UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
2300 Clarendon Boulevard, Suite 1300
Arlington, VA 22201

April 6, 2009

Mr. Christopher A. Kouts
Acting Director
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Mr. Kouts:

The U.S. Nuclear Waste Technical Review Board held its winter meeting on January 28, 2009, in Las Vegas. The participation of management and technical personnel from the Office of Civilian Radioactive Waste Management (OCRWM), OCRWM's lead laboratory, and the U.S. Geological Survey (USGS) at the meeting contributed significantly to the meeting's success.

In keeping with the Board's long-standing practice, we offer feedback that is based on the meeting's presentations and discussion. The Board realizes that implementation of the recommendations presented in this letter is subject to funding and to Administration and Congressional direction.

Yucca Mountain Program Status Update

The Board appreciated the discussion of contentions recently submitted by potential parties to the Nuclear Regulatory Commission's (NRC) licensing proceedings for Yucca Mountain and of the NRC's "Requests for Additional Information" (RAI) submitted to OCRWM. The Board is not a party to the licensing proceedings and does not intend to become one. Nevertheless, most of the contentions and RAIs deal with technical matters and therefore are of interest to the Board.

Emplacement Drift Stability

Approximately 85 percent of emplacement drifts would be located in lithophysal tuff, which contains a highly heterogeneous size and spatial distribution of cavities. The Board has greater concern about the behavior of this rock than about the behavior of the nonlithophysal tuff, which constitutes the other 15 percent and is stronger, much more uniform, better characterized, and much better understood. The Board has no doubt that sufficient data exist for confidently designing a ground support system for repository tunnels in the preclosure period, although questions remain about how drift inspection and maintenance would be carried out. However, behavior of the lithophysal rock during the thermal period immediately following repository closure still presents uncertainties. No direct or indirect tensile-strength tests have been done on rock of sufficient size to be representative of lithophysal rock. Furthermore, laboratory testing and numerical simulations of basic rock behavior have focused on intact lithophysal rock, not on tuff with abundant preexisting interlithophysal fracturing, typical of the

Tptpll zone and representing 81 percent of all drift emplacement rock. OCRWM should conduct full-scale or near-full-scale thermomechanical testing of fractured lithophysal tuff to help validate the novel project models and estimates.

Criticality

Burnup credit for actinide depletion and for the presence of fission products is necessary for repository disposal of most commercial spent fuel in waste packages containing many spent-fuel assemblies. OCRWM should continue following its comprehensive technical work plan to obtain the additional data and to perform the additional analyses needed for obtaining full burnup credit. OCRWM also should continue working with NRC to reduce or eliminate the requirement for burnup measurements to obtain burnup credit.

A representative of the Electric Power Research Institute (EPRI) discussed a recent EPRI report on the direct disposal of dual purpose canisters (DPCs) that have been loaded with commercial spent nuclear fuel. A conclusion that can be reached from the report is that some or many of the several hundred already loaded DPCs may have sufficiently low potential for criticality to permit direct disposal in a repository. The EPRI report also demonstrates that the potential for criticality of a loaded DPC can be affected by the pattern of placement of spent fuel assemblies in the DPC. In particular, loading more-reactive assemblies toward the periphery of a DPC reduces the potential for criticality. Such loading involves tradeoffs, however, because shielding also could be improved but temperatures at the DPC centerline could increase. The operational practicality of making individual calculations for each DPC rather than using the more conservative "loading-curve" approach for criticality control also should be reevaluated.

The license application does not include direct disposal of DPCs, and current OCRWM funding constraints preclude the development of license innovations. Nonetheless, when budgets permit, the direct disposal of DPCs warrants OCRWM's investigation because of the significant safety and cost advantages it offers. DOE's current plans are to cut open loaded DPCs and repackage their contents into TAD (transportation, aging, disposal) canisters — a process that would involve possibly needless fuel-handling risks as well as costs of the TAD canisters and disposal of the emptied DPCs, which are likely to be contaminated and not reusable. In addition, if DOE were to provide guidance to the utilities about recommended loading strategies for DPCs, the direct disposal option could be achieved more easily.

