U.S. Department of Energy
Office of Civilian Radioactive Waste Management

Issues in Preparing the Total System Performance Assessment for SR: Timeframes and Status of Inputs

Presented to:
Nuclear Waste Technical Review Board

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YUCCA MOUNTAIN PROJECT

Outline

- **Calculational time frames**
  - **SR: PORB Decision of 16 Feb 2000**
  - **SR: Undisturbed performance**
  - **SR: Disturbed performance and human intrusion**
  - **EIS: Undisturbed performance and peak dose**
- **Status of TSPA-SR**
  - **PMR and AMR schedule**
  - **Inputs to the TSPA-SR**
  - **TSPA-SR system performance modeling**
  - **TSPA-SR sensitivity/uncertainty studies**
- **Summary**

Project Operations Review Board (PORB) Decision of 16 Feb 2000

- **SRCR Volume 1 is to include a complete summary of the TSPA-SR**
  - **TSPA-SR is to include calculations beyond 10,000 years to provide insights into the robustness of the repository system**
  - **Peak dose evaluations are to be included**
- **SRCR Volume 2 is a regulatory compliance argument**
  - **A Site Recommendation requires showing suitability as defined in 10 CFR 963 (draft)**
  - **This invokes 10 CFR 63 and 40 CFR 197 (drafts)**
  - **Therefore, SR Volume 2 is a 10,000 year compliance demonstration**

SR: Undisturbed Performance

- **To provide added assurance, undisturbed performance will be calculated to 100,000 years**
  - **Undisturbed performance includes climate changes, thermal effects, and design basis seismic events**
  - **100,000 year calculations provide an additional assurance of robustness to the compliance calculation**
  - **100,000 years is sufficient to illustrate the role of processes, natural and engineered, that come into play after some waste packages have failed: supports a demonstration of meeting the multiple barriers requirement**

SR: Time Frame for Disturbed Performance and Human Intrusion

- **Lower-probability events are part of the disturbed performance case(s), particularly volcanism's direct and indirect effects**
  - **A 20,000 year time frame will be used in volcanism calculations to put the 10,000 year result into a wider context**
- **Human intrusion is to be addressed at two times**
  - **Assuming the event occurs at 100 years as per draft 10 CFR 63**
  - **Assuming the event occurs at 10,000 years, more in keeping with the 40 CFR 197 draft**
  - **It will be treated separately, as a stylized analysis, a point of agreement between the two draft regulations**
  - **Both analyses will be conducted to 20,000 years**

Principles Governing the Peak Dose Calculation for the EIS

- **NEPA requires best available information to be used to support best-estimate calculations, and discourages speculation**
- **A ‘realistic’ (non-pessimistic) system performance calculation is to be provided in the EIS, from closure to 1,000,000-years postclosure for the undisturbed system**
- **Volcanic events will be analyzed for the first 20,000 years because the peaks potential consequences from such an event would occur in that timeframe**

Peak Dose Under DOE Discussion, May Lead to Policy Statement

- **DOE is a participant in creating an international statement of principles that includes this topic, in "The Environmental and Ethical Basis of Geologic Disposal," 1995, NEA/RWMC**
- **DOE interprets the document to suggest:**
  - **A repository should not present public health risks unacceptable to current generations (p. 14)**
  - **This translates to a small fraction of natural background, in terms of potential added dose (p. 16)**
  - **Resources should not be spent by a society to minimize small potential risks in a very distant future when those resources could be used to address present, more meaningful risks (p. 8)**

Status of Process Model Reports (PMRs)

PMR	Status
Integrated Site Model	Accepted by DOE on 2/16/00 (on Internet)
Unsaturated Zone Flow & Transport	Accepted with conditions by DOE on 4/14/00 (M&O incorporating comments)
Engineered Barrier System Degradation, Flow, & Transport	Undergoing DOE acceptance review
Biosphere	Undergoing DOE acceptance review
Waste Package Degradation	Undergoing DOE acceptance review
Waste Form Degradation	Undergoing DOE acceptance review
Near Field Environment	Undergoing DOE acceptance review
Saturated Zone Flow and Transport	Undergoing DOE acceptance review
Disruptive Events	Being prepared by the M&O

Status of Analysis & Model Reports (AMRs)

- **97 of 121 AMRs have been completed**
  - **These reflect the design with backfill**
  - **Of the 121, all but 3 have completed checking**
- **27 of these 121 AMRs are currently being updated to reflect removal of backfill**
  - **Most of these changes are not significant**

Status of TSPA-SR

- **TSPA-SR model development has been delayed due to late feeds from process models, late design changes, and software (GoldSim) debugging**
- **TSPA-SR model (without backfill) requires modified thermo-hydrology and indirect volcanic effects**
- **TSPA-SR model has undergone testing and is in review by AMR suppliers**

Status of TSPA-SR

(Continued)

- **TSPA-SR (Rev 00A) documentation expected to be completed on May 17, 2000 with punchlist of remaining items, including sensitivity analyses**
- **Feeds from TSPA-SR to SRCR are being delivered in advance of result finalization**
- **TSPA-SR (Rev 00) documentation expected to be completed on time on August 31, 2000**
- **Range of possible uncertainty, sensitivity and barrier importance analysis methods and approaches have been defined**

Summary

- **Decisions have been made with respect to calculational time frames**
- **A potential policy regarding the peak dose is being discussed**
- **Backfill inputs to TSPA-SR are now in place, the TSPA-SR model is running (although continued testing, verification and documentation are under way)**
- **TSPA-SR is catching up to its original schedule, but many activities are being conducted in parallel (requiring more checking)**
- **Sensitivity and barrier importance analysis required to address 10 CFR 963 criteria have been defined**
  - **The Board's comments on any or all of these issues would be welcome**