

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

January 10, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Larry Zull, DNFSB Staff

SUBJECT: Trip Report for Staff Visit to the Savannah River Site (SRS)
Replacement Tritium Facility (RTF), December 8-10, 1993

1. **Purpose:** The purpose of this site visit was to conduct followup technical reviews on various topics as the RTF approaches the completion of the Startup Test Program. Reviews were also conducted to closeout several open items identified in the DNFSB Staff Topic Papers. The review team for this trip consisted of Ajit Gwal, Herb Massie, and Larry Zull.
2. **Summary:**
 - a. The facility is nearing completion of the Startup Test Program, with only 24 of approximately 450 total startup and integrated system operations tests remaining. All testing necessary to load production reservoirs on one loading line has been completed. Reviews by the design agency, the Sandia National Laboratory, to certify the loading of the first reservoir type for production are scheduled for January 5-7, 1994.
 - b. Testing of the Thermal Cycling Absorption Process (TCAP), which separates tritium from deuterium, and the In-Bed Accountability Process (IBA), which determines the amount of tritium stored on the hydride beds, is in progress, with completion expected by March 15, 1994. These tests are being performed in parallel with the program to certify the loading and unloading of reservoirs for war reserve production operations. If the TCAP system cannot separate deuterium and tritium to the required purity levels, the cryogenic separation process in the existing tritium facility can be used to provide the tritium and deuterium necessary for RTF to process reservoirs for war reserve production.
 - c. Several concerns were identified during the reviews, including the following:
 1. Fire water tanks have not yet been connected to piping leading to the RTF. The fire water tanks are seismically qualified, but the connecting piping is not seismically qualified. WSRC intends to connect the piping prior to war reserve production, which is currently scheduled for March 1994. However, RTF has not conducted fire drills to demonstrate the ability to fight fires using the water in these tanks in the event piping unavailability. Good commercial practice in such a situation would include the planning and conduct of fire drills.

2. The environmental qualification report for Seismic Tritium Confinement System (STCS) components has been revised to impose administrative controls to prevent equipment from exceeding design temperature limits, instead of qualifying the components to the anticipated abnormal conditions. Although the use of such administrative controls is an acceptable approach, it is not the preferred approach, and sole reliance on administrative controls is not considered good commercial nuclear practice. Also, the probability and consequences of a common mode failure of the valves due to a loss of ventilation system temperature excursion has not been evaluated.
 3. An electrical safety violation incident occurred when an electrical mechanic failed to check that the terminals of a switch were not energized before lifting leads. The worker was not injured, but the RTF Ventilation system was shutdown. This is the third electrical safety violation at the Savannah River Site in the last 4 months.
3. **Background:** The RTF has been involved in a startup test program since the Secretary of Energy approved the introduction of a small amount of tritium to begin low concentration leak testing of the process piping and components in June 1993. Following the completion of facility modifications and open items, including completion of the Seismic Tritium Confinement System (to limit the accidental releases of material from the facility), and the development of seven Technical Safety Requirements to limit the tritium inventory in the facility, the DOE approved an increase in the tritium inventory on October 8, 1993.
4. **Discussion:**
- a. Startup Test Program - On October 10, 1993, RTF began leak testing of piping and components using approximately a 50% concentration of tritium gas. All startup tests required for reservoir loading on one loading line have been completed. There are 24 of approximately 450 total startup and integrated system operations tests remaining, including four tests on the Thermal Cycling Absorption Process (TCAP) and the In-Bed Accountability (IBA) Process. The completion of these system tests is expected in March 1994. These tests are being performed in parallel with the program to certify the loading and unloading of reservoirs for war reserve production operations. If the TCAP system cannot separate deuterium and tritium to the required purity levels, the cryogenic separation process in the existing tritium facility can be used to provide the tritium and deuterium necessary for RTF to process war reserve production reservoirs.
 - b. Preparation for Design Agency Reviews - To date, twelve reservoirs of one type have been test loaded in preparation for review and acceptance of the process by the design agency, the Sandia National Laboratory. Weld integrity and fill gas composition of ten reservoirs have been evaluated at SRS, and found to satisfy the design agency standards. The two other reservoirs will be shipped to Mound for independent evaluation.

