Department of Energy
Washington, DC 20585
July 20, 2001

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Washington, D.C. 20004

Dear Mr. Chairman:

This is in response to your May 29, 2001, letter that identified several concerns the Board believes need to be addressed promptly to establish the feasibility of transferring the americium and curium (Am/Cm) solution in F-Canyon at the Savannah River Site to high-level waste (HLW) for vitrification in the Defense Waste Processing Facility. Your letter also requested a report addressing some related issues, and that report is enclosed.

As you are aware, the contractor has recently identified a significant increase in cost to complete the current project to vitrify the solution in the Multi-Purpose Processing Facility (MPPF). As a result, we are reconsidering the HLW alternative, which now appears to be a much less expensive approach for disposing of a material for which there is no currently identified programmatic need. We have recently directed the contractor to further develop the HLW alternative with the goal of removing the remaining uncertainties associated with that approach.

We have also directed the contractor to temporarily suspend work on the current approach to vitrify the material in MPPF to avoid further expenditures on that project. Although we agree with you that stabilization of the Am/Cm solution would be delayed if we find the HLW alternative is ultimately not feasible, we believe this course of action is prudent given the current state of knowledge about the remaining uncertainties associated with the HLW alternative.

We are pleased you note that it is possible the HLW alternative may reduce the Am/Cm safety risks more quickly and in a more straightforward fashion than the MPPF approach. I want to assure you that we share the same concerns identified in your letter, and have been working to address them so that we will have a firm basis for deciding whether to change our current approach for reducing the risks associated with this material.

On June 25 and 26, 2001, your staff was briefed on issues associated with the HLW alternative and on our progress thus far in resolving our shared concerns. We will continue to keep you and your staff apprised of our progress on this matter. Should we decide to cancel the current project and implement the HLW alternative, we will revise our Implementation Plan for Recommendation 2000-1 to include appropriate milestone commitments.

If you have any questions, please contact me or have your staff contact Mr. Mark W. Frei, Deputy Assistant Secretary, Office of Project Completion, at (202) 586-0370.

Sincerely,

James M. Owendoff

for Jessie Hill Roberson
Assistant Secretary for
Environmental Management

Enclosure

Enclosure

This following information is provided in response to a May 29, 2001, letter from the Defense Nuclear Facilities Safety Board concerning the feasibility of transferring the americium and curium (Am/Cm) solution in F-Canyon at the Savannah River Site to high-level waste (HLW) for vitrification in the Defense Waste Processing Facility (DWPF).

Assessment of the safety risks and the likelihood of success of the HLW option, considering what is presently known about Am/Cm solubility

The current knowledge of Am/Cm solubility is based on testing performed at the Savannah River Technology Center (SRTC) in 1994 using Am/Cm material from F-Canyon Tank 17.1 and simulated tank farm sludge. The testing was performed at a specific hydroxide concentration representative of sludge storage, but not representative of sludge washing, evaporation/re-dissolution or salt processing. The results of this previous testing indicates that Am/Cm solubility is low enough that there should be minor impact to the HLW System or the Saltstone Facility that could be accommodated by blending feeds to the salt processing facility. Testing performed on Hanford tank wastes by Pacific Northwest National Laboratory showed the low Am/Cm solubility, and that permanganate will further reduce Am/Cm concentration in these wastes by precipitation. On May 23, 2001, SRS initiated a test program to bring this question to prompt resolution. New samples were drawn from Tank 17.1 to perform additional testing representative of sludge washing and salt processing, and to test the effectiveness of various additives in F-Canyon such as MonoSodium Titinate (MST) and permanganate to reduce Am/Cm concentration in the supernate if the solubility is higher than expected. Based on the chemistry of Am/Cm, both MST and permanganate are expected to remove additional Am/Cm from solution. Existing data and scientific knowledge indicate that the small amount of Am/Cm expected to exist in the supernate can be accommodated by the HLW System and the Saltstone Facility. Final results from the additional testing are expected later this year.

