

August 2, 2002

The Honorable Richard A. Meserve
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: YUCCA MOUNTAIN REVIEW PLAN, REVISION 2

Dear Chairman Meserve:

The Advisory Committee on Nuclear Waste (ACNW) has reviewed the Yucca Mountain Review Plan (YMRP or the Plan), Revision 2, prepared by the staff of the U.S. Nuclear Regulatory Commission (NRC) and the Center for Nuclear Waste Regulatory Analyses (CNWRA). The YMRP was discussed at the Committee's 133rd meeting on March 19-21, 2002, 134th meeting on April 16-18, 2002, 135th meeting on June 18-20, 2002, and 136th meeting on July 23-25, 2002.

The YMRP was developed with the intent that 10 CFR Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada," will be implemented using the Plan to guide the site-specific review. The principal purpose of the YMRP is to ensure the quality and uniformity of staff licensing reviews. In addition, although the U. S. Department of Energy (DOE) as the potential applicant is free to choose how to present the safety case, the YMRP does provide a "form-and-content" guide that DOE is likely to follow in a license application, at least to a large extent. As such, the YMRP is important to the NRC, DOE, and the stakeholders.

In reviewing the YMRP, the ACNW asked several questions:

- Is the document well written and is it likely to be clear to the reviewers, the applicant, and technically knowledgeable stakeholders?
- Is the YMRP consistent with the risk-informed aspects of 10 CFR Part 63?
- Is the document appropriate in level of detail; that is, does it avoid being too prescriptive about how the applicant should conduct studies and analyses to demonstrate compliance, while containing enough specificity to provide useful guidance for reviewers?

OBSERVATIONS AND RECOMMENDATIONS

Observation 1

The YMRP meets the purpose for which it was written. It explains the bases of the Plan with respect to Congressional actions, previous regulatory activities, requirements of the U. S. Environmental Protection Agency (EPA), and the role of such organizations as The National Academies. In addition, it emphasizes the adoption of a risk-informed regulatory practice.

The YMRP has a great deal of repetitiveness, particularly with respect to such headings as “Areas of Review,” “Review Methods,” “Acceptance Criteria,” “Evaluation Findings,” and “References.” Every such heading, along with much common verbiage, is repeated for each of the many topics, which are separately discussed for both preclosure operations and postclosure performance. The Committee recognizes that this approach may support the uniformity of the review by different staff groups. Nevertheless, the repetitiveness does make the document quite long.¹

Recommendation 1

The staff should consider using tables, charts, and graphics to give the reader a high-level overview so that the YMRP can be grasped as an integrated whole, rather than a long series of separate activities. An example of a “table” could be an abbreviated form of what currently appears as narrative under the headings (e.g., “Acceptance Criteria,” “Evaluation Findings,” etc.) for each of the topics involved. Several such tables could be developed, one for each major category, as listed in the Contents sections §1.3.1 through §1.3.6, “General Information,” “Preclosure Evaluation,” “Postclosure Safety Evaluation,” “Research and Development Program,” “Performance Confirmation,” and “Administrative and Programmatic Requirements.” A graphic that might facilitate understanding is an “activity network,” which diagrams how the YMRP would work in terms of activities and linkages between activities. Such linkages are not always clear in the text of the YMRP, in part because of the length caused by the repetitiveness. An activity network diagram would also help to communicate the completeness of the YMRP and, hopefully, make the report more understandable to the stakeholders.

Observation 2

The parts of the YMRP dealing with postclosure issues reflect the risk perspectives of 10 CFR Part 63 appropriately. The YMRP is not prescriptive,² rather it leaves to the applicant decisions about how to demonstrate compliance with 10 CFR Part 63. While the ACNW applauds this aspect of the YMRP, we caution that implementation of the YMRP will actually determine whether a risk perspective is indeed followed. The YMRP identifies the need to maintain

¹ At the March 2002 meeting with the Commission, we were asked why the YMRP had to be so long and whether the NRC staff was prescribing too much detail in the YMRP. The ACNW believes that the repetitiveness in the document, designed by the staff to ensure uniformity in the review process, makes the document longer in words than in content.

