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FINAL REPLY:

Mel Silberberg  
Thousand Oaks, California

TO:

Chairman Meserve

FOR SIGNATURE OF :

\*\* GRN \*\*

CRC NO: 02-0156

DESC:

Restoring NRC HLW Research: It's All About  
Credibility, Building Public Confidence and  
Science-Informed Decisions

ROUTING:

Travers  
Paperiello  
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Thadani, RES  
Lohaus, STP  
Hornberger, ACNW

DATE: 03/01/02

ASSIGNED TO:

CONTACT:

NMSS

Virgilio

SPECIAL INSTRUCTIONS OR REMARKS:

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**AUTHOR:** Mel Silberberg (CA)  
**AFFILIATION:** CA  
**ADDRESSEE:** CHRM Richard Meserve  
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**ACTION:** Appropriate  
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February 26, 2002

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

The Honorable Nils J. Diaz  
Commissioner  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

The Honorable Greta J. Dicus  
Commissioner  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

The Honorable Edward McGaffigan, Jr.  
Commissioner  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

The Honorable Jeffrey S. Merrifield  
Commissioner  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Dear Chairman Meserve and Commissioners Diaz, Dicus, McGaffigan, and Merrifield:

**SUBJECT: RESTORING NRC HLW RESEARCH: IT'S ALL ABOUT CREDIBILITY,  
BUILDING PUBLIC CONFIDENCE AND SCIENCE-INFORMED DECISIONS**

**BACKGROUND, STATUS, AND SUMMARY OF CONCERNS**

1. On January 16, 2001 I sent a letter to Chairman Meserve regarding my concerns about the flawed strategy and scope of the NRC HLW research program (Ref. 1).
2. I received a response to Reference 1 in a May 7, 2001 letter (Ref. 2) from Mr. Martin Virgilio restating the staff position on the current NRC HLW program strategy, judging it

effective and efficient, so that NRC is well positioned to support an independent review of any potential license application for a potential repository. I will address this assertion later.

3. Since May 7, 2001 the results of several relevant, timely, and substantive reviews by boards and special panels have been published. I have also found additional, related information in searching various agency documents.
4. Many of the conclusions and recommendations contained in these reviews provide convincing support for the need for change expressed in Reference 1. They not only serve to confirm and reinforce the concerns I outlined in Reference 1, but also more clearly reveal the program deficiencies. **Overall, these recommendations were sufficiently compelling for the Commission to take action**, yet another year has passed, without visible changes to the program. **Despite specific recommendations from these reviews, including several relevant Commission meetings in 2001, the Commission was silent, not even issuing a Staff Requirements Memorandum dealing with this policy issue.**
5. There is a perceptible absence of a viable NRC HLW research program, regardless of the semantics used by the NRC staff to categorize the research as confirmatory or anticipatory. **Even more alarming is the continuing lack of a viable role for the fundamentally important and valuable research arm of the NRC, the Office of Research (RES), in the regulatory process for a proposed HLW repository at Yucca Mountain, Nevada.** The passing of another year has only magnified these concerns.
6. **It is difficult to imagine how a program strategy that doesn't take advantage of all of the technical and scientific staff resources available in the NRC can be deemed effective and efficient.**
7. **If one summarizes the abovementioned concerns and the discussion to follow, I do not agree with the conclusion in Reference 2, that the NRC is well positioned to support an independent review of any potential license application for a potential repository.**

Critical decisions required to implement needed change to a flawed research strategy for the NRC HLW program are of such magnitude and importance to the credibility of the NRC HLW regulatory program, they can no longer be left to the NRC staff. **Based upon the record to date, I do not believe the senior management in NMSS and the EDO can be expected to render an objective judgment in this matter.** In addition, the current NRC organizational structure no longer gives the RES Director an independent voice in waste-related matters, as was the case prior to ~1996, therefore, it is necessary to bring this urgent need for change involving NRC HLW research, directly to the attention of the entire Commission as a vital policy matter.

In the following sections I will discuss further the rationale supporting the concerns and conclusions reached above.

