



Department of Energy
Under Secretary for Nuclear Security
Administrator, National Nuclear Security Administration
Washington, DC 20585



March 26, 2024

The Honorable Joyce L. Connery
Chair, Defense Nuclear Facilities Safety Board
625 Indiana Avenue NW, Suite 700
Washington, DC 20004

Dear Chair Connery:

This letter is provided on behalf of the Secretary of Energy in response to Defense Nuclear Facilities Safety Board's (DNFSB or Board) October 4, 2023, letter regarding ongoing safety improvements at the Savannah River Tritium Enterprise (SRTE). Your letter requested that the Department of Energy (DOE) provide a report and briefing within six months of receipt of the letter on DOE's progress on safety improvements at SRTE and stated that the report and briefing should include a prioritized list of safety risk reduction efforts, allocated resources, and a schedule for completion. The letter also requested that DOE provide a report and briefing annually after the first report on progress of the facility and system upgrades, decisions made for proposed upgrades and analytical initiatives, and the impacts of safety risk reduction efforts and that the annual reports and briefings include any changes and justification for those changes regarding prioritization, resource allocation, and schedule for safety risk reduction efforts since the previous report and briefing.

As noted in your letter, DOE's National Nuclear Security Administration (NNSA) is pursuing a multi-pronged approach to improving the SRTE safety posture by updating the safety basis, reducing potential doses to co-located workers, enhancing the SRTE Emergency Preparedness Program, and constructing the Tritium Finishing Facility while maintaining safe operations at H-Area Old Manufacturing. Collectively, the modifications, upgrades, and programmatic improvements in these areas provide a systematic approach to improving safety at SRTE.

During your site visit in May 2023, the Board was provided a briefing on the following topics: (1) SRTE safety basis; (2) Tritium inventory; (3) Co-located Worker Dose Reduction strategy; (4) mass casualty event drill and exercises; and (5) planned calendar year 2025 outage. NNSA and Savannah River Nuclear Solutions are committed to continued improvements following a comprehensive approach that focuses both on enhancing existing programs and infrastructure and identifying and implementing new controls. The enclosed report summarizes the ongoing initiatives to address the progress and status of NNSA's approach to improving safety at SRTE.

Pursuant to your October 4, 2023, letter, NNSA will schedule and provide additional details on this approach at a briefing with the Board by May 1, 2024. If you have any questions, please contact Mr. Michael Mikolanis, Manager, Savannah River Field Office, at (803) 208-3689.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jill Hruby", with a stylized flourish at the end.

Jill Hruby

Enclosure

Annual Report on Ongoing Initiatives to Address the Progress and Status of the Savannah River Tritium Enterprise

Introduction

During the Defense Nuclear Facilities Safety Board's (DNFSB or Board) site visit in May 2023, the Department of Energy's National Nuclear Security Administration (DOE/NNSA) and Savannah River Nuclear Solutions (SRNS) briefed the Board on the following topics: (1) Savannah River Tritium Enterprise (SRTE) safety basis; (2) Tritium inventory; (3) Co-located Worker Dose Reduction (CLWDR) strategy; (4) mass casualty event drill and exercises; and (5) planned calendar year 2025 outage.

On October 4, 2023, the Secretary of Energy received a letter from the Board requesting a report and briefing within six months of receipt of the letter on the DOE/NNSA's progress on safety improvements at SRTE and an annual report and briefing to follow thereafter on progress of the facility and system upgrades, decisions made for proposed upgrades and analytical initiatives, and the impacts of safety risk reduction efforts. The Board's letter stated that the "annual report and briefing should include any changes and justification for those changes regarding prioritization, resource allocation, and schedule for safety risk reduction efforts since the previous report and briefing."

NNSA and SRNS are committed to continued improvements to the safety posture of the SRTE Tritium Facilities. As noted in the Board's letter, NNSA is pursuing a multi-pronged approach to improving the SRTE safety posture. The modifications, upgrades, and programmatic improvements discussed in this report provide a systematic approach to improving safety at SRTE. This report provides a status on NNSA's multi-pronged approach, which will be updated in subsequent reports. Due to funding cycles, the resource allocations and scheduling of projects and activities is an ongoing effort; activities in the analysis and evaluation stage are funded under the existing contract, and specific project resources will be included in future reports as they are identified. Prioritization is discussed below in terms of which efforts NNSA continues to pursue. As funding allocations are authorized, NNSA will re-evaluate the approach to prioritize activities with the highest safety impact.

