

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

September 27, 1994

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director \_\_\_\_\_

**COPIES:** Board Members

**FROM:** J. T. Arcano, Jr.

**SUBJECT:** Report on the Status of Startup Preparations at the In-Tank  
Precipitation Facility - Savannah River Site

- 1. Purpose:** This report provides an overview status of startup preparations at the In-Tank Precipitation (ITP) Facility. Information for this report was gathered from a staff review at ITP by Defense Nuclear Facilities Safety Board (DNFSB) staff member J. T. Arcano, Jr., and Outside Expert R. L. Thompson from August 7-10, 1994; observance of an earthquake drill by staff members J. T. Arcano, Jr. and J. Blackman on September 22, 1994; and discussions with Department of Energy - Savannah River Operations Office (DOE-SRO), DOE Office of Environmental Management (DOE-EM-343), and Westinghouse Savannah River Company (WSRC) personnel between September 9 and 26, 1994 regarding safety envelope bases and operational readiness.
- 2. Summary:** WSRC appears to be aggressively pursuing startup of the In-Tank Precipitation Facility, currently scheduled for December 1994. WSRC is in the process of resolving findings which resulted from a WSRC Readiness Self-Assessment (RSA) and is preparing for the start of a WSRC Operational Readiness Review (ORR). However, safety analysis issues regarding uncertainties in benzene generation rate calculations and seismic analysis of the tanks must still be resolved. Significant work remains in the areas of procedures development and implementation, system status control, configuration management control, and implementation of operational safety requirements (OSRs).
- 3. Background:** The ITP Facility is a high-level radioactive waste (HLW) chemical processing facility in which radioactive isotopes will be removed from dissolved salt solutions by precipitation (cesium removal) and adsorption (strontium and plutonium removal) in the process tank, Tank 48.

The resulting high-activity solids will be separated from the decontaminated salt solution via filtration in the Filter Building. The high-activity precipitate slurry will be stored in Tank 49, and then transferred to the S- Area vitrification plant (Defense Waste Processing Facility). Low-activity decontaminated salt solution will be stored in Tank 50, and then transferred to the Z- Area Saltstone Facility. The ITP Facility will process batches of up to 260,000 gallons

of liquid high-level radioactive waste. The upper limit activity of the waste assumed in the safety analysis documentation is 39 Curies (primarily beta-gamma radiation) per gallon. Operating hazards at the facility are increased above those inherent to the SRS Tank Farms' tanks due to benzene generation caused by the radiolytic decomposition of tetraphenylborate salts.

Relative to DOE Order 5480.31, *Startup and Restart of Nuclear Facilities*, the ITP facility has been categorized by DOE as a Hazard Category 2 nuclear facility as defined by DOE Order 5480.23, *Nuclear Safety Analysis Reports*, and DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, and requires contractor and DOE Operational Readiness Reviews. The authority to approve ITP safety basis documentation and startup has been delegated to the DOE-SRO manager by DOE-EM-1. The facility is currently scheduled to begin operations in December 1994.

4. **Discussion:** The DNFSB staff has been reviewing several issues related to the ITP facility. The following topical areas are those which the staff believes DOE must resolve prior to startup:
  - a. Safety Analysis - The WSRC ITP safety analysis is documented as an addendum to the Tank Farm safety analysis report (SAR), *Additional Analysis for DWPF Feed Preparation by In-Tank Processing* (WSRC-SA-15, Rev 4, June 1994). This SAR addendum was developed using DOE Order 5481.1B, *Safety Analysis and Review*, and was approved by DOE-SRO on September 23, 1994 with two open issues: (1) resolving the seismic safety basis, and (2) completing analyses and controls to ensure the assumptions used to determine the time to reach composite lower flammability limits are protected.

DOE Order 5480.23, *Nuclear Safety Analysis Reports*, requires that a basis for interim operations (BIO) be submitted with the implementation plan for the Order. WSRC personnel have stated that the SAR addendum for ITP, along with its Operational Safety Requirements (OSRs) and appropriate DOE review, are equivalent to a BIO. However, no BIO has been prepared for ITP. The staff has the following concerns with the ITP safety analysis:

- (1) Chemical Processing - Uncertainties still exist regarding the calculation of benzene generation rates which affect the analysis of the time to reach composite lower flammability limits in the ITP tanks. No plan has been developed by WSRC on how to address the issues regarding the many uncertainties in these calculations.

- (2) ITP/H-Area Tank Farm Tanks Structural and Geotechnical Issues - The staff has closely monitored DOE structural and geotechnical analyses of ITP/H-Area high-level radioactive waste tanks and has been concerned that the analysis required for Performance Category 3 is not conservative, given the large source term present in the ITP HLW tanks and inconsistencies between the WSRC hazard classification system and DOE standards.