## **INFORMING, BUILDING PUBLIC CONFIDENCE WITH CREDIBLE DECISIONS ASSURED BY SOUND SCIENCE: A MANDATE FOR THE NRC RESEARCH OFFICE**

The institutional process driving a decision on the siting, licensing and operation of a proposed, potential geological repository at Yucca Mountain, Nevada, (YM) involves technical, scientific, and political issues. At the end of the day, if you can't build a consensus base in the scientific community for repository science, you will not be able to gain the confidence of the public. For example, recent concerns about the state of DOE scientific investigations (Ref. 3 and 4) can have serious implications for building public confidence in the potential licensing process for a possible repository. Since the current divisions over YM science will continue to exist for some time into the foreseeable future, we should not expect the licensing review to be a pro-forma process of compliance. **Regardless of the outcome of the NRC review of the license for a potential repository, the agency will have to defend the scientific basis for its decisions to all stakeholders, as well as to the world court of scientific opinion.** This issue is addressed later.

Over the course of NRC history (e.g. reactor system thermal-hydraulic performance, severe accident risk and source term, nuclear plant aging and pressurized thermal shock, to name a few) the public and other stakeholders have gained confidence in NRC decisions involving controversial, complex technical and scientific issues because of the coordinated support of a robust, independent research program carried out by the NRC, within RES. The scope and depth of the NRC research programs were of sufficient magnitude that NRC was able to independently defend its decisions based upon sound science, while assuring public health and safety. NRC was in effect the last word, literally and figuratively. The need for an adequate NRC HLW research program is not exempt from the tested lessons and wisdom derived from NRC's past. **NMSS regards the NRC HLW regulatory program as risk-informed, effective and efficient, but at the end of the day, success and credibility requires a comprehensive research effort, one that has not been evident in recent years.**

## **NRC HLW RESEARCH: A PRIORITY NEED FOR A PROGRAM STRATEGY**

The NRC HLW research program was ostensibly terminated in 1996 owing to a severe reduction in funding for the NRC HLW program. Although funding for the NRC HLW program was restored in 1998, the NRC HLW research program per se was not restored. The chronology of these program decisions was discussed previously in Reference 1. **As a member of the public I have not found on the public record, the existence of a bona fide NRC HLW research program or strategy to support and confirm technical and scientific issues over the entire regulatory process.** The NRC Performance and Strategic Plans for the Nuclear Waste Safety Arena are silent about the role of research in the HLW program or program strategy. **By comparison, the role of research to provide the technical basis to confirm the adequacy of regulations and guidance to maintain safety in areas such as decommissioning and interim spent fuel storage are evident. How can the agency justify and defend such an incongruent policy in the application of research in the interest of safety and public confidence?**

Since 1996 the NRC HLW program at the CNWRA has been referred to sometimes (e.g. ACNW) as technical assistance, a part of which is considered to be 'research.' In their 2000 ACNW Performance Plan under Second-Tier Priorities – Research, reference is made to “technical assistance performed by the CNWRA. During presentations before the ACNW, NMSS and contractor staff noted that no research was actually being conducted under the NRC HLW program (Ref. 5 and 6). Nevertheless, in Reference 2, Mr. Virgilio states “ Although some of the CNWRA’s technical work might be deemed ‘confirmatory research’ by some, I do not believe the assignment of some research responsibilities to NMSS violates any prohibition in the ERA. The reason is that, under the ERA, the Commission has wide discretion in assigning work among its statutory offices.” The first point about this assertion is that I cannot find evidence in the ERA to support it. **The second point is that if NMSS staff really believes it was given such a mandate by the ERA, why haven’t they come forth, on the public record, with an integrated, confirmatory research plan and strategy to support even the current phases of their pre-licensing review.**