1. SRTE Safety Basis

SRTE currently implements two Documented Safety Analyses (DSAs) and Technical Safety Requirements (TSRs), one for the Tritium Extraction Facility (TEF) and one for the Tritium Facilities (TF). SRNS has made significant progress to combine the safety basis documents into a single DSA and TSR, the Combined Tritium Facilities (CTF) safety basis. The CTF DSA was partially developed to incorporate MELCOR Accident Computer Code System 2 atmospheric

dispersion modelling in the analysis. The CTF DSA Revision 1 and TSR Revision 1 were submitted to NNSA for review and approval in May 2023. After review and comment resolution, NNSA approved Revision 1 of the DSA and TSR in December 2023 via a Safety Evaluation Report in accordance with 10 C.F.R. § 830.207 and DOE Standard 1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*.

The CTF DSA and TSR represent an improvement to the overall SRTE safety posture by adding new credited controls and elevating elements of safety management programs and administrative controls to specific administrative controls (SACs). The new credited controls in the DSA and TSR are Safety Class 217-H Vault Fire Damper, 217-H Vault Transient Combustible Material Control SAC, Vehicle Barrier Movement SAC, Critical Lift SAC, and Passive Fire Barriers. These controls improve the safety posture for certain events analyzed in the consolidated hazard analysis involving fires, critical lifts, and/or vehicle impacts. Implementation efforts are underway, with full facility implementation expected in fiscal year (FY) 2024. These efforts are being conducted with existing contract funds.

Two planned improvements identified in the safety basis, and cited in the Board's letter, provide an enhanced SRTE safety posture: the 233-1H Fire Barrier and investigation of 296-H stack collapse mitigation/prevention.

233-1H Fire Barrier

The CTF safety basis implementation is scheduled for FY 2024; however, the 233-1H Fire Barrier will not be credited in the CTF DSA and TSR until the project is complete and is released to operations. Once complete, the 233-1H Fire Barrier will be credited to prevent the propagation of fires in or out of H-Area Old Manufacturing (HAOM). To accomplish this, a backfit analysis of the 233-1H Fire Barrier identified several structures, systems, and components (SSCs) that require modification to enable crediting the fire barrier in the DSA to further reduce the postulated consequences. These upgrades have been documented as design input for a project to upgrade all SSCs necessary to credit the 233-1H Fire Barrier. The initial design of the 233-1H Fire Barrier modifications is nearing completion and is scheduled to be issued in FY 2024. Following acceptance of the design, the project will transition when it is authorized for execution to focus on procurements and construction with project completion currently forecasted in FY 2026.

296-H Stack Collapse Mitigation

An engineering control does not readily exist to address the reported material at risk (MAR) release postulated in the post seismic event followed by a full facility fire due to the assumed 296-H Stack collapse and subsequent impact to the 217-H Vault. Efforts continue to identify possible solutions focused on potential modifications to the 296-H Stack or 217-H Vault and to protect the MAR within 217-H from fire propagation in the event the 296-H Stack collapses on the 217-H Vault during/after a design basis earthquake. Initially, NNSA and SRNS collaborated to identify 12 possible solutions to protect the MAR in 217-H in the postulated post-seismic fire

scenario and prioritized the selection by narrowing down the modifications based on preliminary feasibility and their potential impact to safety and operations. SRNS is currently studying the remaining proposed modifications to support the final down selection decision, based on constructability, cost, and effectiveness. NNSA expects to make a decision on which modification to pursue in FY 2024; project funding will be pursued following this decision.

2. CLWDR Strategy

In 2017, NNSA directed SRNS to formulate a strategy to reduce the high consequences to the co-located worker (CW) at SRTE. The CLWDR strategy is focused on the development of multiple SSCs and analytical assumptions that could reduce the postulated high residual doses to CWs documented in the SRTE Consolidated Hazards Analysis. CLWDR is working to minimize the dose consequence to the CW through initiatives which provide credited SSCs that are not currently credited in the DSA. The CLWDR strategy started with 19 deliverables in pursuit of nine initiatives with the aim to improve the safety posture and reduce postulated high consequences to CWs. The nine initiatives are discussed below, which is documented in the CLWDR Roadmap. The relative order of magnitude (RM) costs below was provided by SRTE and has not been formally reviewed or accepted by NNSA.