The *Justification for Continued Operations of H Tank Farm and Startup of In-Tank Precipitation Under Interim Seismic Safety Basis* is currently undergoing DOE review. The Tank Seismic Expert Panel (TSEP) has expressed concern that the Evaluation Basis Earthquake (EBE) used by WSRC is unconservative based on the facility's classification as "High Hazard." As of September 20, DOE EM-343 personnel indicated that they are considering developing and using a deterministically-based EBE.

- (3) Procedural Implementation of Operational Safety Requirements - As procedures which implement the OSRs are issued, it is important that they are properly phased into operations. However, according to DOE-SRO personnel, no plan exists for implementing the OSRs.

- b. Independent Reviews - In this area, the staff has been monitoring the line management readiness self-assessment and planning for the WSRC and DOE Operational Readiness Reviews. The following observations are provided:

- (1) Readiness Self- Assessment - The *WSRC Operational Readiness Functional Area Requirements* (WSRC-SCD-4) is a document which covers 22 functional areas, containing performance objectives and criteria which are intended to provide the basis for safe operation of nuclear facilities at the Savannah River Site. The WSRC Readiness Self-Assessment (RSA), conducted by WSRC line management, typically paralleled the SCD-4 process. Each functional area was assigned a "Function Area Champion" as its lead, with assessors assigned to review their specific areas. The WSRC ORR Board approved the RSA plan for each functional area and has continued oversight of the RSA process at ITP.

DOE-SRO is validating the contractors RSA, and intends to validate the WSRC ORR in accordance with SRIP 5480.31, *Facility Startup Approval Process*, which adapts DOE Order 5480.31 to the Savannah River Site. DOE-SRO reports significant issues identified by the RSA regarding procedure development, system status control, and configuration control.

- (a) Procedure development - Discussions with briefers, operators, and support personnel indicated that the overall development and maturity of procedures comprises a significant portion of the RSA findings. The procedure development effort has lacked appropriate team emphasis, resulting in many procedures which have been issued, but are subsequently found to be deficient. Late approval and issue of safety documentation has significantly impacted the development of surveillance procedures (WSRC is still developing Alarm Response Procedures and Surveillance Procedures). As of September 16, WSRC had instituted a procedures roundtable which brings together engineering, operations, and procedures development personnel to improve the procedures development process.

A "quiet time" began on September 1 for ITP operations personnel to use the new procedures while working for the shift manager rather than directly for the startup manager. WSRC personnel have indicated that they are using this quiet time for coaching and reinforcing conduct of operations principles.

On September 22, four days before the then-scheduled start of the WSRC ORR, DNFSB staff observed a drill involving the use of the *Earthquake* emergency operating procedure (SW 16.4-EOP-003) and *Loss of Nitrogen* abnormal operating procedure (SW 16.3-AOP-005). WSRC personnel stated that these procedures had not been practiced before, and that other similar procedures had not been practiced before. The staff noted an apparent lack of command and control in the ITP control room during conduct of the drill - although status reports were received by at least three different personnel, the passing of this information to all watch stations did not appear to occur. No one was visibly in charge of control room proceedings.

The earthquake drill was interrupted by an actual fire alarm in the ITP control room building. After exiting, DNFSB staff noted that both control room operators had also left the control room. When queried, the operations manager stated that one operator was required to remain in the control room and immediately returned one of the operators to the control room. (It was later determined that the shift manager had remained in the control room because both control room operators had left.)

- (b) System Status Control - DOE-SRO has reported inconsistencies among the system status board, lockout log, in-process work requests, and status files.

- (c) Configuration Management Control - DOE-SRO has expressed concern regarding incorporation of design changes into drawings and procedures, and Alarm Response Procedures not being consistent with alarm set point documents.
  
  - (2) WSRC Operational Readiness Review - DOE-SRO has approved the *Operational Readiness Review Plan of Action for the In-Tank Precipitation Facility at the Savannah River Site*. This plan calls for both the WSRC and DOE ORRs to be conducted in accordance with DOE Order 5480.31. DOE-SRO personnel have indicated that the WSRC ORR start date continues to extend, though tentatively set for the week of October 3.
  
  - c. Standards Program - Order Compliance - WSRC has completed and documented its Phase I (Programmatic) and initial Phase II (Adherence) Order compliance efforts for ITP and has instituted an ongoing program for adherence assessments based on the SCD-4 program. DOE-SRO personnel have indicated that their Phase I compliance efforts are complete and that Phase II Order compliance baseline efforts should complete by the end of September.
  
  - d. Environmental Protection - Supplemental Environmental Impact Statement - A Draft Supplemental Environmental Impact Statement for the Defense Waste Processing Facility (DWPF) was issued in August 1994. This supplemental environmental impact statement (EIS) is being developed to address the environmental impacts of design and process modifications to the DWPF since 1982, which includes the ITP facility.
5. **Future Staff Actions:** The DNFSB staff will continue to follow up on the above areas and other topical areas relevant to ITP as DOE continues preparations for ITP startup.