One explanation was offered in Reference 7 by former Commissioner Kenneth C. Rogers, who chaired an expert panel on the role and direction of NRC nuclear research: . . . “A considerable lack of understanding exists both outside and inside NRC of exactly what the words research, confirmatory research and anticipatory research mean at NRC. The Panel sought clarification from the staff on those questions with limited success . . . Further confusion in definitions arises because the Center for Nuclear Regulatory Analysis conducts studies entirely related to Yucca Mountain (which could either be short term or long term). Because they are carried out with the express approval of NMSS consistency would define them as Confirmatory Research. However the Commission has directed that all Confirmatory Research is to be conducted under RES. Perhaps this is the reason that Mr. Kane in his presentation to the Panel contended that NMSS does not do research.” **Another possible explanation is that a planned, multi-year program, confirmatory or otherwise, does not really exist in NMSS, or if such a program exists it is inadequate to meet the needs of the HLW program.**

Since 1996 there has been little, if any, discernable participation by RES experts in the NRC HLW program. For example, one of the key technical and scientific challenges in HLW is the question of the corrosion of the Alloy 22 waste package material proposed by DOE. RES had on its staff internationally recognized expertise in materials corrosion science as one of its core research capabilities applicable to nuclear waste safety. NMSS, carrying out an ostensible NRC policy, failed to take advantage of this staff capability in RES. There are other examples of this deficiency. **The internal culture displayed in this case tends to promote a ‘closed program,’ indicative of a program operating ‘inside the box.’**

#### **INFORMING NRC HLW PROGRAM STRATEGY: ADVICE OF EXPERT PANELS AND REVIEW BOARDS SPEAK VOLUMES ON THE NEED FOR CHANGE**

In its Annual Report on NRC Waste-Related Research (Ref. 8) the ACNW noted: . . . “Another aspect of partitioning the HLW and non-HLW issues is the potential for ignoring anticipatory needs in the HLW area. NMSS focuses on the relatively short-term goal of analyzing what the DOE is doing. RES, on the other hand, is prohibited from doing any work on HLW even if it is anticipatory and arguably focused on the long term. There is a potential for a gap in the NRC

Program because of the separation of the NMSS and RES programs.”

In one of his comments in Reference 7, former NRC Chairman John F. Ahearne, citing Reference 8 noted: “These are issues raised by the NRC group chartered to review the waste programs. I believe these comments should alert the Commission to a serious potential for the NRC becoming a major obstacle to moving forward with HLW disposition for reasons other than sound science. Rather, the NRC may be found unprepared to address issues which arise because of the exclusion of a research-perspective.”

In Reference 7, Robert J. Budnitz, a former Director of RES, expressing a similar concern noted: “I feel very strongly that the Commission made a serious mistake in its decision to allow NMSS to manage the research aspects of the overall program to support its regulatory decision concerning Yucca Mountain. NMSS is not suited to managing long-range research as a matter of culture, staff-incentive structures and management skills (neither is NRR) . . . But, looking ‘beyond the licensing offices headlights’ is RES’s Congressionally assigned role! I urge the Commission to revisit this decision, and in doing so to hear from people like me who can provide it with another view, to balance what I believe to be the distorted and incorrect view that now emerges from senior staff management in NMSS and at the EDO level, few if any of whom are researchers.”

A recent report (Ref. 9) issued by one of the committees of the National Research Council’s Board on Radioactive Waste Management (BRWM) presented a number of useful views and recommendations on regulatory issues related to geologic disposal. I have selected a few cogent excerpts from Chapter 6, entitled *Scientific and Technical Issues in Radioactive Waste Management*:

- In a section called ‘The Regulator’s Dilemma’ two roles of the regulator are defined, the first role is to decide on the rules for demonstrating compliance that the implementing agencies should follow. The second role of the regulator is to decide if the license application meets these requirements. The report then states: “Both roles require that the regulator has scientific credibility and that the same rules as described above for science at the implementing agencies apply also to regulators. This includes the need for scientists at the highest levels, sufficient scientific staff, publications, room and funding for independent scientific views.”
- From Sidebar 6.4 (1).... “A second corollary is that, in general, a ‘compliance’ attitude and philosophy is an inappropriate way for the regulator to approach the major yes-or-no decision; the regulatory yes-or-no decision for a geological repository will always require a good deal of judgment, not merely a cookbook compliance-type finding. At some very fundamental level, the implementer is always responsible for showing that the site is safe. Programs should be careful that a prescriptive regulatory approach does not induce a compliance attitude rather than a ‘safety’ attitude.
- From Sidebar 6.4 (5) “The regulatory body’s ability to adopt and utilize a less prescriptive system that involves relatively more judgment is very much tied up with how much trust that body enjoys with the broad public. The more trust, the more

deference is afforded the regulatory body to exercise judgment instead of relying on prescriptive yes-or-no findings, and the more likely is acceptance by the public of the regulator's decisions."

