

MAY 19 1992

MEMORANDUM FOR: Joseph J. Holonich, Director
Repository Licensing and Quality Assurance
Project Directorate, HLWM

FROM: Ronald L. Ballard, Chief
Geology and Engineering Branch, HLWM

SUBJECT: GEOLOGY AND ENGINEERING BRANCH (HLGE) REVIEW OF THE EARLY
SITE SUITABILITY EVALUATION (ESSE)

The Geology and Engineering Branch has completed its review of the Early Site Suitability Evaluation as requested in the Youngblood to Branch Chiefs memorandum dated April 29, 1992. The review was conducted under the guidance provided by the review plan enclosed in the April 29 memorandum.

The ESSE review team included members of the Geology/Geophysics Section, the Engineering Section, and members of the Repository Design, Construction, and Operations Staff of the Center for Nuclear Waste Regulatory Analyses (CNWRA). The Geology/Geophysics Section was designated as lead section for the review and comments developed by the Engineering Sections and the CNWRA served as input.

The HLGE review of the ESSE has resulted in the development of two comments. In an earlier submittal (McConnell to Abrams note, May 5, 1992), the Geology/Geophysics Section transmitted one draft comment to HLPD noting concerns over how the ESSE treated engineered barriers in the findings for Postclosure Tectonics. The issues identified in that comment continue to be a concern to the staff and that comment is enclosed as Attachment #1. In the McConnell to Abrams note, an additional staff concern was identified, but not developed into comment form. That concern related to an apparent nonadherence to 10 CFR Part 960 requirements (i.e., 960.3-1-4-2) on the use of technically conservative assumptions supporting findings made in the ESSE. As a result of discussions held in the May 13, 1992, team meeting, the concern about the approach to the use of assumptions was developed into a comment, and that comment is enclosed as Attachment #2.

If you have questions about the ESSE review process please contact Keith McConnell at 504-2532. Technical questions related to HLGE comments on the ESSE should be directed to John Trapp at 504-2509.

Ronald L. Ballard, Chief
Geology and Engineering Branch
Division of High-Level Waste
Management, NMSS

Attachments:
As Stated

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Central File	HLWM B/C	HLGE R/F
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ATTACHMENT 1

Section 2.3.7.3.3 Conclusions and Recommendations for Future Postclosure Tectonics Activities

COMMENT

The treatment of engineered barriers and the subsequent level of findings for the Postclosure Tectonics Disqualifying Condition appears to be in violation of the intent of the 10 CFR Part 960 Siting Guidelines.

BASIS

NRC agreed to concur in the DOE siting guidelines provided various conditions were met. These conditions were stated in 49 FR 9650. Provision 4 of these conditions was that DOE should "Modify the siting guidelines to make clear that engineered barriers cannot constitute a compensating measure for deficiencies in the geologic media during site screening."

In response to the NRC concerns, as well as the concerns raised by the EPA, the States of Texas and Nevada, and some citizens groups, the DOE provided a section 960.3-1-5, Basis for Site Evaluation. While much of what is contained in this section envisioned more than one site would be available, the opening sentence in the section clearly states that it is applicable for evaluation of individual sites.

Section 960.3-1-5 states "... engineered barriers shall not be used to compensate for an inadequate site; mask the innate deficiencies of a site; disguise the strengths and weaknesses of a site and the overall system; and mask differences between sites when they are compared."

While section 960.3-2-4, Recommendation of Sites for Development of Repositories" clearly envisioned more than one site would be available for the decision process by which DOE selected a site after site characterization to recommend to the President for development into a repository, this section also clearly states that the basis for evaluations in 960.3-1-5 will be used.

In the discussion of Qualifying conditions on page 2-116, it is apparent that DOE recognizes that the design of the engineered barrier system will be important in determining compliance for the Yucca Mountain site as it states; "Ground motion is highly unlikely to cause damage to the waste canisters, assuming reasonable conservatism in the design of canister emplacement." and "Current understanding is inadequate to estimate, in a sufficiently meaningful way, the probability of fault movement or various levels of ground motion (including secondary faulting and recurrent ground motion), the initial effects on EBS integrity, or potential subsequent increases in rates of waste-package corrosion because of changes to the hydrologic system."

