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**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

Washington, DC 20004-2901



June 24, 2020

The Honorable Dan Brouillette
Secretary of Energy
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Brouillette:

We intended to hold a public hearing at the Savannah River Site (SRS) in March but postponed it until later this year. One topic of that hearing will be the current status of efforts to improve worker safety at the SRS Tritium Facilities. As we prepare for that hearing, we are following the status of the actions that the National Nuclear Security Administration (NNSA) stated would address concerns that we expressed in Recommendation 2019-2, *Safety of the Savannah River Tritium Facilities*. The enclosed report summarizes our staff's analysis of the actions proposed, taken, and not taken to address the risk to the workers and public, as well as the timeline of those actions.

Portions of the Board's Recommendation 2019-2 were recently echoed in your Office of Enterprise Assessments May 2020 [Safety Basis Assessment at the Savannah River Site Tritium Facility report](https://www.energy.gov/ea/downloads/safety-basis-assessment-savannah-river-tritium-facility-may-2020) (<https://www.energy.gov/ea/downloads/safety-basis-assessment-savannah-river-tritium-facility-may-2020>). We encourage you to review our staff's analysis as you continue to implement timely improvements in the safety posture at the SRS Tritium Facilities. We will continue to oversee NNSA's actions, and we plan to discuss those actions at our rescheduled SRS public hearing.

Yours truly,


Bruce Hamilton
Chairman

c: Mr. Joe Olencz

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Report

May 28, 2020

Staff Evaluation of NNSA's Proposed and Ongoing Actions for Improving Safety at the Savannah River Site Tritium Facilities

Summary. The National Nuclear Security Administration (NNSA) rejected Recommendation 2019-2, *Safety of the Savannah River Site Tritium Facilities* [1], based on the statement that it is already addressing the Defense Nuclear Facilities Safety Board's (Board or DNFSB) concerns with proposed and ongoing actions [2 – 4]. This report summarizes the current status of those actions and the staff's assessment of the effectiveness of those actions in addressing the issues of adequate protection identified in the Board's Recommendation.

The Savannah River Site's (SRS) Tritium Facilities' new documented safety analysis (DSA) approved in December 2019 [5] contains improvements that address some of the previous Board concerns from 2011 [6, 7], but calculated dose consequences for co-located workers are still unacceptably high (based on the Department of Energy's (DOE) own requirements); calculated dose consequences for the public challenge the evaluation guideline; and no new controls have been identified and implemented that reduce the calculated dose consequences to DOE's acceptable levels. SRS has not tested safety management programs that could help mitigate accident consequences, such as its emergency preparedness and response program, to demonstrate their effectiveness. Finally, SRS has not implemented any compensatory measures to ensure safety in the interim.

The Board's staff and NNSA personnel differ significantly on the perception of the risk to workers and the public associated with the SRS Tritium Facilities. In the staff's assessment, NNSA's proposed and ongoing plans will not result in sufficient improvement to the safety posture of the Tritium Facilities.

Background. The Board issued Recommendation 2019-2, *Safety of the Savannah River Site Tritium Facilities*, on June 11, 2019. The Administrator of the National Nuclear Security Administration, on behalf of the Secretary of Energy, rejected the Recommendation on September 10, 2019, stating that

DOE/NNSA remains fully compliant and committed in our duties to the American public in the safe operation of these facilities as outlined in the enclosure to this letter. These actions address the concerns of the DNFSB and reflect how DOE/NNSA is providing adequate protection of the public's health and safety at the Tritium Facilities at the Savannah River Site (SRS). Therefore, I do not accept Recommendation 2019-2. [2]

The letter and its attachment described a number of proposed and ongoing actions that NNSA stated would address the Board's concerns, and would "make the need for additional actions in response to a DNFSB Recommendation unnecessarily duplicative of that effort, and

would, therefore, detract from our continued progress” [2]. In the letter, NNSA offered to provide a briefing to the Board to discuss its actions. NNSA provided that briefing during a public Board meeting on October 28, 2019 [4].

Following the public meeting, the Board voted to reaffirm the Recommendation and transmitted that affirmation to the Secretary in a letter dated December 5, 2019. The Administrator again rejected the Recommendation in a letter dated January 3, 2020.

Noting that NNSA based its rejection on statements that proposed and ongoing actions already address the Board’s concerns, the Board’s staff is evaluating the effectiveness of those actions as part of its routine safety oversight. This report summarizes the current status of those actions and the staff’s assessment of how effectively they address the Board’s concerns.

Discussion. The purpose of a facility’s safety basis is to evaluate hazards and identify the controls needed to eliminate or mitigate the hazards. After six years of preparation and two years of review prior to its approval, the Tritium Facilities DSA has still concluded that “[c]ontrols are not available for all events that have High unmitigated consequences to the CW [co-located workers]” [5]. Even though NNSA cited the new DSA as part of its rationale for rejecting Recommendation 2019-2, Tritium Facilities’ contractor, Savannah River Nuclear Solutions LLC’s (SRNS) latest schedule, provided to NNSA in January 2020, lists an implementation date of 2025 for this new DSA [8]. Consequently, the currently implemented DSA discussed in Recommendation 2019-2 will be in place for another five years.