Analysis of the potential for the Am/Cm solution to meet the tank farm waste acceptance criteria and to be acceptable for DWPF processing

Strategies are being developed to show that HLW Waste Acceptance Criteria (WAC) such as neutron generation rate, specific heat generation, gamma source term, and inhalation dose can be met by taking credit for the heel in tank 51, tank 7 sludge, or both. In addition, the current hydrogen generation rate requirement at H Diversion Box 8 is under review, which may result in a determination that a ventilation modification, additional dilution, or other control is necessary. Also, a Nuclear Criticality Safety Analysis is being prepared to show the Am/Cm solution complies

with the HLW criticality safety program, although the material is inherently critically safe. These compliance strategies are still being finalized. However, there do not appear to be any WAC requirements or DWPF feed specifications that preclude the feasibility of transferring the Am/Cm material to the HLW system in the near future.

Assessment of the options, associated issues, and potential resolutions for disposition of the Mark 18A targets

The January 18, 2001, Mk-18A Excess Material Decision Memorandum designated the plutonium (Pu)-244 in the Mk-18A targets as National Resource material. The other isotopes contained in the targets do not have a currently defined programmatic need. The Office of Defense Nuclear Nonproliferation (NN) and Office of Security and Emergency Operations (SO) were tasked to identify technology options to separate and enrich the Pu-244, establish more accurate cost estimates, report the results to the Nuclear Materials Council by June 1, 2001, conduct an appropriate National Environmental Policy Act (NEPA) review, contact other organizations and governments that have an interest in the Pu-244 to determine their willingness to share in the expense of recovering the material, and attempt to obtain funding. If funding could be obtained by the fiscal year 2005 budget, and a decision pursuant to NEPA supported processing and enrichment of the Pu-244, then the material would be transferred to NN and SO for programmatic use. If NN and SO cannot obtain the required funding by the fiscal year 2005 budget, or if no suitable Pu-244 separation and enrichment technology is identified, the Office of Environmental Management (EM) is to classify the Mk-18A targets as surplus and proceed with any necessary analysis under NEPA and other applicable requirements to consider disposal options.

NN and SO are still finalizing their report to the Nuclear Materials Council on the technology options and costs. However, a decision by EM to pursue the HLW alternative to dispose of the Am/Cm solution by transferring it to HLW would not preclude recovery of the Pu-244 utilizing any of the options considered thus far. If the Department ultimately decides to recover the Pu-244 (and that decision is supported by an appropriate NEPA review), an option that includes vitrification of the dissolved targets in MPPF could still be implemented. The remaining work to complete design of the vitrification equipment and to prepare MPPF would then need to be funded by an organization, or organizations, other than EM.

At the request of NN, the SRS contractor performed a disposition evaluation for the Mk-18A targets. Based on the results of that evaluation, and the potential change in path forward for managing the F-Canyon Tank 17.1 Am/Cm solution, by memoranda dated April 5 and May 11, 2001, SRS recommended to NN-44 that the best option for recovery of the Pu-244 from the Mark-18A targets would be to crop and repackage these targets in a spent fuel basin at SRS for subsequent processing off-site. The details for off-site processing would need to be defined when required, and by the organization responsible for recovery of the Pu-244. The recommended

option would involve a new isolation tank with support systems for cooling, decontamination, and handling to preclude potential spread of contamination. If this option is selected, then SRS would perform this activity safely and with the appropriate safety measures, documentation, and training in place. On June 7, 2001, the Board staff was provided a copy of the options that were reviewed during the recent evaluation, including a discussion of the pros and cons associated with each disposition option.

Analysis of the impacts of the HLW option on the future use of F-Canyon

Implementation of the HLW alternative would not preclude or complicate potential future operations in F-Canyon. At this time, no chemical separation activities are planned in F-Canyon following dissolution of SRS sand, slag and crucible, currently scheduled for completion by June 2002. However, if a decision were made to process any additional materials in F-Canyon, an evaluation has been performed of the downstream effects of processing the Am/Cm, and the timing and duration that tanks 13.1 and 13.3 would be unavailable for support of Plutonium Uranium Extraction (PUREX) operations. SRS has a thorough knowledge of the Am/Cm material relative to canyon processing, and has concluded that processing this material in the first cycle tanks would not impact the downstream processes.

