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October 8, 2008

B. John Garrick, Ph.D.
Chairman
Nuclear Waste Technical Review Board
2300 Clarendon Blvd., Suite 1300
Arlington, VA 22201-3367

Dear Dr. Garrick:

An August 2008 Sandia document, *Long-Term Corrosion Testing Plan* (SAND2008-4922), acknowledges that the Department of Energy has not done the experimental work that it should have to support the claims in its June 2008 Yucca Mountain License Application (LA) about the corrosion resistance of the metal waste package. We expect to make use of this document to formulate contentions about the deficiency of the License Application for the upcoming hearing. But the implications of these revelations about the arrogant manner in which DOE is approaching the License Application review and hearing are more far reaching and disturbing, and that is why we write to the Board.

The calculation of metal barrier corrosion, of course, lies at the heart of the Yucca Mountain computer simulation that DOE wants NRC to accept as demonstrating conformance with Environmental Protection Agency radiation dose requirements. The research program proposed in the Sandia document is a large, *de novo* program to be concentrated in a 10,000 square foot facility at Sandia and is to run for at least ten years. It is designed to replace Yucca Mountain-related corrosion work formerly performed for DOE at Livermore National Laboratory, which the current report acknowledges was largely invalidated because of the sloppy way it was done. In other words, despite all the claims about having studied the subject for 20 years and relying on good science, in reality, when it comes to corrosion, DOE has essentially no valid experimental work of its own upon which to rely. This situation can be determined by a careful reading of the content of the Application, but the presentation is such that it is not readily apparent. Incidentally, this means that the only substantial program of research directed specifically to the key aspects of corrosion that are at issue is that which has been funded over the last several years by the State of Nevada.

As there would be a three-year startup after approval before the new Sandia facility would be ready to do experimental work, DOE is taking for granted that it can finesse the NRC review process by referring to “the literature,” and promising to do the experiments, the ones it should have done before filing an application, after it gets an NRC construction authorization. This is not the attitude one would expect from a trustworthy and competent designer and operator of the nation’s first high level waste repository.

DOE knew about its experimental deficiency on corrosion before it submitted its License Application. The Sandia document in question superseded an October 2007 document, SAND2007-7027, which contains similar information. Because of the tremendous difficulty in accessing documents on the Licensing Support Network, we did not obtain the earlier version until now. Its date is however important because it comes before DOE submitted its LA. This means DOE submitted the License Application with full knowledge of the deficiency in its corrosion research to date as described in this report.

The most appalling parts of the Sandia document are the sections that identify the gaps in DOE’s current corrosion research program and lessons learned from the Livermore work. Among the acknowledged gaps between corrosion testing needs and available facilities are the following:

“Long term deliquescent environment exposures (up to 5 years) cannot be accommodated by the currently available facilities.” (In its LA, DOE dismissed the possibility of deliquescence—the tendency of impurities on the metal surfaces to attract water from the air and to dissolve in it—as a corrosion path. The Board has repeatedly drawn DOE’s attention to the importance of this issue, advice DOE has ignored up to now.)

“A facility currently does not exist to assess the long-term effects of exposing metals to environments favorable to MIC [microbial influenced corrosion]. . .” (DOE dismissed the possibility of such corrosion in its LA.)

“A facility for testing under simulated dripping conditions does not currently exist. This capability development is part of the FY 11 - 17 activities . . .” (This item is extraordinarily significant. In an underground repository, water would drip down from the hot tunnel ceiling onto an even hotter metal surface. The nature of the evaporated residues would determine the nature of the corrosion on the surface. Nevada has done research that models precisely this process and has obtained important experimental results. DOE has never done this. Instead it immersed metal samples in a solution, which does not replicate the appropriate chemical conditions and is considered by our experts to be largely irrelevant. Sandia now seeks to correct these DOE failures, but to do so after DOE’s projected date for obtaining an NRC construction authorization.)

Among the lessons learned from the work at Livermore, which “was initially intended to provide information to enable screening of candidate materials for use in the

EBS [engineering barrier system],” the Sandia report includes the following observations. They draw from a previously known quality assurance Condition Report on the Livermore experimental corrosion program, but their full significance for the DOE corrosion positions was not evident until this report.

- “Control samples were not a formal component of the long-term testing approach.”
- “Samples were not sufficiently cleaned prior to initial weighing and introduction into the exposure vessels . . .”
- “Samples were not sufficiently characterized prior to testing . . .”
- “Sample geometry was not appropriate for weight-loss measurements on a passive material . . .”
- “Alloy 22 crevice geometry samples were not polished on both sides adding uncertainty as to the actual corrosion rate of the base metal . . .”
- “Samples were loaded so that corrosion products from one could fall onto another, . . .”
- “Half of the samples were tested in the vapor phase above the aqueous phase. The temperature of this phase was not precisely controlled . . .”
- “Dissimilar metals were mixed in the same test vessel. This practice can introduce . . . unknowns.”

In short, as stated earlier, the Sandia document acknowledges that the Livermore work is so suspect it is of no use and DOE does not have an experimental basis of its own on which to base corrosion conclusions about the waste package and drip shield. It is inexcusable that DOE, with its enormous resources, has not corrected this situation, and especially that it has not done so after strong urging from the Board. We urge the Board to maintain the closest watch on these DOE activities.

Sincerely,

Robert R. Loux
Executive Director

Cc: Nevada Congressional Delegation