In addition to approving a new DSA, NNSA directed SRNS to develop a risk reduction strategy for co-located workers. SRNS’s proposed actions focus on either refining the accident analysis parameters or crediting existing structures to reduce the calculated consequences in the safety basis [9]. SRNS currently is not considering implementing additional engineered controls that would improve the safety posture of the Tritium Facilities. The proposed actions do not represent actual improvements to safety, but rather analytical reductions. Regardless, SRNS does not expect to complete all the actions until 2025. This risk reduction strategy will not actually make the Tritium Facilities safer now or in 2025.

Once SRNS implements the new DSA, the calculated dose consequences to co-located workers from multiple accident scenarios will still be nearly 100 times higher than DOE’s guideline for that group. Also, the calculated dose consequences to the public will still be within 20 percent of DOE’s evaluation guideline. Both DOE guidance and procedures at sites with defense nuclear facilities, including SRS, expect that sites will make efforts to identify and establish further controls to reduce the calculated dose to workers and the public when DOE’s guidelines are approached or exceeded. The Board’s staff has not seen any emphasis placed on meeting this expectation at the SRS Tritium Facilities.

Regarding interim compensatory measures, NNSA stated in its September 10, 2019, rejection letter that:

When it was understood that the new analysis would increase the dose consequences, Savannah River Nuclear Solutions (SRNS) reduced tritium quantities in such facility through the Automated Reservoir Management System. These reductions are reflected in the DSA currently advancing through the approval process by the Department's approval process [2].

NNSA officials echoed this statement during the Board's October 28, 2019, public meeting [4]. However, based on documents provided by NNSA, the staff has determined that this statement refers to procedural changes implemented in 2011 [10, 11].

SRNS finally incorporated the lower limits into the 2019 DSA, but the calculated dose consequences to co-located workers after mitigation are still nearly 100 times higher than DOE's co-located worker guideline, and the public doses still approach the evaluation guideline. Furthermore, the procedural changes only reduced the maximum quantity of tritium allowed in the facilities and not the actual amount of tritium in the facilities. While the actual amount of tritium at the facility varies by workload, there has been no intentional effort to reduce the actual amount of tritium. Reducing the actual amount of tritium would increase safety margins. Therefore, the safety posture at the Tritium Facilities has not improved.

NNSA points to the proposed Tritium Finishing Facility (TFF) as its primary long-term solution for improving safety at the SRS Tritium Facilities [2 – 4]. The Board's staff agrees that the new facility, when completed in about a decade [12], will help improve safety for certain tritium operations at SRS. However, the planned TFF will not replace the facilities that contain the largest fraction of readily dispersible tritium and thus pose the largest risk for releases. Therefore, while TFF will help improve the safety posture, it alone will not fully address the concerns detailed in Recommendation 2019-2.

NNSA justified accepting the very high risks to co-located workers on the grounds that the analysis was performed with "extreme conservatism in the analytical parameters [and] hypothetical, worst-case modeling [that] does not account for any Emergency Response exposure reduction actions, personnel self-protection actions, nor any subsequent response actions to mitigate the potential consequences" [2]. NNSA used this argument to discredit the analytical results and imply that worker training and administrative programs provide sufficient protection.

In the staff's assessment, the Tritium Facilities' analyses are consistent with the requirements, guidance, methodology, and expectations that NNSA requires of all of its defense nuclear facilities. While there is conservatism in the parameters and modeling, it is reasonable, technically justified, and consistent with the conservatism applied at other defense nuclear facilities. The staff is not aware of any other NNSA site that has accepted a level of risk comparable to that analyzed for the Tritium Facilities based on the claim that DOE's guidance requires the analysis to be extremely conservative.

More than 1,000 workers in H-Area and the Tritium Facilities [13, 14] are at risk of acute radiation syndrome from a major release at the Tritium Facilities. This at-risk area includes a site-wide training building with a major cafeteria, frequently visited by site visitors as well as workers, that is located less than a quarter of a mile from the Tritium Facilities. An accident that

results in a major energetic release from the Tritium Facilities would create a chaotic situation for the entire H-Area population.

However, NNSA and SRS have not conducted any drills or exercises to prepare the organization for an event of such magnitude. Nor have NNSA and SRS conducted any drill or exercise to validate that the emergency response is capable of handling such an event. In the staff's assessment, absent planning, training, and exercising, NNSA's confidence in worker self-protection and SRS's and the local communities' safety and emergency assets is unfounded.