However, in the discussion of the Disqualifying condition on page 2-118, the DOE states; "In summary, on the basis of the available geologic record of the Quaternary Period, the consensus of the Core Team is that the nature and rates of fault movement or other ground motion are not expected

to be such that a loss of waste isolation is likely to occur. The team therefore concludes that a higher-level suitability finding can be supported for this disqualifying condition."

The staff considers that as the ESSE has had to assume "reasonable conservatism in design" and as the ESSE admits that they do not understand enough about ground motion to evaluate it in a "sufficiently meaningful way," a Level 2 finding on the postclosure tectonics disqualifying condition does not appear justified if the intent of 960.3-1-5 is to be followed.

RECOMMENDATION

The requirements and intent of 960.3-1-5 would appear to require a revision of the Level 2 finding downward until such time as DOE can demonstrate a better understanding of the probability and effects of fault movement or ground motion at the Yucca mountain site.

REFERENCES

U. S. Nuclear Regulatory Commission, "Preliminary Decision Related to U. S. Department of Energy's General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories," Federal Register, Vol. 49, No. 51, March 14, 1984, pp. 9650-9661.

U. S. Department of Energy, "10 CFR Part 960, Nuclear Waste Policy Act of 1982; General Guidelines for the Recommendation of Sites for the Nuclear Waste Repositories," Federal Register, Vol. 49, No. 236, December 6, 1984, pp. 47714-47770.

ATTACHMENT 2

Section 2.3.4.3.2.1 Tectonic Models

Section 2.3.7.3.2.6 Probabilistic Volcanic-release Models

COMMENT

The analysis and conclusions provided within the referenced sections do not appear to reflect the conservatism required by 10 CFR Part 960.

BASIS

10 CFR 960 requires that "...960.3-1-4 only allows the use of "conservative" assumptions that would tend to underestimate the ability of the site to meet the qualifying conditions." (49FR47728)

On page 2-102, while the theories of Smith, et al. (1990) are discussed, they are generally dismissed with the statement "The Crowe and Perry (1989) analysis is considered to be more rigorous..."

In the discussion of probabilistic volcanic-release models on page 2-114 and 2-115 the DOE only presents numbers generated in various publications by Crowe with the general statement that "Numerous assumptions that are believed to be conservative underlie the probability estimates..."

One of the most obvious differences between the models of Smith and his coworkers and Crowe and his coworkers is the orientation assumed for the controlling features. As has been shown in such places as Sheridan (1992), if the other factors are held constant the change in orientation can cause about an order of magnitude difference in the results with the northwest orientation theorized by Crowe providing the least conservative results.

RECOMMENDATION

DOE should reevaluate the assumptions used in arriving at findings related to tectonics and volcanism to assure that they are conservative in accordance with the requirements of 10 CFR 960.

M. F. Sheridan, "A Monte Carlo Technique to Estimate the Probability of Volcanic Dikes," in Proceedings of the Third International Conference, High Level Radioactive Waste Management, Las Vegas, Nevada, April 12-16 (1992)

U. S. Department of Energy, "10 CFR Part 960, Nuclear Waste Policy Act of 1982; General Guidelines for the Recommendation of Sites for the Nuclear Waste Repositories: Final Siting Guidelines," Federal Register, Vol. 49, No. 236, pp 47714-47770 (1984)

B. M. Crowe and F. V. Perry, "Volcanic Probability Calculations for the Yucca Mountain Site: Estimation of Volcanic Rates," in FOCUS '89, Proceedings of the Topical Meeting on Nuclear Waste Isolation in the Unsaturated Zone, American Nuclear Society, Las Vegas Nevada (1989)

E. I. Smith, D. L. Feuerbach, T. R. Naumann, and J. E. Faulda, "The Area of Most Recent Volcanism Near Yucca Mountain, Nevada: Implications for Volcanic

Risk Assessment," in Proceedings of the International Topical Meeting on High Level Radioactive Waste Management, Las Vegas, Nevada (1990)