² We use “prescriptive” to describe a situation in which the staff would propose that a specific method of data collection, data analysis, or modeling is the only way to meet an acceptance criterion. We found no evidence of prescriptive wording in the postclosure sections of the YMRP.

flexibility in the review guidelines at the expense of specificity. The YMRP acceptance criteria are replete with guidance to the staff for evaluating such aspects as whether “sufficient data are available to adequately define relevant parameters and conceptual models,” whether “models use parameter values, assumed ranges, probability distributions, and bounding assumptions that are technically defensible,” and whether “the technical bases for the parameter values are consistent with data from the Yucca Mountain region.” The critical issue will be how items like data sufficiency and model adequacy are determined at the detailed level. The ACNW believes that the work carried out in the issue resolution process will be a key to ensuring that the YMRP does not result in unwarranted requirements for ever-greater amounts of data and analysis with no increase in safety.

Recommendation 2

The staff should consider adding an appendix to the YMRP to provide an abbreviated illustration of a “review” of a very specific issue. This might be achieved using one of the integrated subissues, with specific reference to the agreements between the NRC and DOE as to how questions about sufficiency and adequacy will be addressed in the review process. Such an example might be very useful to all of the “users” of the YMRP, including the NRC and DOE staffs. The example might also clarify what might lead to a conclusion that the safety case presented was inadequate.³ Findings of compliance or noncompliance will need to be substantiated.

Observation 3

The YMRP suggests that the question of whether the NRC staff performs a detailed review or a simplified review of a particular feature will be answered by how important the DOE safety analysis considers the feature to be to the overall performance of the repository. [... the staff will review each model abstraction to a detail level suitable to the degree the U.S. Department of Energy relies on it to prove its safety case” (YMRP, page 4.2-17)]. On the other hand, the YMRP contains language that suggests that the scope of the review will be determined in part by what DOE deems important in the safety case, but also in part by risk insights developed by the NRC staff by using their own knowledge of the site and their own analyses of performance assessment models. The ACNW strongly favors the latter approach.

Recommendation 3

The NRC staff should not be guided solely by the applicant on the depth of the review of an application. The staff should continue to build their own insights about important contributors to risk at the proposed repository, and should ensure that all reviewers of an application have these insights as a common background.

³ It might be useful to add general instructions in the Introduction to the YMRP to describe what the Commission expects in terms of “reasonable expectation,” thereby setting the overall criterion for adequacy. These general instructions could then be clarified by the example in the recommended appendix to the YMRP.

Observation 4

Because 10 CFR Part 63 does not have performance objectives for administrative and programmatic aspects, the staff relied on experience with regulating other nuclear facilities, most notably nuclear power plants for these parts of the YMRP. Some of the preclosure parts of the YMRP also apparently rely on experience with fuel cycle facilities and nuclear power plants. Although experience can be a valuable guide, one must recognize that the operations at the proposed Yucca Mountain facility have little in common with nuclear power plants and, hence, many reactor-related guidance documents may not be transferable. Important hazard factors, such as large amounts of stored energy, short-lived biologically active fission products (such as iodine), high levels of self-heating, and events with short-time constants are important to nuclear power plant safety, but are not present either in vitrified high-level waste (HLW) or in cooled spent fuel. Repeated references to reactor-based documents (e.g., NUREG-2300 and 1278, Regulatory Guides 1.109 and 8.38 and references to the design of systems that are important to safety) support the observation that the YMRP relies heavily on NRC documents prepared for and used in conjunction with the licensing of nuclear power plants.

Recommendation 4

The staff should review material carried over from nuclear power plant reviews, and delete all material and requirements that are not relevant to the safety of the proposed Yucca Mountain repository. For material that is deemed relevant, the staff should explicitly defend, in the YMRP, the use and relevance of reactor-based guides and policies, and clearly indicate in the YMRP where use of such experience has been modified or amended to account for the differences between HLW disposal and nuclear power plant operation.

CONCLUSION

We find that the YMRP is capable of providing a risk-informed approach to the review of a repository license application. We believe that adopting the recommendations made above can strengthen the YMRP.

Sincerely,

/RA/

George M. Hornberger
Chairman