Formal design reviews of the production loading process for the first reservoir type will be conducted at RTF on January 5-7, 1994. RTF plans to certify four reservoir types, which will allow eight reservoir models to be processed. The last design agency review is scheduled for March 15, 1994.

- c. Fire Protection - RTF has two seismically-qualified fire water tanks. Although filled with water, the tanks are not yet connected to piping leading to the building. However, the connecting piping is not seismically qualified. WSRC intends to connect the piping prior to war reserve production, which is currently scheduled for March 1994. However, RTF has not conducted fire drills to demonstrate the ability to fight fires using the water in these tanks in the event of piping unavailability. Good commercial practice in such a situation would include the planning and conduct of fire drills.
- d. Environmental Qualification of Nuclear Safety (NS) Components - During its review of the latest revision of the environmental qualification report for the Seismic Tritium Confinement System (STCS) components, the DNFSB staff observed that instead of qualifying components to anticipated abnormal conditions, RTF has used administrative controls to prevent operation of the STCS under conditions that could cause temperatures to exceed the design ratings of some components (e.g., the solenoid valves).

The ASCO pilot solenoid valves are important for maintaining operability of the STCS. Initially, the valves were to be replaced every 5-1/2 years based on equipment qualification concerns of temperature aging. The latest revision of the equipment qualification report states that administrative controls will be used to enforce the temperature limit. The report now states that the qualified life of the solenoid valves is indeterminate; therefore, the valves will not be replaced until after they fail. Although the use of such administrative controls is an acceptable approach, it is not the preferred approach, and sole reliance on administrative controls is not considered good commercial nuclear practice.

As part of the Component Operability Readiness Evaluation (CORE) Program, actuation of the solenoid valves will be tested monthly. This should be adequate in the short term, but the Staff believes that the solenoid valve environment bears close monitoring to ensure that temperatures are effectively controlled over the long term. Also, the probability and consequences of a common mode failure of the valves due to a temperature excursion caused by a loss of the glovebox stripper systems has not been evaluated. The DNFSB staff intends to review the changes to the STCS equipment qualification program in detail, including WSRC's expected actions if the temperature limit is exceeded.

- e. Electrical Safety - Occurrence Reports written during the last 2 months were discussed. An issues management group has been formed to trend equipment problems and personnel errors. The DNFSB Staff was also briefed on an electrical safety incident which occurred during their visit on December 8, 1993. An electrical maintenance mechanic removed power to test a barometric pressure switch, but did not verify the absence of voltage before

lifting leads. The switch had an alternate power source, which was not identified on either the work package or the available drawings. Loosening of the first lead blew a 2 amp fuse in the alternate power feed, which resulted in the closure of tornado dampers and shutdown of the RTF HVAC system. The mechanic was not injured, but violated safe electrical working practice procedures. A review of the incident was held, and the mechanic was disciplined by time off without pay. A similar event happened at F-Canyon the previous week, and in the 700 Area several months ago. RTF management is proposing to add a caution statement to every electrical procedure to check voltages before performing work. The DNFSB Staff was given an electrical safety videotape, which has been shown to all electrical workers.

- f. Status of Other Activities and Concerns - Information on the status of other programs and activities at RTF, and additional concerns identified by the DNFSB staff, are provided in the Attachment.
5. **Future Staff Actions:** The DNFSB Staff intends to conduct followup reviews of the technical concerns identified in this memo. WSRC progress in addressing these concerns will be discussed during the next DNFSB Staff review trip to the RTF, currently scheduled for February 1994. The DNFSB Staff will also continue to follow scheduled RTF activities.

Attachment

Status of Other RTF Activities and Additional DNFSB Staff Concerns

This Attachment presents information on the status of other programs and activities at RTF, and additional concerns identified by the DNFSB staff during the December 8-10, 1993 site visit.

