

November 29, 2001

Dr. George Hornberger, Chairman
Advisory Committee on Nuclear Waste
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: RESPONSE TO THE ADVISORY COMMITTEE ON NUCLEAR WASTE
LETTER DATED SEPTEMBER 18, 2001, ON TOTAL SYSTEM
PERFORMANCE ASSESSMENT—SITE RECOMMENDATION (TSPA-SR),
WHICH PROVIDED RECOMMENDATIONS TO THE U.S. NUCLEAR
REGULATORY COMMISSION STAFF

Dear Dr. Hornberger:

I am responding to your letter, dated September 18, 2001, providing us with the Advisory Committee on Nuclear Waste's (ACNW's) comments on the U.S. Department of Energy's (DOE's) Total System Performance Assessment—Site Recommendation (TSPA-SR). The ACNW made three specific recommendations to the U.S. Nuclear Regulatory Commission (NRC) staff. In responding to your letter, the NRC staff has relied upon its understanding of the ACNW's concerns, gained from the many discussions with the ACNW on these topics, and your September 28, 2001, letter on the NRC staff's issue resolution process, as it relates to NRC's sufficiency review.

In addition, it should be noted that consistent with the NRC Chairman's letter to DOE dated November 13, 2001, the NRC staff believes that sufficient at-depth site characterization analysis and waste form proposal information, although not available now, will be available at the time of a potential license application such that development of an acceptable license application is achievable.

Recommendation 1:

Take the necessary action to be assured that the performance assessment of the proposed Yucca Mountain repository is, in fact, risk-informed.

NRC Staff Response:

The NRC staff has taken actions to be assured that the performance assessment for the proposed repository will be risk-informed. These actions include developing a risk-informed, performance-based regulation. In this context, DOE is required to provide risk information arising from its need to:

- (1) Explicitly consider a broad set of potential challenges to safety,
- (2) Explicitly identify and quantify sources of uncertainty, and
- (3) Have a means to test the sensitivity of the results to key assumptions.

For example, DOE must:

- (1) Provide the technical basis for its performance assessment, including how the assumptions, models, and parameters affect the resulting time and magnitude of the resulting radiological exposures
- (2) Account for the effect of uncertainties in parameters and models on the performance of the repository, and
- (3) Describe the capabilities of each barrier of the repository system.

DOE is able to use the flexibility afforded by the NRC's risk-informed, performance-based regulations to develop a realistic performance assessment or to introduce conservatism; as long as their approach is able to demonstrate compliance, the staff has no basis to require DOE to use any particular approach. In some cases, DOE may decide that adopting a conservative approach can be an effective and efficient method for demonstrating compliance (e.g., when uncertainties may be large and data collection is difficult). In pre-licensing interactions, the staff has emphasized the expectation that DOE will provide a transparent, traceable, and technically supported assessment of repository performance in any licensee application submitted to NRC. The staff will continue efforts to have DOE provide the information necessary to allow a risk-informed review and to facilitate effective, efficient, and realistic regulatory decisions.

We recognize that if DOE introduces conservatism into their performance assessment, then DOE may have difficulty making optimal design decisions and communicating the risk associated with their design, because they would not have their best estimate of the risk. We also recognize and agree with the concern that was described explicitly in your September 28, 2001, letter: namely, that DOE's use of conservatism makes it difficult to identify the importance of particular issues to risk (i.e., that it is not "risk-informed" as the term is used by the ACNW). Objective regulatory decisions (e.g., whether public health and safety will be adequately protected) can be — and have been — based on the results of performance assessments that include conservatism. One example that illustrates where conservative performance assessments have been used to make objective regulatory decisions is the application of the DandD screening code for site decommissioning decisions.

NRC and DOE held 18 technical exchanges addressing topics related to post-closure performance between June 6, 2000, and September 10, 2001. The agreements resulting from these meetings will lead to information that will help the NRC staff conduct a risk-informed review of DOE's license application, should one be submitted. Some of these agreements address issues of concern that were specifically expressed in your September 18, 2001, letter such as:

- Use of conservatism,
- Representation of uncertainty,
- The process used to develop abstracted models from detailed models, and
- The need to consider the effects of non-linear models when judgments are made to use conservatism to address uncertainty.

Recommendation 2:

Take the necessary action to be assured that DOE has adopted an evidence-supported approach and realistic modeling assumptions for use in the TSPA-SR while reducing the dependence on parameter bounding and conservatism to overcome uncertainty and increase the reliance on such available evidence as site-specific field and laboratory data, natural analogs, and expert knowledge.

NRC Staff Response:

The NRC staff agrees with the ACNW that there should be a clear link between the evidence and the performance assessment modeling.

As indicated in the discussion of Recommendation 1, above, the NRC staff shares aspects of the ACNW's perspective on the treatment of conservatism, in general, and the manner in which DOE should address conservatism in any performance assessment supporting a potential future license application. In particular, the staff recognizes the value of making modeling choices that are reasonable and realistic, but are supported by evidence. As I have indicated above, the NRC staff have reached a number of agreements with DOE, where some of these agreements call for DOE to improve support for assumptions, parameter ranges, and models used in the performance assessment that DOE would use to support a potential license application. In addition, there are agreements that specifically address DOE's approach to conservatism and its use to address uncertainty. These agreements will lead DOE to:

- (1) Strengthen, or clarify, the links of future performance assessments to the supporting data; and
- (2) Improve the consistency, in their approach to conservatism, including the approach used to assert that particular assumptions, models, or parameter distributions are conservative.

Recommendation 3:

Take the necessary action to be assured that the NRC staff's review of the TSPA-SR adequately emphasized waste package failure and in-package processes to assure the staff that the waste package can perform as DOE claims and to inspire confidence in the characteristics of the source term for radionuclide transport.

NRC Staff Response:

The NRC staff agrees with the ACNW on the importance of the waste package and source term to the evaluation of repository safety. The NRC staff has emphasized processes related to waste package failure and in-package chemistry in completing the review of the TSPA-SR and supporting Analysis/Model Reports. As a consequence of this review, the NRC staff sought, and reached, agreements with DOE pertaining to DOE's assertions of waste package performance and the characteristics of the source term.

Dr. G. Hornberger

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The NRC staff believes that the agreements reached with DOE will help address the ACNW's concerns expressed in your letter. The staff recognizes the need for continuing work to assure that DOE provides the information that will be needed to conduct a risk-informed review of the potential license application. The staff will remain cognizant of your views on: (a) realism versus conservatism in performance assessment; and (b) the need for a clear link between the performance assessment modeling and the supporting evidence.

Sincerely,

/RA/

William D. Travers
Executive Director
for Operations

cc: Chairman Meserve
Commissioner Dicus
Commissioner Diaz
Commissioner McGaffigan
Commissioner Merrifield
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Commissioner McGaffigan
Commissioner Merrifield
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