A statement in Reference 7 sums up the concerns and advice presented above: "Several panel members felt that regardless of the work being done by NMSS in evaluating the ability to license waste management programs, special research skills are required to review that work and verify its credibility. **Decisions regarding the ultimate safety of the Yucca Mountain Project, for example, will be carefully scrutinized by stakeholders and solid research data must be available to support the decisions made by the Commission.**" (Emphasis added)

### **REFLECTIONS ON NRC HLW CONFIRMATORY RESEARCH: GETTING OUTSIDE OF THE BOX**

In a number of the reviews referenced above, many of the comments point to the need for anticipatory or long-term research in the NRC HLW program. The anticipatory, or so-called long-term, research needed has been referred to as a 'small' or 'modest' program. No basis is offered for the qualitative nature of these judgments and their meaning. The current situation regarding what HLW research is actually being done by the NRC is confusing and troubling. If the elusive scope and magnitude of the NRC research program is not clear or definitive, how can one start to define or bound the anticipatory research program? At its outset, the anticipatory program is a derivative of the confirmatory program, and for many years, both programs should be complementary. The first question that needs to be answered is: How much of the confirmatory research needed to credibly review a possible licensing application for a potential repository been completed or even identified? I believe the short answer to this question is we don't know. The NRC needs to be sure it is doing the research needed to support a credible licensing review now, before it can initiate a meaningful anticipatory program. The reasons for this answer follow.

The NRC has listed nine key technical issues (KTI) for their review of the YM project. There are many additional sub-issues related to these KTIs. Some of these issues would be influenced more by the assumption of a high-temperature repository design. The NRC is using a repository performance assessment (PA) code to project repository performance for thousands of years into the future. Large uncertainties exist in the processes and parameters for many of the models in the code, as well as the models themselves, and are closely related to many of the KTIs. Some NRC research related to these uncertainties is needed now just to understand and confirm the DOE PA code, its models and parameters, for the licensing review, and for many years to come. Such research is also essential to gain understanding and build confidence in the use of the NRC PA mode. **Risk-informed PA can be an important tool for HLW regulatory decisions, but unless the PA model is also sufficiently science-informed, it is much less useful and credible.**

Recent reports of the Nuclear Waste Technical Review Board (NWTRB) appear to be consistent with these views. In Reference 10 the NWTRB commented on the DOE performance assessment model and its related uncertainties: "The DOE uses a complex integrated performance assessment model to project repository performance. Performance assessment is a



useful tool because it assesses how well the repository system as a whole, not just the site or the engineered components, might perform. However, gaps in data and basic understanding cause important uncertainties in the concepts and assumptions on which the DOE's performance estimates are now based. Because of these uncertainties, the Board has limited confidence in current performance estimates generated by the DOE's performance assessment model.

... An international consensus is emerging that a fundamental understanding of the potential behavior of a proposed repository system is of importance comparable to the importance of showing compliance with regulations. The Board agrees that such fundamental understanding is important."

**This evaluation by the NWTRB, albeit directed towards the DOE, also frames the technical challenge faced by the NRC, with its current HLW program strategy, which appears to be heavily weighted towards compliance-based review, as opposed to a more balanced strategy involving more fundamental understanding of repository science. This view is also consistent with recommendations by the BRWM committee in Reference 9.**

## **CONCLUSIONS AND RECOMMENDATIONS FOR COMMISSION CONSIDERATION**

Ample arguments, supported by a preponderance of testimonials by recognized experts and former regulatory decision-makers, have been presented for the Commission's policy consideration in the matter of NRC HLW program strategy and the urgent need to fill the current void in the science-informing role normally derived from NRC research. The current NRC HLW strategy is not sufficiently pro-active in the area of confirmatory research, lacks a role for traditional RES support, and appears to rely excessively on a compliance-based approach.