1. Status of Other Activities:

- a. Technical Safety Requirements - Procedures to implement Technical Safety Requirements (TSR's) 3.7.1 through 3.7.7 regarding the tritium inventory limits were reviewed. A procedure which cross-references TSR requirements with the applicable surveillance procedures was also reviewed. The documents reviewed appeared to adequately address the multiple TSR tritium inventory limits. Work is also in progress to revise TSR's to make them more user friendly and clarify their implementation.
- b. Component Operability Readiness Evaluation (CORE) Program - The CORE Program is defining in-service inspection requirements for nuclear safety (NS) and Critical Protection (CP) components. Data sheets for the inspection of all NS components have been completed. However, the development of requirements for CP components is behind schedule. A total of about 1,900 CP components in about 500 groups exists. WSRC plans to prioritize the development of inspection requirements for these items based on their relative safety significance.
- c. Mix Tank Leak Identification - Review of a leak in the Tank 106F mix tank in the existing tritium facility illustrated that tritium monitoring is more effective than ultrasonic testing (UT) for detection of leaks. Hence, the staff does not object to WSRC taking credit for tritium monitors within the gloveboxes for the detection of leaks from RTF components.
- d. Operational Readiness Review (ORR) Observation Closures - The status of closeout actions from WSRC Operational Readiness Review (ORR) Observations for War Reserve Production was reviewed. To date, 127 of 259 observations have been closed.
- e. Cable Marker Fire Test Report - A WSRC-prepared test report presenting the results of flammability testing of electrical cable with cable markers utilized in the STCS relay cabinets was reviewed and found acceptable by the DNFSB Staff.
- f. Low Level Waste - On October 10, 1993, RTF elected to cease all Low Level Waste (LLW) shipments to the Solid Waste Disposal Facility until full WSRC Waste Certification and Minimization (WCAM). The WCAM plan was expected to be approved by December 8, 1993. However, DOE has requested an independent assessment of the plan, which will certify only RTF, not LLW generated by the existing tritium facility. The independent assessment is expected to be completed by January 21, 1994.

- g. Safety Analysis Report (SAR) Update - WSRC expects to have a copy of the first annual SAR update to DOE in August 1994. Current plans are to incorporate Volumes 17-20 (questions and responses) into the applicable sections; incorporate all SAR change requests through February 1994; and provide updates on conduct of operations, radiation protection, and other program changes.

2. Additional DNFSB Staff Concerns:

- a. Lightning Protection - WSRC is depending on the use of building steel structural components (e.g., rebars, columns, etc.) to dissipate the energy from any lightning strikes. The DNFSB staff does not concur with this approach. WSRC has not adequately demonstrated RTF's capability to withstand lightning strikes, especially the diesel generator building, electrical sub-station, stack, ventilation system equipment on the roof, and distributed control system (DCS) components.
- b. Ventilation in the battery room to prevent hydrogen buildup - WSRC has not yet demonstrated conformance with applicable codes and standards related to battery area ventilation to prevent hydrogen buildup. The DNFSB Staff referred WSRC to the following applicable standards: ANSI C2-1993, Article 142, "Ventilation"; NFPA 70, Article 48, "Storage Batteries"; and IEEE - 450, "Recommended Practice for Maintenance, Testing, and Replacement of Lead Storage Batteries". Also, the potential for an explosion in the battery room if the ventilation system becomes inoperable has not been evaluated.
- c. Electrical Calculations and Isolation Devices - WSRC has not yet completed calculations for voltage profile and grounding, and a design modification is being prepared by WSRC for the application/deletion of isolation devices. Voltage profile calculations are required by DOE Order 6430.1A, *General Design Criteria*.
- d. Emergency Lighting - While reviewing the completed procedure for loss of power, the Staff noted that there is no discussion of the interim action requiring the use of flashlights for emergency lighting. WSRC agreed to have flashlights available in the facility until the emergency lighting supports have been seismically qualified. WSRC will revise the procedure to include the use of flashlights.

The DNFSB staff clarified to WSRC that the concern about seismically qualified lighting supports is limited to the battery-powered emergency lights (battery packs); it does not include emergency lights fed from diesel generators.