Department of Energy
Washington, DC 20585

August 16, 2007

The Honorable A. J. Eggenberger
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

To support the need to remove additional aluminum from the tank waste sludge that will be vitrified in the Defense Waste Processing Facility, the Department of Energy (DOE) plans to move forward with aluminum removal from sludge batch 5. Enclosed is a summary of the DOE plan to initiate dissolution of aluminum from sludge batch 5 in Tank 51 at the Savannah River Site (SRS) and store the aluminum rich supernate from that process in a Type 1 "old style" Tank in the H-Tank Farm.

Consistent with the ongoing oversight by the Defense Nuclear Facilities Safety Board (Board) of the tank waste activities at the SRS, it would be helpful if the Board would provide any comments it has on the nuclear safety aspects of the DOE plan to transfer and store low curie, aluminum rich supernate in this "old style" tank.

Sincerely,

James A. Rispoli
Assistant Secretary for
Environmental Management

Enclosure

cc:
M. Whitaker, HS-1.1
J. Allison, SRS

Enclosure

LOW TEMPERATURE ALUMINUM DISSOLUTION OF SLUDGE BATCH 5

Plan Summary

Introduction

In March of 2001 the Defense Nuclear Facilities Safety Board presented the Department of Energy (DOE) with Recommendation 2001-1 expressing concern with tank leaks in old style tanks, critical shortage of tank space and reduced margin of safety. The DOE responded indicating a shared concern for the decreasing operational flexibility and a desire to move forward with efforts toward long term solutions while ensuring safe storage and maintaining flexibility. A plan was implemented to address these issues. System planning since the events leading to the recommendation included limited use of old style tanks except for waste removal activities.

As the DOE continues to vigorously address the significant management challenges that the Savannah River Site Waste Disposition Program faces, a critical shortage of regulatory compliant tank space continues to complicate short term and long term progress. An opportunity to address a recently identified long-term issue requires the safe use of available leak-free space in an old style tank. The summary below provides background for the DOE decision to address this opportunity after giving careful consideration to the technical safety issues, risks and benefits of re-using old style tanks.

Executive Summary

Aluminum compounds, along with other non-radioactive components, represent a significant portion of the sludge mass currently planned for vitrification processing in the Defense Waste Processing Facility (DWPF). Removing the aluminum from the waste stream would reduce the volume of sludge requiring vitrification and improve production rates. Sludge batch 5 consists primarily of radioactive wastes removed from Tank 11 and contains a very high aluminum concentration. A unique opportunity exists to remove a significant amount of this aluminum prior to vitrification in DWPF. This provides opportunity for shortening the life cycle of the tank waste system and reducing risk associated with the long term storage of radioactive wastes at the Savannah River Site (SRS).

Aluminum in sludge batch 5 will be dissolved at low temperature in a concentrated sodium hydroxide solution. Based on initial laboratory testing and previous sludge characterization, the amount of aluminum that will dissolve under these conditions ranges from 25% to 80%. For planning purposes, it is assumed that 50% of the aluminum solids

will be dissolved and removed. SR projects a reduction of 50-150 canisters from sludge batch 5 by implementing this dissolution. This represents an additional reduction beyond the 785 canister savings projected from future planned aluminum removal activities. Processing less vitrified canisters and an increased production rate allows for accelerated waste removal schedules within the tank waste system.

The dissolved aluminum supernate will be returned to Tank 11 for safe interim storage until future processing. Tank 11 is a Type I waste tank which does not have full secondary containment. Tank 11 also has known leak sites that were identified in 1974. The tank level from the proposed transfer will be well below the levels of the known leak sites. Additionally, there are several mitigating actions available to reduce the risks from a leak into the annulus should one occur. A revision to the Authorization Agreement (AA) must be approved to allow transferring waste into Tank 11 that is not associated with waste removal operations. In addition, appropriate regulatory authorization to return the tank to storage service must be obtained.

Background

Radioactive waste at SRS is currently stored in aging underground storage tanks. Continued long-term storage of these radioactive wastes poses an environmental risk. This waste is a complex mixture of insoluble solids, referred to as sludge, and soluble salt supernate. The sludge is currently being stabilized in DWPF through a vitrification process that immobilizes the waste in a borosilicate glass matrix for long-term storage in a federal repository. Without performing any additional treatment, the existing volume of sludge waste would produce nearly 8000 canisters of vitrified waste and extend operations of the tank farms and DWPF well beyond the planned 2028 completion date. Additionally, high aluminum waste reduces vitrification efficiency and has potential to increase the frequency of melter pour spout pluggage.

Aluminum compounds, along with other non-radioactive components, represent a significant portion of the sludge mass. Removing the aluminum from the waste stream would reduce the volume of sludge requiring vitrification and improve production rates. Aluminum dissolution is part of an overall sludge mass reduction effort to reduce the amount of vitrified canisters. In keeping with the DOE commitment to implement long-term solutions, an existing upgrade project will develop and install equipment to perform aluminum dissolution on six targeted sludge batches beginning in 2013. The project requires the use of a dedicated Type III waste tank to treat the sludge with concentrated sodium hydroxide (caustic) solution at an elevated temperature of approximately 65°C. Based on a projected 75% removal efficiency, a reduction of approximately 785 canisters will be achieved. Although substantial, this does not support a 2028 completion date for the tank waste system as identified in the Site Treatment Plan. Additional opportunities must be pursued to further reduce the amount of vitrified waste and increase production rates. A unique opportunity exists to remove a significant amount of the aluminum from sludge batch 5 prior to vitrification in DWPF.

