

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

January 27, 1995

MEMORANDUM
FOR: G. W. Cunningham, Technical Director
COPIES: Board Members
FROM: David C. Lowe
SUBJECT: Savannah River Site (SRS) -- Recommendation 94-1, Americium/
Curium (Am/Cm) Processing Program Status (January 25, 1995)

1. **Purpose:** This trip report documents the Defense Nuclear Facilities Safety Board (DNFSB) technical staff (D. Hurt, W. Kornack, and D. Lowe) January 25, 1995, review of the Am/Cm processing program in order to implement Board Recommendation 94-1.
2. **Summary:** The current Westinghouse Savannah River Company (WSRC) schedule calls for the start of vitrification operations in April 1998, with completion in September 1998. This is 15 months sooner than the completion date provided in the 94-1 Implementation Plan, but still 16 months later than the goals set forth in Recommendation 94-1.

The prospect of further accelerating stabilization by using an oxide process for the Am/Cm solutions was discussed. This alternative is not developed to the same extent as the vitrification process and it is apparent that WSRC strongly prefers the vitrification process. However, sufficient information was provided to reach a rational technical conclusion. The oxide process offers few technical advantages over the vitrification process and it appears that completion of the oxide processing would be later than the vitrification alternative.

3. **Background:** The Board states in Recommendation 94-1, Sub-Recommendation 3, the following: "That preparations be expedited to process the dissolved plutonium and trans-plutonium isotopes in tanks in the F-Canyon at the Savannah River Site into forms safer for interim storage. The Board considers this problem to be especially urgent." The Secretary of Energy accepted Recommendation 94-1 on August 31, 1994.
4. **Discussion:**
 - a. ***Vitrification Process:*** The current WSRC schedule calls for the start of vitrification operations in April 1998, with completion in September 1998. This completion date is 15 months sooner than the date provided in the 94-1 Implementation Plan. This schedule appears reasonable and it appears that the Department of Energy (DOE) and WSRC are taking actions to accelerate the program. The DOE Savannah River Operations Office (DOE-SR) is preparing their recommendation to DOE-Headquarters for using the vitrification process to stabilize the Am/Cm solutions. This decision should help focus WSRC management and technical attention on the vitrification process development

efforts.

The vitrification process development efforts are underway. The Savannah River Technology Center (SRTC) is conducting bench-scale tests and procurement of the prototype melter is in progress. The melter pilot runs are scheduled to start in October 1995. The melter is a proven commercial design slightly modified for the current situation. The proposed glass composition is a commercial borosilicate glass composition and SRTC has made bench-scale glass with simulants. The primary uncertainties are with the melter off-gas system. Resolution of these uncertainties will be a major part of the pilot runs.

The vitrification process offers several technical advantages over the oxide alternative, including:

1. Simpler process with minimal intermediate handling steps, while the oxide process has several intermediate handling steps. The vitrification process is a continuous process with a higher throughput resulting in a shorter processing time.
 2. The packaging and loadout steps have been thought out, and WSRC believes that certifying the transportation container will not be a problem.
 3. Oak Ridge National Laboratory (ORNL) prefers the glass product since it is more suitable for long-term storage
- b. ***Oxide Process:*** The use of the existing oxide conversion process for stabilizing the Am/Cm solutions was discussed. DOE and WSRC expressed severe doubt about using the equipment/process that was used to process the Am-241 during the 1978-1981 campaigns. The equipment has not been maintained or operated since the completion of those campaigns. The quantity of the material to be processed is significantly greater in the proposed campaign (i.e., approximately 120 kg) than processed in the previous campaigns (i.e., total of 7 kg). There were also serious technical difficulties (e.g., filter clogging, high moisture content of oxide product) encountered during the 1978-1981 campaigns. Resolution of these issues, development of a packaging/loadout process, and certification of a transportation container will require a development effort similar in magnitude to the development effort envisioned for the vitrification process.
- c. ***Safe Storage:*** WSRC reiterated their belief that recent actions will ensure the continued safe storage of the Am/Cm solutions in Tank 17.1 until they can be stabilized. The following specific actions have been completed:
1. Revised F-Canyon safety documentation to include accidents associated with the storage of the Am/Cm solutions.
 2. Isolated Tank 17.1 from the cooling water system and other process

systems.

3. Increased control and monitoring of Tank 17.1 levels.
4. Established a sampling program for monitoring corrosion.
5. Increased operational controls over systems to ensure the prevention of hydrogen gas buildup in Tank 17.1. Established a procedure to provide a backup purge capability to Tank 17.1 upon loss of the process vessel vent system.
6. Completed a seismic analysis of Tank 17.1 which concluded that the tank will not fail during a Design Basis Earthquake.

WSRC also reported that Tank 16.2 has been designated as a spare for Tank 17.1. A dedicated transfer route and procedure will be in place in April 1995. Alternatives to continued storage of the Am/Cm solutions in Tank 17.1 were discussed, but each of the alternatives has inherent risks that appear to be greater than the continued storage in Tank 17.1.

5. **Future Actions:** In order to remain apprised of the process development efforts and to seek further opportunities to accelerate the project, the DNFSB staff will conduct Am/Cm program reviews every six months or at major milestones. These reviews will focus on both the technical and schedule aspects of the program.