1. H-Area New Manufacturing (HANM) Exhaust Stack: This is anticipated to be a line-item project with a RM cost between \$150 million (M) and \$250M and a notional Critical Decision 4 (CD-4) date of 2038. This system will involve Natural Phenomena Hazard Design Category 3 (NDC-3)-qualified ductwork within HANM, ventilation fans, exterior ducting to the stack, diesel generator, and an approximately 200-foot stack.
2. HANM Fire Suppression: This is anticipated to be a line-item project with a RM cost between \$80M to \$100M (or \$105M to \$165M when combining the cost for HANM and TEF) and a notional CD-4 date of 2037. This system will involve NDC-3 qualified fire water supply and fire sprinkler system.
3. TEF Fire Suppression: This is anticipated to be a line-item project with a RM cost between \$80M to \$100M (or \$105M to \$165M when combining the cost for HANM and TEF) and a notional CD-4 date of 2037. This system will involve NDC-3 qualified fire water supply and fire sprinkler system.
4. HANM Seismic Tritium Confinements System (STCS) Upgrade: This is anticipated to be a General Plant Project (GPP) with a RM cost between \$10M to \$15M and will notionally become operational in 2035. This system will involve seismically qualified glovebox structural supports, process vessels, valves, seismic triggers, and relay cabinet.
5. HANM Hydrogen-Tritium Thermal Cycling Absorption Process (HT-TCAP) STCS: This is anticipated to be a GPP with a RM cost between \$12M to \$17M and will notionally become operational in 2033. This system will involve seismically qualified glovebox structural supports, process vessels, valves, seismic triggers, and relay cabinet.

6. TEF STCS: This is anticipated to be a GPP with a RM cost between \$12M to \$17M and will notionally become operational in 2035. This system will involve seismically qualified glovebox structural supports, process vessels, valves, seismic triggers, and relay cabinet.
7. Plume Rise: This initiative developed a conservative methodology for qualitatively incorporating plume rise into fire hazard events. This analysis has been completed, and its results have been incorporated into the CTF DSA.
8. Tritide Inventory: This initiative developed a basis for lowering the dose inhalation factor while maintaining a conservative analysis. The analysis has been completed, and its results have been incorporated into the CTF DSA.
9. Tritium Oxidation Study: These analyses will notionally be complete in 2030 and involve analyzing the release of tritium during fire events and the percent conversion of elemental tritium to tritium oxide in fires. It is important to note that it may be difficult for the vested parties to reach a consensus on the utilization of a percent conversion less than 100 percent.

Since the Board's May 2023 briefing, the modifications that have been de-scoped are the HANM NDC-3 Stack and related infrastructure and the TEF STCS. The physical modifications that continue to be pursued are the HANM and TEF seismically qualified fire suppression systems, the HANM STCS upgrade, and the HANM HT-TCAP STCS.

Fire suppression system evaluations continue to progress and the initial evaluations for both HANM and TEF are complete. Both system evaluations identified open items that are being pursued so that the system's seismic performance can be documented. The TEF open items are expected to be resolved in FY 2025, and the HANM open items are expected to be resolved in FY 2026. Funding for these modifications will be pursued following the completion of backfit analyses, conceptual design, and cost estimation efforts.

The HANM STCS upgrade completed all seismic analyses and obtained concurrence through NNSA subject matter expert review. This initiative is currently pursuing a conceptual design revision to incorporate the changes identified by the preliminary backfit analysis of the existing confinement system, with a new cost estimate expected in FY 2025. HANM STCS and the HANM HT-TCAP STCS will both be pursued to achieve the desired consequence reduction. However, due to the required sequencing, the HANM STCS will be upgraded prior to HT-TCAP STCS. Following funding for the design and execution of the HANM STCS upgrade, the CLWDR strategy will evaluate the pursuit of a credited seismic tritium confinement system for the HT-TCAP system.

The Savannah River Field Office (SRFO) provides DNFSB monthly updates on the schedule of ongoing and forecasted work in the CLWDR strategy.

3. Tritium Finishing Facility (TFF)

TFF, which is planned to replace activities currently being performed in the HAOM facility, will be paused from FY 2024 to FY 2026. TFF is currently estimated to start up in FY 2035. The TFF project was one of three projects paused to redirect funding and personnel to higher-priority projects in the DOE/NNSA complex, including the Savannah River Plutonium Processing Facility (SRPPF), the Los Alamos Plutonium Pit Production Project (LAP4), and the Uranium Processing Facility (UPF), all which require increased funding to remain on schedule. While TFF has been delayed, many aspects of the enterprise are simultaneously being modernized. NNSA intends to incorporate lessons learned from SRPPF, LAP4, and UPF to modify, upgrade, and improve future safety conditions at TFF.

Site preparation activities that can be completed using existing/available project funding for TFF include the demolition of the existing warehouse, the construction of one new warehouse, and the installation of a new 13.8 kilovolt power supply to the HANM facility. These site preparation activities are planned for completion by March 2025. Limited design scope will also continue during the site preparation phase of the project, including a draft Preliminary Documented Safety Analysis for the Preliminary Safety and Design Results and design of selected process systems. The HAOM facility will remain operational until the completion of the TFF project.

HAOM Bridging Strategy

The HAOM Bridging Strategy was developed to help maintain continued operations in the HAOM facility until TFF is constructed and is periodically assessed and revised as necessary to ensure continued operations in HAOM based on facility/equipment conditions, production requirements, and programmatic changes. The second revision of the Bridging Strategy was issued in June 2023 and was incorporated into the approved SRTE integrated priority list (IPL) in October 2023.

