the model include, but are not limited to, any of the following: peer and technical reviews; comparisons with alternative models or with published refereed journals or literature; comparisons of abstracted model results to the process model; and comparisons of pre-test model predictions to data collected during testing.

DOE should consider the following as they implement Procedure AP-SIII.10Q. The relevant section of the procedure is provided for each observation.

1. Adequate confidence in the models used in the performance assessment should exist at the time that the performance assessment documentation is issued or the results are relied upon. (Section 5.4.1(a)(3))

> a. Continuing confidence building efforts to include performance confirmation activities (i.e., confirming model results or reaffirming the appropriateness of the model) is appropriate, provided that sufficient confidence-building measures were in place and have resulted in an adequate level of confidence.

2. Currently, one (or more) of several criteria may be used to build confidence in a model. Some criteria, taken individually, are insufficient to yield adequate model confidence, although using a combination of the criteria may be sufficient. (Section 5.4.1(c))

3. The more objective criteria (e.g., corroboration with data not used in model development) typically yield greater model confidence than the more subjective criteria (e.g., peer review, technical review). (Section 5.4.1(c))

> a. Objective confidence-building measures should be used, where possible, in place of more subjective measures; if data are reasonably attainable, then corroboration with this data should be used either before, or with, other confidence-building approaches.

4. If reviews are used to build confidence in a model, then the review should encompass, to the extent practical, the full body of information necessary to evaluate the model. Information such as that contained in references, relevant data, supporting documents, and alternative models can provide insight into the appropriateness, and limitations, of a model. (Section 5.4.1(c))

5. Due to the absence of predetermined acceptance criteria in confidence building, the conclusions drawn from model confidence-building efforts will tend to be subjective. Therefore, it is important to document the judgments of the usefulness and limitations of those confidence-building measures used. (Section 5.4.1(c))

6. Corroboration of results with alternative mathematical models needs to consider the confidence in these alternative models and how that confidence was reached. (Section 5.4.1(c)(2))

DOE, by providing the revised AP-SIII.10Q procedure, has satisfied the intent of agreement TSPAI.4.05. The NRC staff will evaluate the implementation of this procedure as it follows DOE's progress towards satisfying agreements TSPAI.4.06 and 4.07.

Additional Information Needed: None

Status of Agreement: TSPAI Agreement 4.05 is "Complete."