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Aug. 26, 2001

Ms. Carol Hanlon
U.S. Dept. of Energy
Yucca Mtn. Site Characterization Office (MS #025)
North Las Vegas, NV 89036-0307

Dear Ms. Hanlon:

This letter comes to you from a member of the Committee on Remediation of Buried and Tank Wastes of the National Academy of Sciences/National Research Council. That Committee recently completed its report on the long-term management of nuclear wastes for the Department of Energy. As a member of that Committee who has published often in the field of risk analysis, I feel a need to warn you about the scientific implausibility of the quantitative estimates in the Yucca Mountain Preliminary Site Suitability Evaluation (PSSE) Report. I write this letter as an individual scientist, and not as a representative of the National Academy of Sciences/National Research Council, of my employer (the University of Wisconsin), or of any other organization.

As you may know, the Department of Energy asked our Committee to review and make scientific recommendations regarding the management of long-term risks at DOE facilities. The Committee's final report, which was transmitted to DOE just a few months ago, was entitled *Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites* (Washington, D.C.: National Academy Press, 2000). If you have not yet seen this report, I strongly urge you to consult it at your earliest convenience, given that our findings regarding the Department's existing problems with radioactive waste management have such strong and clear implications for the proposed Yucca Mountain site.

In particular, to quote from the Summary of that report (page 4), future risks at many DOE sites "cannot be predicted with any confidence, because numerous factors that influence the character, extent, and severity of long-term risks are not well understood." As the same page of that Summary goes on to note, "DOE's preferred solutions—reliance on engineered barriers and institutional controls—are inherently failure prone." Lest the point be lacking in clarity, page 7 of the same Summary underlines it:

> Knowledge of the effective lifetimes of the materials and systems used in barrier design is limited ... and comparatively little performance monitoring data exists. *The lack of experience with the long-term performance of engineered barriers, coupled with the heavy reliance being placed upon them at DOE sites... necessitates an approach to long-term institutional management that actively seeks out and applies new knowledge.*
>
> In situ barriers used to isolate long-lived contaminants from the environment will have to be not only maintained, but in some instances completely replaced....

> *Irrespective of the management systems put in place in support of other aspects of long-term stewardship programs, physical barrier systems to keep hazardous wastes in isolation will require their own ongoing support from the institutional management system.*

Unfortunately,

> It will, however, be very difficult to assure that proper attention continues over time.... Many weaknesses in institutional controls and other stewardship activities stem from inherent institutional fallibilities.... *Because the organizational systems charged with long-term care and custodianship of hazardous materials ... have proven so fallible in the past, the research and development efforts that are part of long-term institutional management need to extend to the social, institutional aspects of long-term management systems as well* [all italics in original].

It is disturbing indeed to see such clear scientific consensus—italics and all—so thoroughly ignored in the same agency's planning for a proposed nuclear waste site that has not yet been built. Regrettably, rather than following the Committee's unusually clear guidance, the PSSE claims that there will be "*no* releases from the waste package" in the next 10,000 years (page xxxi of PSSSE Executive Summary, emphasis added).

In scientific circles, claims of zero releases tend to belong in the same category as claims of cold fusion or of perpetual motion machines. To make such a claim for a period of ten thousand years—based on a few years of simulations and virtually zero experience with actual emplacements—is to cast serious doubt on any potential for scientific credibility.

Based on the best available science, I urge you and the Department of Energy to rescind the PSSE and to begin afresh with a planning effort that pays attention to relevant scientific advice. Lest there be any confusion about the most important points to be kept in mind for that effort, I summarize them here as concisely as possible:

1. Sooner or later, all engineered systems fail.
2. DOE's proposed Alloy 22 waste package, drip shield, and other proposed engineered barriers, constitute just such an engineered system.
3. No matter how encouraging the initial test results may have been, there is still no plausible basis for arguing that the proposed system will work flawlessly for the next ten thousand years under real-world conditions. *No* engineered system from the industrial era has lasted for more than three centuries. Only a few structures such as the pyramids have lasted for as long as five thousand years, and it would be difficult to argue that any such structures have managed to maintain "zero releases."
4. Engineered systems thus require ongoing management from institutional (human) systems. Unfortunately, human systems often fail even sooner than do engineered ones.
5. As our recent National Academy of Sciences/National Research Council report makes clear, there is nothing in the track record of the Department of Energy to date to suggest that the Department can expect to be immune to just such failures in the future.

6. Accordingly, the only way to predict zero releases from Yucca Mountain over the next ten thousand years is to ignore not just the recent report from the National Academy of Sciences/ National Research Council, but also the experience and findings in the open scientific literature involving risk analysis and risk management more broadly, showing that such "zero releases" estimates tend to offer little more than what the recent book from Dr. Lee Clarke calls *Fantasy Documents.*

I hope this letter of warning will be useful to you and to the Department of Energy more broadly. Before attempting to move forward with plans that may lead to serious problems in the future, you and your colleagues should be urged again to read and take seriously the recent report from the National Academy of Sciences/National Research Council that was after all commissioned by that same Department of Energy.

I trust that this letter will be self-explanatory, but please do feel free to contact me if you would like further information or references to the scientific literature that might help you to move forward in preparing

Respectfully submitted,

William R. Freudenburg
Professor