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DNF SAFETY BOARD

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Dear Mr. Chairman:

This letter responds to the March 27, 2012, Defense Nuclear Facilities Safety Board (Board) letter regarding the A- and K-Area fire protection water supply at the Savannah River Site (SRS). In our May 30, 2012, letter to the Board, we indicated additional time was needed to resolve issues identified by the Board within the SRS A-Area fire protection water supply system and to clarify how the revised functional classification was accomplished.

The Department of Energy (DOE) recognizes there are issues with the age, material condition, and code compliance of the existing A-Area fire protection water supply system and has concluded replacement with a current code compliant fire water supply tank and fire water pumps is warranted. In response, Savannah River Nuclear Solutions, LLC has engaged a senior technical team to produce an alternative analysis of options for a path forward to replace the fire water supply tank and fire pumps. Implementation of the preferred alternative to ensure reliable fire water supply for the Savannah River National Laboratory will proceed once the alternative analysis is completed and is contingent upon securing sufficient funding.

The enclosure provides a detailed status in response to the Board's issues with additional details on DOE's plans to address the SRS A-Area water supply and fire protection program.

If you have any questions, please feel free to contact me or Mr. Matthew Moury, Deputy Assistant Secretary for Safety, Security, and Quality Programs, at (202) 586-5151.

Sincerely,

David Huizenga
Senior Advisor
for Environmental Management

Enclosure

cc: David Moody, SRS
Matthew Moury, EM-40



Enclosure

Savannah River Nuclear Solutions (SRNS) has completed a number of actions, such as conducting flow testing of the three fire water pumps, restoring the 782-A Service Water Storage Tank external surface, changing the fire water pump start order that places the larger and more capable pump in the lead, and completing extent of conditions walk-downs of key Savannah River National Laboratory (SRNL) sprinkler systems in support of revisions to the Backfit Analyses (BFAs). As additional requirements are identified while performing the ongoing improvement activities going forward, SRNS will initiate measures to address those requirements. SRNS has established some primary compensatory measures to ensure continued safe operations of SRNL, including:

- Maintaining a minimum 782-A Service Water Tank level of 25 feet to provide a 2-hour supply of fire water.
- Conducting surveillances of this tank every 6 hours.
- Restricting the outage time allowed for the primary Fire Water Supply System and providing for an alternate back-up supply when needed.
- Terminating HOT WORK activities conducted in SRNL within specified periods of time after losing all water supplies.
- Continued fire patrols.

SRNS Response to the Defense Nuclear Facility Safety Board’s (DNFSB) Issues on the A- Area Fire Water Supply

	DNFSB	SRNS Response	Status
1	<p>Backfit Analyses. The staff's review of the BFA for the A- and K-Area Fire Water Supply Systems, together with verification of actual field conditions and subsequent identification of errors within the analyses, called into question the quality and completeness of the analyses, as well as the process used to approve the BFA reports. Both BFAs lacked rigor and resulted in conclusions that were not supported by the data.</p>	<p>SRNS agrees that the BFA for the A-Area Fire Water Supply System lacked rigor and resulted in conclusions that were not supported by data. Because of this, the A-Area BFA is being revised to ensure assumptions are valid, supporting calculations are correct, and current configuration is compared to NFPA code requirements.</p>	<p>Revise A-Area Fire Water Supply System BFA by 10/15/2012.</p>
	<ul style="list-style-type: none"> • Neither BFA included a crosswalk of all applicable requirements from National Fire Protection Association (NFPA) 20, <i>Standard for the Installation of Stationary Pumps for Fire Protection</i>; NFPA 22, <i>Standard for Water Tanks for Private Fire Protection</i>; or NFPA 25, <i>Standard for the Inspection, Testing, and Maintenance of</i> 	<p>As part of that revision, an evaluation of the applicable requirements of NFPA 20 and NFPA 22 is being performed. As a separate improvement initiative, an NFPA 25 Compliance Matrix is being developed for A-Area comparing requirements against implementing procedures. Gaps identified in this effort that impact the safety performance of the system will be addressed in the BFA.</p>	<p>NFPA 25 review for A-Area Fire Water Supply completed 6/26/2012. (F-TRT-A-0008)</p>

