

STATUS OF RESOLUTION OF MULTIPLE BARRIER PERFORMANCE OBJECTIVE



NRC/DOE TECHNICAL EXCHANGE ON TOTAL-SYSTEM PERFORMANCE
ASSESSMENTS FOR YUCCA MOUNTAIN

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SYSTEM DESCRIPTION AND DEMONSTRATION OF MULTIPLE BARRIERS SUB-ISSUE

(Consistent with Proposed Rule)

- Demonstration of Multiple Barriers
 - identification of barriers
 - description of each barriers capability including uncertainties
 - description of the reliance placed on each barrier (including the effect on overall performance)
 - technical basis provided for those barriers identified as important to waste isolation (commensurate with the degree of reliance placed on a particular barrier and the associated uncertainties)
- Transparency and Traceability of the Analysis
 - TSPA documentation is complete, clear, and consistent with sufficient cross-referencing to supporting documents
 - Scenarios are fully described (including screening of FEPs and, as appropriate, the relationship between FEPs)
 - model abstraction is adequately explained
 - source and validity of data is established
 - TSPA code design and data flow is described

AREAS OF REVIEW FOR MULTIPLE BARRIERS

- Identification of barriers
 - are all barriers identified?
 - are there natural and engineered barriers?

Review Results

- Principal factors of the Repository Safety Strategy comprehensively identifies both natural and engineered barriers

AREAS OF REVIEW FOR MULTIPLE BARRIERS (cont.)

- Description of each barrier's capability including uncertainties
 - is the description of each barrier's capability consistent with the TSPA results?
 - what is the impact of the barrier performance on the overall performance measure?
 - what is overall importance of each barrier?
 - what are the uncertainties?

Review Results

- Pinch point analysis quantifies a barrier's ability to positively influence repository performance

AREAS OF REVIEW FOR MULTIPLE BARRIERS (cont.)

- Description of the reliance placed on each barrier (including the effect on overall performance)
 - what is overall reliance for each barrier?
 - is barrier depiction (under-performance) consistent with the barrier representation in the TSPA?
 - is the repository system unduly reliant on any single barrier?
 - how are uncertainties considered in the description?

Review Results

- “Neutralization” analysis quantifies reserve capacity of a barrier assuming under-performance
- DOE has considered “complete” neutralization of barriers
- Technical basis for determining “degree” of barrier under-performance uncertain if complete neutralization is not adopted

AREAS OF REVIEW FOR MULTIPLE BARRIERS (cont.)

- Technical basis provided for those barriers identified as important to waste isolation
 - what is the technical basis for the barrier performance and under-performance?
 - is the technical basis commensurate with the degree of reliance placed on a particular barrier and the associated uncertainties?

Review Results

- Technical basis for barrier performance is dependent on relevant process KTI issues
- RSS discusses barrier under-performance in terms on “complete” neutralization (thermal conditions are treated somewhat different)

AREAS OF REVIEW FOR TRACEABILITY AND TRANSPARENCY

- TSPA documentation is complete, clear, and consistent with sufficient cross-referencing to supporting documents
 - are the TSPA results traceable to modeling assumptions and input parameters?
 - are modeling assumptions and input parameters traceable to supporting information (e.g., design, site characterization information) and analyses, and expert opinions?

Review Findings

- Methods and Assumptions Report provides an overview of the modeling assumptions and describes sensitivity analyses to quantify importance
- Recently described DOE approach (e.g., use of GOLDSIM software) appears to provide a capability for improving traceability and transparency of PA results, modeling assumptions, and input parameters

REVIEW FOR TRACEABILITY AND TRANSPARENCY (cont.)

- source and validity of data is established
 - is the origin, sufficiency, and quality of data established (commensurate with importance to performance)?
 - is data to be collected during performance confirmation described relative to its importance to performance and data used to support the TSPA?

Review Findings

- None of the documents reviewed to date discuss this topic directly, however, recently described DOE approach (e.g., use of GOLDSIM software) could provide information regarding origin of data

REVIEW FOR TRACEABILITY AND TRANSPARENCY (cont.)

- TSPA code design and data flow is described
 - are computational modules (e.g., source term, saturated zone) of the TSPA identified and described?
 - is the flow of information within the TSPA code (between modules) described?

Review Findings

- Methods and Assumptions Report provides an overview of the modules and general description of the data flow
- Recently described DOE approach (e.g., use of GOLDSIM software) may provide a capability for improving traceability and transparency of data flow within the TSPA code