During the revision, personnel performed a series of walkdowns by utilizing existing operational risk reports. The assessment included various electrical, communications, fire protection, HVAC, steam, breathing/instrument air, chilled water plant, non-process gas supplies, building structure, and reservoir processes. The bridging strategy only addresses the recapitalization and major maintenance necessary to maintain HAOM in an operational state while minimizing risks to the mission. The bridging strategy does not address the activities that would be necessary to address the building limitations related to natural phenomena hazard events and the compliance with current national codes and standards.

There are several scopes within the Bridging Strategy that will improve the operational safety of the HAOM facility. Funding requests will be added to the budget cycle accordingly; however, as work progresses, a more balanced approach may be applied. As TFF project work continues, SRNS will curtail, revise, or stop selected scopes and adjust time frames for work to be performed based on facility needs to continue operations. The following activities are identified in the Bridging Strategy as contributing to the overall radiological safety of the facility:

- Kanne System Replacement – This system is obsolete and will need to be replaced to ensure monitoring capability in the process rooms. This effort is tentatively scheduled for beginning design in FY 2029.
- Stack Monitor Replacement – This system is obsolete and will need to be replaced to ensure monitoring capability in the process rooms. This effort is tentatively scheduled for beginning design in FY 2030.
- Fire System Installation in Active Hoods – Active process hoods in HAOM do not have fire suppression. To mitigate this hazard, fire suppression will be installed in the active HAOM hoods. This effort is tentatively scheduled for beginning design in FY 2029.
- Fire System Sprinkler Head Replacement – The life cycle replacement for all sprinkler heads in HAOM will require replacement in 2030. Parts will be procured and installed as a part of regular fire system maintenance. Sprinkler head replacement is expected to begin in FY 2024 and will continue through FY 2030.

The status for each of the bridging strategy scopes are tracked on the IPL. There have been several recent Bridging Strategy accomplishments to ensure HAOM's enduring mission, including completion of the Main Side (HAOM original structure) Motor Control Center replacements, the cooling tower and chiller refurbishments, and the Hoffman Blowers replacement for the air monitoring system. Significant progress continues with laser marker replacement, calorimeter refurbishments, mass spectrometer and scanning electron microscope procurements, and several other projects identified in the Bridging Strategy scope.

4. SRTE Emergency Preparedness (EP)

SRTE initiated an EP Improvement Plan (originally titled the "SRTE Emergency Preparedness Drill Improvement Plan") in August 2022 to further align the SRTE program within the framework of DOE Order 151.1D, *Comprehensive Emergency Management System*. This improvement plan applies changes as new opportunities arise and currently encompasses improvements to many aspects of EP, including the following:

- drill conduct;
- training;
- drill scenarios;
- programmatic improvements; and
- administrative improvements.

In August 2023, SRFO sent a letter of concern to SRNS about the SRTE EP Program. In the letter, SRFO communicated four areas of concern related to drill improvement, personnel turnover, training, and expertise and noted that the SRTE Emergency Management Program is a critical element of Tritium Enterprise DSA. SRFO requested a comprehensive Emergency Management plan with corrective actions, measurable milestones, and effectiveness reviews from SRTE and

stated that updates should be made to the SRFO EP team on a bi-weekly basis. SRFO received the requested plan from SRNS on September 28, 2023.

Improvements to the SRTE EP program include:

- Increasing fulltime EP staff, including experienced personnel (expected to be completed in FY 2024);
 - SRTE recently hired one key EP staff position (Lead Controller).
- Addressing a gap analysis to develop EP drills scenarios that satisfy all Emergency Action Levels and Site Area Emergencies identified (expected to be completed in FY 2025);
- Addition of Senior Management drill observers to help identify areas of growth (completed in FY 2024);
- Communications improvements (expected to be completed in FY 2024);
- Comprehensive hot washes immediately following the drill play (implemented);
- Improved and standardized drill and exercise reporting (completed in FY 2024);
- Standardization and strengthening of matrixing to sitewide EP organizations (completed in FY 2024); and
- Preparation for a postulated mass casualty drill.
 - SRTE plans to execute a postulated mass casualty drill in FY 2024 that assumes the onsite medical response capacity will be exceeded. This drill will contain various postulated risk/release elements to challenge first responders with the need to prioritize their response as the drill evolves.

Additional actions to strengthen SRTE's EP program include the incorporation of the SRTE EP organization into the Operations organization while remaining connected to matrixed support from both Site EP and the Site Drill Team. SRNS also revitalized their conduct of operations drill program and ran postulated abnormal event scenarios on both day shifts and backshifts, lessening administrative burdens in favor of increased drill/practice time.