

September 28, 2000

Dr. Stephan J. Brocoum, Assistant Manager
Licensing and Regulatory Compliance
U.S. Department of Energy
Yucca Mountain Site Characterization Office
P.O. Box 30307
North Las Vegas, NV 89036-0307

SUBJECT: ISSUE RESOLUTION STATUS REPORT (KEY TECHNICAL ISSUE: TOTAL SYSTEM PERFORMANCE ASSESSMENT AND INTEGRATION), REV. 3

Dear Dr. Brocoum:

The overall goal of the Total System Performance Assessment and Integration (TSPAI) Key Technical Issue (KTI) Issue Resolution Status Report (IRSR) is to document the U.S. Nuclear Regulatory Commission (NRC) staff's systematic approach for reviewing the U.S. Department of Energy (DOE) assessment of repository performance. The previous drafts of the TSPAI IRSR covered the following:

- Revision 0 - initial development of model abstraction.
- Revision 1 - (i) acceptance criteria and review methods for the subissue of scenario analysis; (ii) current staff views of Key Elements of Subsystem Abstraction (now Integrated Subissues); and (iii) changes to the DOE's reference design and performance assessment models.
- Revision 2 - (i) revision of the model abstraction section; (ii) addition of a section on transparency and traceability; (iii) rebaselining of the open items; and (iv) addition of a section presenting an initial partitioning of features, events, and processes to integrated subissues. The revision of the model abstraction section, supported by other KTIs, facilitated the review of supporting data and models in the context of total system performance assessment.

The current revision of the TSPAI IRSR, Rev. 3, is a substantial modification from revision 2. These modifications include: (i) addition of a technical basis for the section on demonstration of the overall performance objective (Chapter 4), (ii) addition of a technical basis for the section on system description and demonstration of multiple barriers (Chapter 4), (iii) removal of acceptance criteria and review methods (Chapter 4), (iv) revision of the status of resolution for all of the TSPAI subissues (Chapter 5), (v) addition of a section to highlight integration concerns for model abstraction (Chapter 5), and (vi) inclusion of detailed review comments for features, events and processes (FEPs) (Chapter 5 and the Appendices).

Consistent with NRC regulations on preclicensing consultations and a 1992 agreement with DOE, staff-level resolution can be achieved during preclicensing consultation. The purpose of issue resolution is to assure that sufficient information is available on an issue to enable the NRC to docket the license application. Resolution at the staff level does not preclude an issue

being raised and considered during the licensing proceedings, nor does it prejudge what the NRC staff evaluation of that issue will be after its licensing review. Issues are “closed” if the DOE approach and available information acceptably address staff questions such that no information beyond what is currently available will likely be required for regulatory decision making at the time of initial license application. Issues are “closed-pending” if the NRC staff has confidence that the DOE proposed approach, together with the DOE agreement to provide the NRC with additional information (through specified testing, analysis, etc.) acceptably addresses the NRC's questions such that no information beyond that provided, or agreed to, will likely be required at time of initial license application. Issues are “open” if the NRC has identified questions regarding the DOE approach or information, and the DOE has not yet acceptably addressed the questions or agreed to provide the necessary additional information in the license application. Pertinent additional information could raise new questions or comments regarding a previously “closed” issue.

The TSPA IRSR is composed of four subissues pertaining to the DOE's performance assessment: (1) system description and demonstration of multiple barriers; (2) scenario analysis; (3) model abstraction; and (4) demonstration of the overall performance objective. All four subissues are currently “open.” To close these subissues, the DOE will need to address the concerns presented in Chapter 5 of the attached IRSR. Chapter 5 of the enclosed IRSR summarizes our independent pre-licensing review of some of the documents supporting the DOE's site recommendation (SR). To date, the staff's review of the DOE's performance assessment has been limited by the unavailability of the Total System Performance Assessment (TSPA)-SR technical and model documents, the preliminary version of the FEPs database, and the preliminary nature of the draft Analysis Model Reports (AMRs) and Process Model Reports. After receipt of all of the technical materials supporting TSPA-SR, staff will review these documents to consider whether it is appropriate to close any of the TSPA subissues or any portion of those subissues. The review that is documented in Chapter 5 was limited to a few example AMRs. Issues of global nature were identified and presented. It is conceivable that staff will identify additional issues once it reviews all final TSPA-SR documentation.

Based on available information, the TSPA subissue on system description and demonstration of multiple barriers is currently “open.” To close this subissue, the DOE will need to provide information pertaining to multiple barriers on: (1) the reliance on barriers in a semi-quantitative or quantitative manner, (2) the treatment of uncertainty in barrier performance, (3) the use of barrier importance to determine the extent of technical basis needed to support a barrier's capability, and (4) the method describing the level of underperformance to be used in barrier analysis. It is recognized that the requirements for multiple barriers have been developed recently. However, it is expected that the TSPA-SR documentation will address most of the key issues. The TSPA-SR documentation will need to satisfy the acceptance criteria pertaining to transparency and traceability.

The TSPA subissue on scenario analysis is currently “open.” Closure of this subissue will require information on: (1) the comprehensiveness and technical completeness of the FEPs database, (2) adequate technical basis for FEPs screening arguments, and (3) general improvement in documentation for sufficient transparency and traceability.

The model abstraction subissue is “open.” To close this subissue, the DOE will need to satisfy the five general model abstraction acceptance criteria. The TSPA KTI will focus on integration

and model implementation. The other generic model abstraction acceptance criteria will be addressed by the process KTIs in their IRSR. Upon receipt of all TSPA-SR documentation, NRC performance assessment staff will provide the specific items that will need to be addressed in order to close the integration aspect of model abstraction. Preliminary items have been highlighted in Chapter 5 based on the documentation that has been reviewed to date.

The TSPA subissue on demonstration of the overall performance objective is “open.” Information is required on: (1) implementation of the methodology to calculate expected annual dose for all scenario classes, (2) demonstration that the TSPA model results are stable (sufficient number of realizations, appropriate time-step size, appropriate TSPA model discretization), (3) adequacy of the treatment of model uncertainty in the TSPA, (4) the approach for demonstration of reasonable or conservative representation of actual repository performance, (5) sufficiency of the treatment of alternative conceptual models, and (6) comparison of alternate repository designs.

Although every TSPA subissue is currently “open,” we recognize vast improvement in the TSPA-Viability Assessment compared to previous performance assessments. We anticipate that the TSPA-SR will have a comparable amount of improvement. We welcome dialogue on total-system performance assessment with the DOE, the U.S. Nuclear Waste Technical Review Board, the State of Nevada, and other interested parties. If you have any questions about this letter, please contact David Esh of my staff at (301) 415-6705, or via internet mail service (dwe@nrc.gov).

Sincerely,

/RA/

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

Enclosure: Issue Resolution Status Report (Key Technical Issue:
Total-System Performance Assessment and Integration,
Revision 3)

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Janet R. Schlueter, Acting Chief
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