

PRESENTATION TO THE NUCLEAR WASTE
TECHNICAL REVIEW BOARD



ANALYSES FOR FAULT DISPLACEMENT AND SEISMIC HAZARDS
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OUTLINE OF PRESENTATION

- FAULT DISPLACEMENT HAZARDS AND SEISMIC HAZARDS:
 - 1) Staff Position on Deterministic and Probabilistic Assessments;
 - 2) Acceptance Criteria for Data and Analysis
("When 'enough is enough'")
 - 3) Investigations that are Needed for Hazard Assessment

STAFF POSITION ON DETERMINISTIC/PROBABILISTIC ANALYSES

- "...both deterministic and probabilistic techniques will play a role in the analysis of fault displacement and seismic hazards." (Bernero, 1993)
- In its review of the License Application, the staff expects both deterministic and probabilistic analyses of fault displacement and seismic hazards to be presented.
- In FY 1995, the staff intends to prepare a draft staff technical position on the criteria and analyses needed to develop design bases for fault displacement and vibratory ground motion.

STAFF POSITION ON DETERMINISTIC/PROBABILISTIC ANALYSES (Cont.)

Deterministic:

- In contrast to the eastern U.S., most of the faults at Yucca Mountain have a surface signature.
- Based on these signatures, estimates of magnitude, slip rate, maximum offset, and style of offset can be made.
- Based on these estimates the maximum magnitude earthquake and maximum fault displacement can be determined.
- Has regulatory and licensing precedent.
- Straight forward, transparent method.

Probabilistic:

- 10 CFR 60.112 requires compliance with EPA standard, that necessitates a probabilistic analysis.
- Proper implementation explicitly includes uncertainty.
- Frequency and magnitude of earthquakes and displacement events are considered.
- Uses multiple estimates, considers range of possibilities.

ACCEPTANCE CRITERIA FOR FAULT DISPLACEMENT AND SEISMIC HAZARDS

- The Staff considers the following to be minimum requirements for determining when "Enough is Enough."
 1. Collection of data used in support of the analyses is sufficient to support assumptions made.
 2. When the positions provided in NUREG-1451 and the draft STP on "Consideration of Fault Displacement in Repository Design" have been satisfactorily addressed.
 3. Expert judgement has not been used as a substitute for field or experimental data, or other more technically rigorous information that is reasonably available or obtainable.

ACCEPTANCE CRITERIA FOR FAULT DISPLACEMENT AND SEISMIC HAZARDS (Cont.)

4. Analyses are transparent, sensitivity analyses have been performed, alternative models (e.g., statistical and conceptual) have been identified and evaluated, and the results of analyses of individual alternative models are explicitly treated.
5. Analyses clearly reflect the uncertainty in the understanding of tectonic processes.

(Site-specific acceptance criteria are being identified during development of the License Application Review Plan)

- Ultimately, the final determination will be an assessment of repository performance and full consideration of uncertainty.

CRITICAL INVESTIGATIONS AND ANALYSES

Although many critical investigations are ongoing, the following need to be done:

- High resolution geophysical investigations to identify buried structures and the expression of faults at depth.
- An appropriate tectonic model for earthquake locations that also addresses the apparent discrepancy between fault plane solutions and the nature of displacement expressed by faults at the surface.
- Site-specific information on surface and subsurface ground motion at Yucca Mountain and the development of an attenuation function for Yucca Mountain.
- Identification of all "Type I" faults including an analysis of their possible subsurface connection and their relationship to regional tectonics.
- Determine possible coupling of faulting and igneous activity including structural control of igneous events.
- Determination of stress and strain patterns in the YMR.