The Board recommends that DOE aggressively pursue burnup credit and guidelines for loading DPCs.

Welding – Waste Package Closure System Prototype

The Board was interested in hearing about the welding and other work that is nearing the point of a full-scale continuous demonstration of all of the steps necessary for closure of a loaded waste package. Development of this complex prototype system, which has been underway at Idaho National Laboratory (INL) for approximately seven years, is a signal accomplishment for which the personnel involved at INL, BSC, and OCRWM deserve credit. The time, money, and technical effort necessary to integrate all the steps in a higher-than-ambient-temperature,

radiation environment have been substantial. This is true despite the fact that the technology for each individual step except low-plasticity burnishing is backed by years of commercial experience in less hostile environments. The Board notes that the prototype system includes steps for evacuating the inner, stainless-steel waste package and filling that space with inert gas (helium). Because the inner waste package will contain a sealed and inerted canister, the Board would like to understand better the need for or advantages of evacuating and inerting the inner waste package. In addition, the tolerances for the dimensions of the narrow groove between the Alloy-22 lid and the Alloy-22 waste package seem very tight, which may cause problems during the remote placement of the lid on the waste package.

Science

The Board was pleased to have a science update again after a hiatus of two years. Although the performance-confirmation scientific activities discussed at the January meeting are necessary, they are not a substitute for scientific investigations that can lead to better understanding, alternate lines of evidence related to repository behavior, and increased confidence, or suggest safety or cost improvements. OCRWM's long-term corrosion testing program presented at the Board's meeting in January of 2008 is an example of such scientific activities. Another example — presented at the meeting — is the scientific investigation of precarious rocks and surface rocks at and near the Yucca Mountain site to help date and corroborate predictions of seismic activity in the repository area. The results of this investigation by USGS scientists also may be used to constrain the maximum ground motions that Yucca Mountain has experienced in its 12-million-year history. In addition, the geotechnical work in and around the area where the repository surface facilities are planned to be located enhances confidence and understanding. Because of the value of such scientific investigations, the Board is hopeful that conditions will permit resumption of OCRWM's Science and Technology Program in the near future. When possible, significant further enhancements to scientific understanding and confidence in predictions of repository performance can be gained through monitoring of fundamental physical conditions in the Exploratory Studies Facility and the Enhanced Characterization of the Repository Block tunnels.

Corrosion

The Board is particularly interested in the experiments conducted by USGS that show that nitrate can be lost and chloride retained upon heating of atmospheric dust. The implications of these results have not been integrated with respect to the laboratory work completed on the corrosion of Alloy 22 in nitrate-chloride brines. The discussion that ensued at the Board meeting appears to indicate that DOE is no longer relying on the presence of nitrate and loss of chloride through acid-gas devolatilization as a localized-corrosion exclusion argument, but is now emphasizing an argument based on a prediction that the volume of any brine formed will be too small to have any effect on corrosion. DOE's prediction of the volume of brine apparently does not take into account that the volume of brine that forms shortly after closure will be greater than that which will exist at the time of peak postclosure temperature and can spread on the metal surface. In addition, DOE's concept of the statistical rarity of mutual deliquescence salts occurring on adjacent particles that supports the prediction of a very small brine volume has not been substantiated. A brine-volume analysis that follows the temperature-time trajectory and

takes into account chemical composition should be conducted that is directed at predicting the potential for localized corrosion of Alloy 22. Many facets of the prediction of the physical and chemical environment appear to be evolving that DOE does not recognize. The Board would like to hear a comprehensive and encompassing discussion of the status of dust-deliquescence-induced localized corrosion of Alloy 22.

The Board places high value on OCRWM's participation in our meetings. Thank you again for the participation of OCRWM and its contractors in the Board's winter meeting.

Sincerely,

{Signed by}

B. John Garrick
Chairman