Department of Energy
Washington, DC 20585

February 26, 1999

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004-2901

Dear Mr. Chairman:

The Department of Energy's Implementation Plan for the Remediation of Nuclear Materials in the Defense Nuclear Complex (Revision 1), December 22, 1998, includes a February 1999 commitment to remove an estimated 2.6 kg deposit of uranium from the Auxiliary Charcoal Bed of the Molten Salt Reactor Experiment. This letter is to formally advise the Defense Nuclear Facilities Safety Board that the Department will not be able to meet this commitment. In addition, the Department has verbally notified the State of Tennessee and the U.S. Environmental Protection Agency, Region IV, that the Removal Action Report for this project will be delayed from the July milestone in the Department's Federal Facility Agreement under the Comprehensive Environmental Response, Compensation, and Liability Act.

The project team gained remote access to the Auxiliary Charcoal Bed in December 1998 in preparation for the scheduled removal action. The project team investigated the charcoal bed with numerous tools during the month of December and ultimately concluded that unexpected conditions of the deposit and the charcoal have precluded the planned approach of remote vacuum removal.

The project team is currently working on several issues in parallel to develop and implement an alternative approach for the deposit removal project. The team has identified several potential alternatives and has planned additional characterization of the deposit and the surrounding charcoal. The remote vacuuming approach had the lowest cost of the alternatives that were previously evaluated so the project is expected to incur a significant cost impact as well as a schedule impact. The project team does not believe that this event will necessitate a delay in the removal of the fuel salt from the drain cells in May 2002 to complete the Department's commitments to the Board for this project. We will advise the Board and the regulators as soon as we are able to recommend alternative approaches and schedules for the project.

We wish to conclude by noting that numerous actions taken since 1994, when uranium migration was initially discovered in this facility, have dramatically improved the overall safety of the facility. The enclosed memorandum (Sleeman to Nace) dated February 3, 1999, provides additional information regarding the reasons for the delay, the plans for corrective actions, and the improvements in the facility's safety posture.

We appreciate your continued attention to the progress on this important project. If you have any questions, please contact Mr. David Huizenga at 202-586-5151.

Sincerely,

James M. Owendoff
Acting Assistant Secretary for
Environmental Management

Enclosure

DOE F 1325.8
(4/93)

United States Government

Department of Energy
Oak Ridge Operations Office

memorandum

DATE: February 3, 1999

REPLY TO
ATTN OF: EM-912:Jugan

SUBJECT: **DEFENSE NUCLEAR FACILITIES SAFETY BOARD 94-1 AND FEDERAL FACILITY AGREEMENT MILESTONES FOR THE MOLTEN SALT REACTOR EXPERIMENT**

TO: Richard N. Nace, Acting Deputy Director of Eastern Area Programs, Office of Environmental Management, EM-42

The Molten Salt Reactor Experiment (MSRE) has a February 1999 Defense Nuclear Facilities Safety Board (DNFSB) milestone associated with removal of a 2.6 kg deposit of uranium from the MSRE Auxiliary Charcoal Bed (ACB). In addition, there is a July 1999 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Federal Facility Agreement (FFA) milestone associated with the Removal Action Report that documents the removal of the uranium from the ACB.

The deposit is primarily Uranium-233, reads 500R/hr, and is in a shielded cell. Only recently has it been possible to obtain good access to the exterior and any access to the interior of the ACB. The planned approach was remotely to cold-tap into the ACB and to remove the uranium deposit by a vacuuming operation. The project assumptions were that the uranium was absorbed on the ACB charcoal filter media and that the charcoal would be similar to its original, granular form. A contingency plan was, that if the charcoal were not granular, it would be broken up by tools that would be inserted through a hole to be drilled into the end of a thermocouple well, a 1/4" ID tube, inside the ACB.

Recent discoveries regarding the nature of the uranium deposit and unforeseen conditions within the ACB have resulted in the conclusion that the DNFSB and FFA milestones cannot be satisfied as originally planned. We have verbally notified the Tennessee Department of Environment and Conservation (TDEC) and the U. S. Environmental Protection Agency (EPA) and are providing formal notification that the FFA milestone will be delayed.