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<p><i>Water-Based Fire Protection Systems.</i> For example, a cross reference to NFPA 22, Section 5.5, which establishes design details for welded steel suction tanks was not provided.</p>		
<ul style="list-style-type: none"> The BFAs did not identify deficiencies related to: (1) the lack of a recent tank inspection report for the A-Area 782-A water supply tank, or (2) the failure to remove sediment from the bottom of the K-Area 192-4K water supply tank, which was identified in a 2007 tank inspection report. The contractor performed this 2007 inspection to meet the 5-year inspection as required by NFPA 25. On November 3, 2011, SRNS issued a Nonconformance Report for failing to follow NFPA 25 during the inspection of tank 192-4K. 	<p>An A-Area material condition assessment was completed and deficiencies identified, such as tank external corrosion, tank fill line corrosion, etc., are being tracked. The tank external corrosion repair and other maintenance items are complete with the remaining items requiring maintenance entered into the site Work Management System for completion of maintenance.</p>	<p>Process developed for tracking deficiencies has been completed.</p> <p style="text-align: center;">DNFSB SAFETY BOARD 2012 AUG 10 AM RECEIVED</p>
<ul style="list-style-type: none"> The assumptions in the A-Area BFA regarding the amount of water to be reserved for fire protection and the condition of the 782- A tank were not in accordance with the requirements of the applicable standards. A subsequent engineering analysis by SRNS determined that the original calculation was in error. As a result, SRNS declared a Potential Inadequacy of the Safety Analysis (PISA). 	<p>Upon declaration of the PISA, SRNS initiated appropriate compensatory actions needed to ensure a safe posture. A Technical Safety Requirement (TSR) Response Plan was subsequently generated that further enhanced these compensatory measures. A Justification for Continued Operations (JCO) has been submitted to DOE that provides continued compensatory actions needed to ensure safety until PISA resolution. Work to close the PISA includes revision of the BFA, which will require correction of the previous calculation errors.</p>	<p>Revise A-Area Fire Water Supply BFA by 10/15/2012.</p>
<ul style="list-style-type: none"> Assumptions without technical justification were used to validate conclusions in the A-Area BFA. For example, the BFA states that fire protection features for the 784-A pump house are not required because the potential for simultaneous fires within the laboratory and the pump house is excluded. NFPA 20 does not permit such an exception. 	<p>In the revised BFA, non-compliances with NFPA requirements will be evaluated to determine if the non-compliance impedes the system's ability to perform its safety function. The BFA will include recommendations to address non-compliance issues. As the BFA development progresses, analyses to date have identified the deficiencies that will be remediated, including:</p>	<p>Implementation of lead/lag modification for electric fire pumps.</p> <p>Replacing piping insulation where required on A-Area Fire Water Supply System is scheduled for 10/15/2012.</p>

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	<ul style="list-style-type: none"> In addition, the BFA for the A-Area Fire Water Supply did not address a number of known deficiencies (portions of the system that did not meet applicable codes and standards) and failed to consider the cumulative effect of those deficiencies. SRNS provided no technical justification for non-compliances with codes and standards. 	<ul style="list-style-type: none"> Design and implement a change in lead pump designation from Fire Pump 1 to Fire Pump 3. Replacing piping insulation where required on Fire Water Supply System. Design and installation of a wireless transmitter capability that will monitor the pump power features and tank level indicator. Design and installation of new circulation relief valves for each electric fire pump. Design and field install modification to the pressure switch sensing line, replacing with dual sensing line capability and improving some control variability issues. <p>Deficiencies identified in the BFA may not warrant field modifications and will be evaluated by SRNS for inclusion in an Engineering Evaluation to be submitted to the Authority Having Jurisdiction (AHJ) for approval.</p>	<p>Field installation of the wireless transmitter capability is scheduled for 10/31/2012.</p> <p>Field installation of the Relief valves and pressure switch modifications are scheduled for 3/15/2013.</p> <p>Submit Engineering Evaluation to DOE for approval by 11/15/2012.</p>
2.	<p>A-Area Fire Water Supply. The staff identified issues associated with the supply tank, pumps, and pump house for the A-Area Fire Water supply. The staff concluded that the A-Area Fire Water Supply does not meet the expectations for a safety-significant system. Details on specific issues are discussed below.</p>		