Bulk waste removal was performed on Tank 11 during 2004 and 2005. The sludge waste was transferred to Tank 51 for eventual processing in DWPF in sludge batches 4 and 5 and contains a very high aluminum concentration. Sludge batch 4 is a relatively small batch and is currently being processed in DWPF. The sludge remaining in Tank 51 will be combined with additional sludge from Tank 7 to form sludge batch 5. The projected need for sludge batch 5 to be ready for feed to DWPF is September 1, 2008. An opportunity exists to dissolve aluminum in the Tank 51 sludge prior to the consolidation with sludge from Tank 7, and in time to complete sludge batch 5 preparation and qualification by the need date.

Aluminum in sludge batch 5 will be dissolved at low temperature in a concentrated caustic solution. Based on initial laboratory testing and previous sludge characterization, the amount of aluminum that will dissolve under these conditions ranges from 25% to 80% (Reference: LWO-PIT-2007-00042, *Flow Sheet for Aluminum Removal from Sludge Batch 5, May 24, 2007*). Additional laboratory testing will be performed that will refine the projected removal efficiency. For planning purposes, it is assumed that 50% of the aluminum solids will be dissolved and removed. SR projects a reduction of 50-150 canisters from sludge batch 5 by implementing this dissolution.

The low temperature aluminum dissolution treatment of the Tank 51 sludge consists of the following sequence. Approximately 140,000 gallons of concentrated sodium hydroxide (caustic) solution will be added to Tank 51. The caustic addition will be made over a 3-4 week period via tanker truck unloading. The temperature will be increased to no more than 65°C and the contents of the tank mixed for 2 weeks. Mixing will be suspended and the sludge allowed to gravity settle. Approximately 360,000 gallons of supernate containing dissolved aluminum will then be transferred out of Tank 51. This material can not be sent through the tank waste evaporator systems and must be segregated from other wastes to prevent reformation of aluminum solids. The storage location and volume must be such that it will not adversely impact ongoing waste removal and treatment missions. The dissolved aluminum supernate will be stored until future processing as salt waste.

A deliberate review of options was conducted for the storage of this material. Sufficient space does not currently exist in Type III waste tanks to support interim storage of this material. SR proposes to store the supernate in Tank 11 until future processing as salt waste. Tank 11 is a Type I waste tank which does not have full secondary containment. A revision to the Authorization Agreement (AA) must be approved to allow transferring waste into Tank 11 since that waste is not associated with waste removal operations. The tank is currently maintained within existing corrosion chemistry and structural integrity inspection programs. Tank 11 underwent bulk waste removal in 2004 and 2005 and currently contains approximately 7.5" of radioactive waste, so storage of this material does not create new or additional hazards. Tank 11 primary vessel has known leak sites

at 189 inches and 235 inches. In December 1994 the level in Tank 11 was 145 inches. The level decreased due to evaporation and was near 108" in December 2004 when sludge removal activities were initiated. The maximum planned fill limit is 140"-145". Authorization from the South Carolina Department of Health and Environmental Control (SCDHEC) must be obtained prior to transferring the supernate into Tank 11.

Plans are in place to monitor the safe interim storage of this material and to transfer the material out should conditions warrant. The volume of supernate to be stored will be well below any known leak sites. The annulus leak detection system for Tank 11 is operable to provide early detection in the unlikely event of the development of a new leak site. The annulus-to-primary transfer path is operable and a current approved procedure exists. Together, the equipment and procedure provide a state of readiness to ensure annulus leak detection and to prevent overflow of the annulus pan and release to the environment in the unlikely event of a leak in the tank's primary wall. The Tank 11 transfer pump will be operable to allow for reducing the level in Tank 11 below a new leak site. If a leak is observed during the transfer to Tank 11, the transfer will be stopped and the supernate sent back to Tank 51. If Tank 11 leaks in the future, existing space held in reserve within the compliant waste tanks will be utilized to transfer waste from Tank 11 and lower the level below the leak site.

The low-curie, aluminum rich supernate stored in Tank 11 may be sent to the Salt Waste Processing Facility (SWPF) for treatment and eventual disposal as low level waste. Prior to DOE's decision to send such Tank 11 waste to the SWPF, DOE will confirm that such an approach is in conformity with the Secretary of Energy's Section 3116 Determination for Salt Waste Disposal at the Savannah River Site, the rationale and analysis in DOE's Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site, the modified permit for the Savannah River Site Z-Area Saltstone Disposal Facility, and the Consent Order of Dismissal in Natural Resources Defense Council, et.al., v. South Carolina Department of Heath and Environmental Control, et.al. SWPF is projected to startup in September, 2012. The storage of this material in Tank 11 prior to processing by SWPF will not adversely impact the Federal Facilities Agreement (FFA) schedule for closure of waste tanks.

Conclusion

A unique opportunity exists to remove a significant amount of the aluminum from sludge batch 5 prior to vitrification in DWPF. Removing the aluminum from the waste stream will reduce the volume of sludge requiring vitrification, avoid a reduction in vitrification efficiency and shorten the projected life cycle for the tank waste system. After careful consideration of the technical safety issues, risks and benefits of re-using old style tanks, DOE has concluded that the dissolved aluminum supernate can be safely stored in Tank 11 until future processing as salt waste without impact to Federal Facility Agreement tank closure commitments.