



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555

May 1, 1992

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Chairman Selin:

SUBJECT: COMPREHENSIVE SYSTEMS ANALYSIS OF THE HIGH-LEVEL
RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL PROGRAM

In response to your request dated August 21, 1991 (M910725A), the Advisory Committee on Nuclear Waste (ACNW) has held several meetings since our oral report to you in December on the scope and need for a systems analysis of the high-level radioactive waste (HLW) management and disposal program. During these meetings, which included a working group meeting on February 19-20, 1992, we discussed this matter in some detail with members of the NRC management and staff; the Environmental Protection Agency (EPA) staff; the Department of Energy (DOE) staff, including the Director of DOE's Office of Civilian Radioactive Waste Management (OCRWM) and the general manager of its primary HLW management and operations (M&O) contractor, TRW; the Chairman of the Monitored Retrievable Storage (MRS) Commission and a representative from the Office of the Nuclear Waste Negotiator; a member of the Waste Isolation Pilot Plant Blue Ribbon Panel; representatives from the State of Nevada; and representatives from industry, including the Edison Electric Institute, the Electric Power Research Institute (EPRI), and Virginia Power. We also had the benefit of the documents listed at the end of this report.

On the basis of these discussions, we believe that a systems analysis for individual components of the HLW management and disposal program, much less the entire program, would encompass a large range of dimensions, many of which are as yet unidentified. Further, such an analysis would also require a substantial effort. This is due to a host of factors, including the number and complexity of the various disciplines that are involved; the absence of firm reference designs for the repository systems; the lack of an equally firm decision about the site being investigated; and the limited experience of the sciences and technologies in describing, with precision, the performance of related systems, both natural and man-made, over prolonged periods of time. We and others agree with your observation that a systems analysis would be extremely useful for identifying deficiencies in the HLW management and disposal program.

Assisting us in reaching conclusions on this issue was a recent beneficial discussion with the Director, OCRWM, and a presentation to us of the plans that DOE has for devising an annotated outline for the preparation of a license application. In addition, during our 41st meeting (March 12-13, 1992), DOE informed us about the processes used to formulate conclusions for the Early Site Suitability Evaluation Documents. We have also reexamined the role of the DOE Site Characterization Plan (SCP) and its relation to the performance of the repository. Of benefit was the presentation we heard on the detailed review and analysis conducted by the MRS Commission. These interactions have shown that many of these activities that are planned, or in early stages of completion, address certain aspects of the assignment given to this Committee.

In addition to our interactions with DOE, to our examination of recent EPRI studies on performance assessment, and to our corresponding reviews of the performance assessments conducted by the NRC staff, we examined several relatively small parts of the overall HLW management and disposal system. These efforts further confirmed the conclusions that the number of dimensions within even a narrow set of issues was very large, that the range of interfaces necessary to analyze the HLW system had not yet been noted in a comprehensive manner, and that an analysis of the complete system would be a formidable task.

We believe it important to reemphasize that the current interest in a systems analysis for the HLW disposal process is in no way to be construed as a desire or need to reconsider the Waste Confidence Proceedings. This Committee reaffirms its concurrence with the findings of the Commission that there is reasonable assurance that the HLW being produced in nuclear facilities can be disposed of safely, that a repository can be made available in an appropriate time frame, and that HLW can be safely stored until emplaced in a repository.

Intermediate Conclusions

- During our reviews of and discussions on this topic, we were able to come to some intermediate conclusions that have bearing on the systems analysis question. These are listed only to illustrate that even a partial and superficial inquiry into the HLW disposal system can identify issues that may need attention.
- Since one of the beneficial aspects of a systems analysis of HLW management and disposal is the identification of interfaces that may not be adequately addressed or coordinated, we noted that the current activities in HLW disposal largely fail to address the question of contingencies. Since it is not ensured that the Yucca Mountain site will prove to be suitable, or that the MRS can

be located and constructed/operated on a timely basis, the DOE and the NRC may be faced with a schedule for accepting and managing HLW, especially spent fuel, that is not in accord with the completion of functional storage or disposal systems. We detected little if any attention being given to the activities that would be necessary should such an occasion arise.

- We have recognized that satisfactory resolution of the technical aspects of the HLW disposal issue is necessary but not sufficient to ensure that HLW can be safely emplaced in a repository. We, as have many others, have noted that communications among the technical community involved in the HLW disposal system are fully functional only among some parts but seem to be inadequate when the public is concerned. Although this area of endeavor is outside the normal scope of ACNW activities, we believe that a systems analysis would focus quickly and emphatically on this aspect as being one that could be as debilitating as the discovery of a substantial flaw in the quality of the candidate site. The NRC is likely to bear a part of the burden of this deficiency.
- We noted that while the current interest in efforts to site an MRS appears encouraging, most views of a systems description of the HLW disposal activities require the presence of such a facility at least for the interim. The restrictions placed on an MRS, both in location and in the length of time for which HLW may be stored therein, are such as to assuredly rise in importance in a systems analysis. We have gathered that interim storage for periods that reduce the heat pulse from HLW may be identified in a systems analysis as a desirable alternative that is not now actively being considered.
- Several of our discussions have focused on human intrusion as a dominant and somewhat unpredictable pathway for exposure of the public to HLW from a repository. A systems analysis is not the only method of arriving at an assessment of this issue, but we believe that unless techniques are found for better evaluation of the likelihood of major impacts from human intrusion, this problem will remain as a dominant challenge in meeting the pertinent standards and regulations.
- We and the Commission have noted before that the subsystem criteria promulgated by the NRC may not be in concert with the corresponding EPA standards. Even though the EPA standards are not yet final, we believe that a systems analysis of the performance of the HLW in a repository would show discrepancies that may not be easily resolvable, except for the consideration that the differences may fall within existing uncertainties.