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	<ul style="list-style-type: none"> • 782-A Water Storage Tank. SRNS did not inspect the tank in calendar year (CY) 2010 as part of the process of implementing the revised functional classification of the system. SRNS inspected the tank's interior using divers in CY 2011, following the reclassification, and found sediment on the tank bottom. SRNS also discovered foreign objects including rocks, remnants of a ladder, a sphere, and other objects. The outer tank had an average sediment (sand and lime) depth of 11.9 inches, and the inner tank had an average sediment depth of 49 inches. Sediment, especially sand (because of its abrasive qualities), can damage the pump and thus affect its performance. The sediment and debris were removed by the divers as a part of the tank inspection process. SRNS has not taken action to prevent the future buildup of sediment in the tank. 	<p>A technical report will be developed from the inspection of the Fire Water/Service Water tank that was performed in March 2010 to document compliance with NFPA 25 inspection requirements.</p> <p>During the inspection, all of the sediment and foreign objects were removed from the tank. Engineering judgment concluded that the majority of sediment was lime used to adjust pH. Lime is no longer used for pH adjustment so that accumulation of sediment is expected to be significantly less.</p> <p>Internal tank inspections will be conducted every 3 years per NFPA 25 to ensure that sediment and other debris is not allowed to accumulate in the future. In addition, sprinkler systems within SRNL will be inspected internally to ensure no sediment has accumulated within these systems.</p>	<p>Technical report for A-Area Water Tank Inspection issued. 6/21/2012.</p> <p>Perform internal inspection of SRNL sprinkler systems for sediment by 8/31/2012.</p>
	<ul style="list-style-type: none"> • An inspection of the tank's exterior conducted by SRNS during the week of October 17, 2011, and previous measurements of pit depth revealed the following issues: <ul style="list-style-type: none"> • at "rusty" areas at the bottom course to base plate attachment, the lowest shell bottom course thickness is approximately 0.180 inches, which is less than that required by the design standard, and • at "rusty" areas, the tank shell base to plate outboard weld is missing (approximately 13 percent of the exterior weld) and the outboard portion of the base plate is missing (rusted away) in numerous areas. 	<p>A Structural Analysis and an evaluation of the condition of the tank were completed (T-CLC-A-00054). The analysis concluded tank failure is not imminent nor likely as long as further degradation does not occur.</p> <p>Recommendations for preparing the surfaces and applying coatings were implemented to arrest further degradation.</p>	<p>Action complete. Statement of work (M-SOW-A-00061) Work Order 01158958.</p> <p>Application of coatings complete.</p>

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	<ul style="list-style-type: none"> In the BFA, SRNS credited automatic refill of the 782-A tank from wells as the means to ensure that the required 2-hour fire water supply would be maintained. For this to be acceptable, the automatic refill system (wells, pumps, power supply, etc.) must be considered a required support system and classified at a level no lower than that of the fire water system that it supports. However, the automatic refill system is classified as general service, not safety significant. 	The revised BFA will address the system functions needed to ensure a 2-hour fire water supply is maintained. The automatic refill system is not expected to be a support system required for maintaining this supply.	Revise A-Area Fire Water Supply System BFA by 10/15/2012.
3.	<p>A-Area Fire Pumps. Tank 782-A supplies water directly to the two electrically-driven fire pumps, which are housed in Building 784-A. Loss of electrical power would render both pumps inoperative.</p>	SRNS recognizes the vulnerability that results from a loss of power to 784-A. Appropriate compensatory measures have been described in the JCO to address this vulnerability for the short term. Further enhancements will be implemented per the revised BFA to install an SS Remote Monitoring System to provide immediate notification of loss of power. This immediate notification will allow for quick response to implement appropriate compensatory measures and to more promptly remedy the loss of power situation.	Field installation of the wireless transmitter capability is scheduled for 10/31/2012.
	<ul style="list-style-type: none"> Both pumps are located in a structure that is partially open to the effects of weather, is not secured from unauthorized entry, and has neither automatic fire suppression nor a fire rated barrier separating the pumps from the remainder of the facility. These conditions do not meet the requirements of NFPA 20, <i>Standard for the Installation of Stationary Pumps for Fire Protection</i>. 	Review of the A-Area Fire Water Supply System versus requirements is being evaluated. Actions to address the deficiencies will include modifications in the field, or be evaluated for inclusion in an Engineering Evaluation submittal to the AHJ.	<p>Submit Engineering Evaluation to DOE for approval by 11/15/2012.</p> <p>Actions to address the deficiencies will include modifications in the field, or be evaluated in the engineering evaluation submittal to the AHJ.</p>