It is requested that DOE-HQ notify the DNFSB that the DNFSB 94-1 milestone cannot be met for technical reasons and that a new milestone will be recommended after further evaluation of conditions in the ACB and a review of alternative approaches. However, it is important to note to the DNFSB that, although actual removal of the uranium deposit will be delayed, substantial progress has been made in reducing the risks associated with the ACB for a potential nuclear criticality, for a potential chemical reaction/explosion, and for a contamination release. These have been accomplished by removing the water surrounding the ACB and removing or isolating potential sources of additional water, repairing valve 561 which allowed the uranium and F_2 to enter the ACB, extensively denaturing the potentially explosive compounds in the ACB, and constructing the ventilated enclosure above the ACB. In addition, while the ACB is being further investigated and alternatives evaluated, the MSRE project team will also be making progress on the MSRE fuel salt removal and uranium conversion problems.

The new conditions began to become evident when, as a part of the planned removal operations, the Charcoal Bed Cell shield plug was replaced with a steel plate that contained strategically placed ports. This allowed better access and subsequent better

radiological surveys of the exterior of the ACB. In November, these new surveys indicated that 10 to 15% of the uranium could be in the ACB, steel wool prefilter and not amenable to vacuuming. In December, an attempt was made to drill through the bottom of the thermocouple well to determine if the charcoal was granular as assumed. The tube was bent and the drill exited in the head space above the steel wool prefilter and baffle plate also above the charcoal. The charcoal, however, was finally accessed by cutting though the steel wool with a knife-edged tube, and drilling though the baffle plate with a smaller diameter bit that was inserted through the knife edged tube. (Because of the location, thermocouple well interference, and small size of the opening, however, the access hole would not be useful for the tools designed to breakup nongranular charcoal.) A probe was then inserted into the charcoal but it was not able to penetrate the bed. A second probe, that incorporated a long and partially fluted bit to drill through nongranular charcoal, was fabricated and inserted. The second probe identified an approximate seven-inch layer of nongranular material, which required drilling to penetrate. After penetrating the first seven inches, the probe could be inserted another inch or two without drilling. Vacuuming this nongranular layer does not appear to be feasible. It is estimated that at best approximately 40% of the uranium laden charcoal filter media containing less than 20% of the uranium could be removed by the planned vacuuming method. Therefore, alternate removal methods need to be evaluated to complete this task.

In addition during the second remote probing/drilling operation, a release of material from the thermocouple well was observed on video camera. The release appeared as a series of brief jets of whitish material over a three-second interval. Alpha and beta/gamma air monitors in the unoccupied ventilated enclosure alarmed shortly after the release, as well as, the conservatively set MSRE stack monitor. The ventilated enclosure was contaminated by the release. Analysis of smears showed $^{233}U/^{232}U$ and daughter nuclides plus ^{137}Cs. Even though the event did not exceed environmental release limits and was within the MSRE authorization basis, an Occurrence Report documenting the release was issued as a management interest occurrence. The hardened charcoal and the release has raised concern that the charcoal may not have been completely denatured during the February of 1998 effort to react the charcoal with NH_3 gas to eliminate potentially explosive CxF compounds. To address this concern, a second denaturing campaign along with controlled heating of the ACB (up to 200 degrees Celsius) has been suggested. Note that the denaturing of the ACB at higher temperatures can cause further clumping of the material within the ACB. Therefore, this process further reduces the chance of successfully vacuuming the uranium laden charcoal filter media in the ACB using the current cold-tap approach.

The project is in the process of evaluating alternative technical approaches. These will attempt to use as much of the currently developed equipment as possible to reduce schedule and cost. Four alternatives are being evaluated:

1. Enlarge existing thermocouple well opening for tool insertion to breakup hard charcoal material

2. Drill larger hole in top of ACB for tool insertion to breakup hard charcoal material and vacuum out as originally planned

3. Cut top off ACB and utilize assortment of tools to breakup charcoal and vacuum out/package material

4. Cut and remove ACB pipe below uranium zone and transport pipe section in a special transport carrier to an existing hot cell facility to extract and repackage material

Before evaluating any of these alternatives in greater detail, it is essential that some further data be obtained from the ACB. The project plans to make another entry into the ACB during the next couple of months to get a better definition of conditions above and below the compacted charcoal. A major cost and schedule impact to the total MSRE project will be incurred no matter which technical alternative is selected.

If we can be of any further assistance please contact Mike Jugan at (423) 576-0169 or me at (423) 576-0715.

Robert C. Sleeman, Group Leader
ORR Remediation Management Group

cc:
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