There is still time for the Commission to make needed changes in the HLW program strategy. The age-old adage about not 'changing horses in mid-stream' is not a sound or prudent justification. The case for change presented in this letter indicates that the 'horse may not make it across the stream.' The potential risk of delaying needed changes to the program increases with time with the consequence of a real potential for the NRC becoming a major obstacle to moving forward with HLW disposal. **This concern is not only about who manages the NRC HLW research program, expressed in Reference 1. It's also about serious concerns with the inadequacies of the research program strategy and its impact on the very credibility of the regulatory program.**

This Commission can leave an important policy legacy for the future of the NRC HLW regulatory program or it can defer the needed change to those who follow. Assuming the Congress decides to move forward with the YM Project on the current schedule, or with a likely scenario which delays the project several years (similar to the GAO finding) to obtain more data, it is incumbent upon the Commission to inform the Congress that the NRC finds it prudent to revise its HLW program strategy, and hence its budget request from the Nuclear Waste Fund, based upon the weight of considerable, expert advice from various panels and committees.

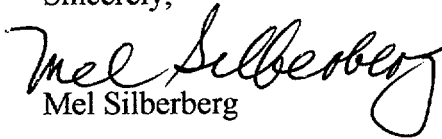
One thing is certain. The earlier needed program changes are made, the easier they are to implement, and with a lower potential risk for a regulatory impasse to HLW disposal. If the Commission decides to take no further action and if for some reason the NRC HLW strategy is

called into question in the future, a response, which in effect says, “we didn’t have sufficient resources to do the job” will be unacceptable.

During a speech in 2001 Commissioner Merrifield used a quotation from Nathaniel Hawthorne, which is appropriate for the current discussion: *“Destiny is not a matter chance; it’s a matter of choice. It is not a thing to be waited for, it is a thing to be achieved.”*

I trust the Commission will accept these comments with the same constructive and collegial spirit in which they are offered. If I can be of further assistance please do not hesitate to call on me. When appropriate, I would be pleased to appear before the Commission on the matters presented in this letter, as an informed stakeholder with extensive expertise in nuclear regulatory research for reactor safety and nuclear waste safety.

Sincerely,

  
Mel Silberberg

cc:  
ACNW  
NWTRB  
DOE/OCRWM  
NWPO

## REFERENCES

1. Letter from Mel Silberberg to The Honorable Richard A. Meserve, Chairman, USNRC, dated January 16, 2001.
2. Letter from Martin Virgilio, Director, NMSS to Mel Silberberg, dated May 7, 2001.
3. GAO Report-02-191, "*Nuclear Waste: Technical, Schedule, and Cost Uncertainties of the Yucca Mountain Repository Project*," December 2001.
4. Advisory Committee on Nuclear Waste, Transcript of Meeting, Nov. 29, 2001.
5. Advisory Committee on Nuclear Waste, Transcript of Meeting, October 22, 1997.
6. Advisory Committee on Nuclear Waste, Transcript of Meeting, Workshop on Research Needs, November 28, 2001
7. USNRC, Office of Nuclear Regulatory Research, "*Role and Direction of Nuclear Regulatory Research – Expert Panel Report*," May 2001.
8. Letter from Advisory Committee on Nuclear Waste to The Honorable Richard A. Meserve, Chairman, USNRC, dated February 5, 2001.
9. National Research Council, Board on Radioactive Waste Management, "*Disposition of High-Level Waste and Spent Nuclear Fuel: The Continuing Societal and Technical Challenges*," June 2001, National Academy Press.
10. Letter from the U. S. Nuclear Waste Technical Review Board to The Honorable Dennis Hastert, The Honorable Robert C. Byrd, The Honorable Spencer Abraham, dated January 24, 2002.

In the interest of time and space, selected passages were chosen from some of these References because of the importance of the comment, view, or discussion to the specific issue being emphasized in this letter. The reading of the full-text of the reference is also recommended.