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<p>The pumps and controllers are obsolete, resulting in the need to scavenge parts or obtain parts from sources other than the original manufacturer. Such an approach to maintenance is not sustainable in the long-term; it also calls into question the pumps' Underwriters Laboratories (UL) listing.</p>	<p>While it is recognized that the pumps and associated instrumentation are old and replacement parts are more difficult to obtain, programs are in place to use alternate parts, perform modifications to existing equipment, and to fabricate parts, as required. Each of these actions will be controlled and conducted consistent with expectations and requirements for an SS fire protection system and consistent with maintaining applicable UL Listings.</p>	<p>No action required.</p>
<ul style="list-style-type: none"> The A-Area pumps, controllers, isolation valves, and other equipment lack supervisory monitoring features (electronic or mechanical) required by current standards. 	<p>A SS wireless monitoring system for tank level and electric fire pump status will provide real time indication in the SRNL Control Room (continuously monitored) of the following attributes:</p> <ul style="list-style-type: none"> Tank 782-A water level, Loss of AC and DC power to the electric fire pumps, and Indication of startup of electric fire pumps. 	<p>Design and procurement is complete. Field installation of the wireless transmitter capability is scheduled for 10/31/2012.</p>
<ul style="list-style-type: none"> SRNS failed to perform the required annual NFPA 25 test of the A-Area fire pumps in CY 2009. 	<p>Annual tests for fire pumps in A-Area were not completed in 2009. The tests were completed in 2010, 2011 and 2012.</p>	<p>Action complete.</p>
<ul style="list-style-type: none"> NFPA 25, section 8.3.5.3, states that a fire pump is to be considered acceptable if the test results are at least 95 percent of the pump's original performance characteristics. The annual fire pump test conducted in CY 2010 showed a 7.16 percent degradation for the 1,000 gpm electric fire pump and a 9.95 percent degradation for the 2,000 gpm electric fire pump when operating at 150 percent of capacity. SRNS has not declared the pumps deficient. NFPA 25 also requires an investigation to reveal the cause of the degraded performance; SRNS has not conducted an investigation. 	<p>The A-Area fire water pumps are being maintained in accordance with NFPA 25 requirements. NFPA 25 requires the fire pump to meet no less than 95 percent of the performance characteristics as indicated on the pump nameplate. The nameplate data for Pump Number 1 is 1000 gpm at 104 psi and for Pump Number 3 is 2000 gpm at 104 psi. As documented in technical report F-TRT-G-00005, from 2000 to 2010 Pump Number 1 pressure has been between 100.3 psi and 107 psi, and Pump 3 has been between 100.4 psi and 103.6 psi. The 95 percent nameplate pressure is 98.8 psi. The 2010 data referenced in the DNSFB letter is data for the pump performance at 150 percent rated capacity. In addition, both pumps have continued to maintain performance within the NFPA 25 95 percent nameplate performance requirement for the years 2011 and 2012.</p>	<p>Action complete.</p>