- We conveyed to you during our December 1991 meeting our belief that performance assessment would be a suitable basis for developing a comprehensive systems analysis. We continue to adhere to this conclusion and are gratified that the performance assessment framework has served as the basis for partial systems analyses that are being developed. This adherence to our previous position does not, however, modify our conclusions about systems analysis as given below.

Commentary, Conclusions, and Recommendations

- With these factors in mind, we believe that the ongoing activities of the DOE and NRC staffs make the immediate initiation by the Commission of a separate, comprehensive analysis of the entire HLW management and disposal system premature at this time. In our opinion, the better course of action would be to await the results of these ongoing efforts. At that time, it should be possible to better determine what is needed. The NRC staff, for example, has been mindful of the importance of addressing significant issues in the repository development program; the quality of its Site Characterization Analysis (SCA) is testimony to that fact. Similarly, DOE has analyzed in detail certain components of the HLW management system, such as transportation. In addition, the nuclear utilities as well as the NRC staff are actively considering the issues encompassing on-site storage of spent fuel.
- We believe that the activities of DOE in defining the HLW management and disposal system will become more visible, and more available for direct examination, by the end of this fiscal year since DOE has announced that it plans to issue at that time draft versions of the annotated outline for preparation of a license application. In addition, the DOE M&O contractor is currently conducting a comprehensive systems analysis. Further, the NRC staff will soon complete phase two of its HLW performance assessment, which could yield a product for review in the near term. The NRC staff should be encouraged to review the DOE documents carefully to ensure not only that the important questions are being addressed but also that interfaces with the other aspects of the HLW management and disposal activities necessary to operate under a Commission license are being properly addressed and resolved. We believe that such attention is in accord with the tenor of your assignment.
- In that connection, the NRC staff should also be encouraged to emphasize in its interactions with DOE the differences between the DOE SCP and the NRC SCA to ensure that DOE is aware of the need to react directly and responsively to the recommendations made in the SCA. The NRC staff also should examine the SCA to

ensure that the interfaces among the various activities for site characterization are adequately identified and addressed.

- We plan to review in some detail the product of the systems analysis effort now being undertaken by the DOE M&O contractor. If, after review of the related documents and after interactions with the DOE staff, we find that there is a need to further ensure that important questions are being addressed in time to provide information needed for the licensing process, we will return to the Commission with a statement of work that, if carried out, will address these concerns. Owing to the major resources that we anticipate that a systems analysis would require, we plan to provide comments on the potential for benefit to the Commission in conducting such an analysis, as compared to the expected cost. We note that the identification by the Commission of the need for a systems analysis of the entire HLW management and disposal program has, by itself, served as a significant stimulus to all parties involved. It should also help ensure that much more attention will now be directed to the various program interfaces and coordination. It is expected that the key questions concerning the comprehensive nature of the investigative programs will also profit from this attention.

In summary, we believe that an in-depth systems analysis is essential to the adequate and proper conduct of an HLW management and disposal program. Ongoing activities of the DOE and NRC staffs appear to us to make it premature at this time for the Commission to initiate a separate study. In our opinion, the better course of action would be to await the results of these ongoing efforts.

We trust that these comments respond, at least in part, to the charge that you assigned us. We intend to continue to follow developments in this area and provide separately the information you requested during our meeting on April 24, 1992.

Sincerely,



Dade W. Moeller
Chairman

References:

1. NRC Staff Site Characterization Analysis of the Department of Energy Site Characterization Plan, Yucca Mountain Site, Nevada, NUREG-1347, 1989
2. DOE Site Characterization Plan, Yucca Mountain Site, Nevada, Research and Development Area, Nevada, December 1989, Volumes I through IX, DOE/RW-0199, DOE, OCRWM

3. U.S. Department of Energy, Yucca Mountain Site Characterization Project, Report of Early Site Suitability Evaluation of the Potential Repository Site at Yucca Mountain, Nevada, January 1992 SAIC-91-8000
4. U.S. Department of Energy, Yucca Mountain Site Characterization Project, Report of the Peer Review Panel on the Early Site Suitability Evaluation of the Potential Repository Site at Yucca Mountain, Nevada, January 1992, SAIC-91-8001
5. Nuclear Waste: Is There a Need For Federal Interim Storage?: Report of the Monitored Retrievable Storage Review Commission, November 1, 1989
6. Strategic Plan for Building New Nuclear Power Plants, First Annual Update, Nuclear Power Oversight Committee, November 1991
7. Physical System Requirements, Overall System (DOE/RW-0334P), Department of Energy, January 1992
8. Physical System Requirements, Store Waste (DOE/RW-0319), Department of Energy, January 1992