As background, the Tank 17.1 material was recovered in the 1970s as a byproduct of the Mark-40 and 41 campaigns. The primary isotope recovered during that campaign was plutonium-242. The targets were dissolved in the F-Canyon dissolvers and processed through first cycle. The Pu-242 was subsequently processed through second plutonium cycle and FB-Line. The Am/Cm was rejected to the waste stream (1AW) and concentrated in the high activity waste evaporator. The Am/Cm material was subsequently processed through first cycle using several specially developed flow sheets for extraction of the Am/Cm.

The project team evaluating the HLW alternative has established a four to five month optimum period of time for transferring the Am/Cm solution out of F-Canyon. During that period, probably occurring during the latter half of 2002, first cycle would not be available. This would not impact future needs, if any are ultimately identified, of the fissile materials disposition program, since most of the near-term strategies and scenarios currently being re-evaluated do not require first cycle operations during that period. However, even if a decision were made in the near future to dissolve additional plutonium and uranium materials in F-Canyon that would require first cycle, storage tanks such as 8.1 or 7.5 would be available to allow continued dissolution activities awaiting availability of first cycle. It should be noted that the Am/Cm solution would not be transferred inside F-Canyon or prepared for transfer to the HLW system until readiness is confirmed in the canyon and Tank Farms. Subsequent to the necessary canyon modifications to implement the HLW

alternative, and prior to initiating the transfer out of Tank 17.1, first cycle could be available for operations if a need were identified.

Determination of the activities that would be conducted to demonstrate operational readiness prior to transferring the Am/Cm solution to the tank farms

The evaluation of the HLW alternative is still in the conceptual phase of development. SRS is still identifying and analyzing the scope of work necessary to implement this alternative, including the necessary changes to authorization basis (AB) documents and implementing procedures. Based on the information to date, however, it is known that cold testing and readiness verification would be established for the Am/Cm transfer from F-Canyon to Tank 51 in H-Area. The Am/Cm transfer would be similar in many aspects to transfers between F-Canyon and F-Tank Farm, as well as inter-area transfers that periodically occur between F-Tank Farm and H-Tank Farm. However, the transfer would be more complex than a simple combination of those two transfers, due to the number of control rooms that would be involved and the extensive array of equipment that would need to be operational. The testing program will focus on ensuring system modifications operate as intended, and verification of flow through F-Canyon waste header 3 to F-Area Pump Tank 1. Readiness activities would consist of material balance determination methods, operator training, including inter-facility operator tabletop discussions, simulated transfers, including control of the transfer/communications between control rooms, normal indications, abnormal conditions, and alarms. Immediately prior to the transfer, water runs would be performed to verify the transfer path and integrity. Those runs would be consistent with the practice of water runs/flushes that are completed prior to all significant transfers.

Extensive effort would be placed on the elimination of nuisance alarms associated with this complex transfer path. Based on DOE experience with complex material transfers, it is recognized that some of the greatest operational difficulties and risk occur upon transfer initiation and shutdown. Many operational activities occur simultaneously, and parameters such as tank levels and material balance are difficult to monitor during these periods. Once steady state operations are achieved, the difficulty of monitoring the various parameters is greatly reduced. Therefore, it is important to minimize unnecessary shutdowns associated with nuisance alarms, without reducing the rigor of existing alarm response protocol.

If DOE chooses to proceed with this alternative, then the readiness verification would be accomplished in accordance with the requirements of DOE Order 425.1, "Startup and Restart of Nuclear Facilities," and Savannah River Implementing Procedure (SRIP) 400.2, "Nuclear Facility Startup Approval Process." The verification would focus on the adequacy of changes made to support the transfer and operator knowledge of system changes. Changes that would be assessed include

procedures and system monitoring capability in control rooms. Below is an outline for the review:

Testing Program
- Verification of AB assumptions regarding system design
- Abnormal condition responses
- System indication and alarm system

Training
- Potential Adverse Conditions/Events
- System indications
- Shutdown requirements
- Material Balance program – discrepancy management
- Procedure changes

Pre-Transfer Water Flush/Run
- Transfer route integrity
- Procedure usability
- Nuisance alarm frequency

Procedures
- Consistency with any system modifications
- Consistency with AB assumptions
- Operator knowledge of procedures

Communication
- Between control rooms – system capability
- Protocol for transfer
- Command and control
- Adverse conditions – i.e., system failure/power loss/etc.

Transfer Management Program
- Material Balance – discrepancy management
- Shutdown requirements
- Expected indications