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4.	<p>Redundant Fire Water Supply. A-Area lacks a credited redundant fire water supply, although DOE Standard 1066-1999, <i>Fire Protection Design Criteria</i>, recommends such a redundant supply.</p> <p>SRNS has no plan to provide a credited redundant water supply for A-Area. SRNS did not consider or evaluate available alternatives such as partially crediting the M-Area diesel fire pump and associated tank (tank and pump are undersized for the maximum fire water demand), or using the existing elevated domestic water tank as a water source for either new fire pumps or the two existing fire pumps in Building 784-A.</p>	<p>SRNS continues to operate and evaluate the Fire Water Supply System per the Fire Protection System requirements defined in the Standards/Requirements Identification Document (S/RID) and agreed to by DOE. These requirements do not include the need for a redundant Fire Water Supply System. However, SRNS recognizes the benefits of redundancy and has taken steps to provide for the availability of the M-Area Fire Water Supply System as a non-credited back-up water supply to the A-Area system in the Response Plan and JCO and expects to keep this backup capability. Flow tests were conducted utilizing the M-Area diesel operated pump that demonstrate that although limited, the M-Area pump is capable of providing an alternate back-up water supply, if required.</p> <p>SRNS is designing a crosstie from the Domestic Water System to the Fire Water Pumps. In addition, SRNS has initiated an alternative analysis review to identify the most cost effective long-term Fire Water Supply solution, including evaluation of a full replacement system. SRNS is committed to pursuing a replacement fire water supply system and plans to communicate the recommended alternative to DOE, as well as investigate funding capabilities for implementation. Each of the above initiatives (Domestic Water Tie-in and the resultant identified alternative solution) will ultimately be dependent on site budget and priority.</p>	Alternative Analysis completed by 8/31/2012.
	<ul style="list-style-type: none"> • Where only a single fire water supply system (single tank and single pumping arrangement) is provided for nuclear safety, loss of that system, as in the case of A-Area, might result in the following negative consequences: <ul style="list-style-type: none"> • Nuclear safety vulnerability between the time operation of the fire water system is lost and when the facility can be placed in a safe status. In the 	The BFA, the DSA, the TSR, the TSR Response Plan, and the JCO assess the risk of losing the fire water system. The assessment takes into account how long the system can be out of service and the risk of a fire during that period of time. Various actions are required based on the nature of the outage and the amount of time the system has been out (including the cessation of all flammable and hot work in the laboratory). The fire system is one of the credited safety significant controls for fire accidents at SRNL; however, there are also credited administrative controls that further	No action required.

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	<p>case of the SRNL, placing facility operations in a safe status would take considerable time and effort.</p> <ul style="list-style-type: none"> • While normal operations are being halted, the available compensatory measures might provide little or no safety benefit. • Depending upon the nature of fire water system deficiency, repair time could range from hours to weeks/months should the single tank or pumps be severely damaged. 	<p>support prevention of a fire and/or mitigation of the consequences if one were to occur. These administrative controls include:</p> <ul style="list-style-type: none"> • Fire Protection Program (Control of combustible loading, fire watches, fire patrols, firefighting coverage, fire barriers, etc.), • Emergency Preparedness Program, • Flammable and Compressed Gas Control Program, and • Process Flammable Gas Control Program. 	
	<ul style="list-style-type: none"> • Considering the number of issues discovered by the Board's staff and SRNS personnel during and following the review of the A- and K-Area fire water supplies at SRS, it is not clear how SRNS was able to justify that the A-and K-Area fire water supply systems met the revised functional classification in CY 2010. Neither system meets safety significant performance expectations. 	<p>It is acknowledged that significant opportunities for improvements were noted in the DNFSB letter. SRNS has implemented corporate actions needed to fully analyze and upgrade this Fire Water Supply System performance to SS expectations. SRNS is taking the appropriate actions to revise the DSA and TSR to close out the PISA. This includes conducting a more thorough engineering review and BFA for the A-Area Fire Water Supply System. The BFA development effort will result in an improved documented engineering/technical evaluation for meeting SS requirements, as well as addressing gaps that are identified during the BFA effort. These actions will result in improved:</p> <ul style="list-style-type: none"> • Engineering calculations, • Material conditions, • Maintenance of SS components, • Testing per code, • Surveillance of operations, and • Modifications necessary to meet DSA requirements. 	No action required.