Prior to drafting Recommendation 2019-2, the Board's staff had a clear understanding that the radiological risk associated with the Tritium Facilities could not be reduced simply by revising the DSA or crediting controls that had not been demonstrated to perform the functions expected of them. At the same time, the Board's staff had a clear understanding that the Tritium Facilities' mission is unique and vital to national security. As a result, Recommendation 2019-2 was intentionally designed to allow for phased implementation of substantive actions and engineered controls, while relying on compensatory measures in the interim. The construction of TFF, when completed in about a decade, fits within that framework; but it alone will not be sufficient to address the Board's concerns or satisfy DOE's own expectations.

Conclusion. The SRS Tritium Facilities' new DSA approved in December 2019 [5] contains improvements that address some of the previous Board concerns from 2011 [6, 7]. It does not address the core concerns expressed by the Board in 2011 or those expressed in Recommendation 2019-2. Calculated dose consequences for co-located workers are still unacceptably high (based on DOE's own requirements); calculated dose consequences for the public challenge the evaluation guideline; and no new controls have been identified and implemented that reduce the dose consequences to DOE's acceptable levels. Furthermore, safety management programs that could help mitigate accident consequences, such as the site's emergency preparedness and response program, have not been tested to demonstrate their effectiveness. Finally, SRS has neither implemented any compensatory measures to ensure safety in the interim, nor has any it developed any plans to implement such measures.

All of the items NNSA cited as addressing the Board's concerns were known and taken into account in the development of Recommendation 2019-2. The Board's staff's evaluation of the rejection letters [2, 3] and the information NNSA officials provided in the Board's October 28, 2019, public meeting [4] have only confirmed that understanding. The Board's staff and NNSA differ significantly on the perception of the risk to workers and the public associated with the SRS Tritium Facilities. In the staff's assessment, NNSA's proposed and ongoing plans will not result in sufficient improvement to the safety posture of the Tritium Facilities.

The Board's staff will continue evaluating NNSA's progress towards completing its proposed and ongoing actions, and will provide periodic updates to the Board.

References

1. Defense Nuclear Facilities Safety Board, *Recommendation 2019-2: Safety of the Savannah River Tritium Facilities*, June 11, 2019.
2. Gordon-Hagerty, L.E., Administrator of the National Nuclear Security Administration, letter to B. Hamilton, Chairman of the Defense Nuclear Facilities Safety Board, *Department of Energy's Response to Recommendation 2019-2*, September 10, 2019.
3. Gordon-Hagerty, L.E., Administrator of the National Nuclear Security Administration, letter to B. Hamilton, Chairman of the Defense Nuclear Facilities Safety Board, *Department of Energy's Response to Reaffirmation of Recommendation 2019-2*, January 3, 2020.
4. Defense Nuclear Facilities Safety Board, *Transcript of Proceedings, Public Meeting on Board Recommendation 2019-2, Safety of the Savannah River Tritium Facilities*, October 28, 2019.
5. Savannah River Nuclear Solutions, LLC, *Tritium Facilities Documented Safety Analysis*, U-DSA-H-00002, Revision 0, August 2019.
6. Defense Nuclear Facilities Safety Board, *Transcript of Proceedings, Public Meeting and Hearing Savannah River Site*, June 16, 2011.
7. Winokur, P.S, Chairman of the Defense Nuclear Facilities Safety Board, letter to T.P. D'Agostino, Administrator of the National Nuclear Security Administration, *Review of Savannah River Site Tritium Facilities Safety Basis*, August 19, 2011.
8. Spangler, R.W., Senior Vice President of National Nuclear Security Administration (NNSA) Operations and Programs, Savannah River Nuclear Site (SRNS), letter to N.N. Nelson-Jean, Manager of NNSA Savannah River Field Office, *MACCS2 Safety Basis Preconceptual Implementation Schedule Modifications, Procedure Changes and Cost*, SRNS-T0000-2020-00015, January 17, 2020.
9. Spangler, R.W., Senior Vice President of National Nuclear Security Administration (NNSA) Operations and Programs, Savannah River Nuclear Site (SRNS), letter to N.N. Nelson-Jean, Manager of NNSA Savannah River Field Office, *Transmittal of the Schedule for Implementing the Strategy for Risk Reduction to the Co-Located Worker in Tritium Facilities (U)*, SRNS-T0000-2018-00227, July 12, 2018.
10. Savannah River Nuclear Solutions, LLC, *HANM, 236-H, and 237/238-H Tritium Inventory Control (U)*, SOP 233-16002, Revision 18, June 27, 2011.
11. Savannah River Nuclear Solutions, LLC, *Tritium Inventory Control (U)*, SOP TRIT-1190, Revision 10, January 6, 2011.
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Critical Decision-1, Approve Alternate Selection and Cost Range, for the Tritium Finishing Facility Project at the Savannah River Site, December 19, 2019.

13. Savannah River Nuclear Solutions, LLC, *SRS Emergency Plan, H-Area Environmental Management Operations Annex*, SCD-7 Annex D, October 24, 2017.
14. Savannah River Nuclear Solutions, LLC, *SRS Emergency Plan, Tritium Facilities Annex*, SCD-7 Annex H, October 24, 2017.