Independent Assessment of the Fire Protection Program at the Savannah River National Laboratory

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Office of Enterprise Assessments
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Acronyms

AHJ	Authority Having Jurisdiction
BNA	Baseline Needs Assessment
BSRA	Battelle Savannah River Alliance, LLC
CAHJ	Contractor Authority Having Jurisdiction
CFR	Code of Federal Regulations
CSE	Cognizant System Engineer
DCF	Design Change Form
DCP	Design Change Package
DOE	U.S. Department of Energy
DOE-SR	DOE Savannah River Operations Office
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
FHA	Fire Hazards Analysis
FHE	Fire Hazards Evaluation
FPC	Fire Protection Coordinator
FPE	Fire Protection Engineer
FPP	Fire Protection Program
FR	Facility Representative
FST&M	Fire System Test and Maintenance
ITM	Inspection, Testing, and Maintenance
LCO	Limiting Condition for Operation
LPS	Lightning Protection System
M&TE	Measuring and Test Equipment
NFPA	National Fire Protection Association
OFI	Opportunity for Improvement
PAD	Performance Assurance Division
PMT	Post-maintenance Test
SRNL	Savannah River National Laboratory
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SRSFD	SRS Fire Department
SS	Safety Significant
SSCs	Structures, Systems, and Components
STAR	Site Tracking, Analysis, and Reporting
TA	Technical Area
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question

INDEPENDENT ASSESSMENT OF THE FIRE PROTECTION PROGRAM AT THE SAVANNAH RIVER NATIONAL LABORATORY

Executive Summary

The U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) conducted an independent assessment of the fire protection program (FPP) at the Savannah River National Laboratory (SRNL), from June 26 to July 13, 2023. SRNL is managed and operated by Battelle Savannah River Alliance, LLC (BSRA) for the DOE Office of Environmental Management and is overseen by the DOE Savannah River Operations Office (DOE-SR). The SRNL FPP is implemented by several Savannah River Site (SRS) organizations through integrated contractor agreements between BSRA and Savannah River Nuclear Solutions, LLC (SRNS), the primary management and operations contractor at SRS. This assessment evaluated overall FPP implementation as well as FPP documentation, design documentation, and inspection, testing, and maintenance (ITM) performance. This assessment also evaluated the effectiveness of DOE-SR's oversight of FPP activities at SRNL.

EA identified the following strengths:

- BSRA implemented a new A-Area fire water system that significantly improved fire protection at SRNL. All reviewed design inputs, analyses, and calculations were of high quality and consistent with applicable requirements.
- BSRA exhibited excellent use of tagging and labeling of permanent combustible material storage areas, fire walls, fire panels, and other fire protection components.
- The BSRA design authority engineer and SRNS cognizant system engineers demonstrated a high level of knowledge of their assigned systems.
- DOE-SR Facility Representatives and fire protection engineers demonstrated a thorough knowledge of SRNL fire suppression systems and recent fire protection issues at the facility.

EA also identified several weaknesses, as summarized below:

- BSRA is not performing scheduled compliance inspections of SRNL hot cell and glovebox fire prevention and combustible material controls.
- SRNS fire protection program procedures do not contain instructions for developing fire hazards evaluations for SRNL glovebox operations.
- BSRA did not follow National Fire Protection Association (NFPA) guidance for using non-listed systems, did not obtain approval from the authority having jurisdiction, and did not conduct a NFPA reconciliation and compliance evaluation for the installed Vortex glovebox suppression systems.
- BSRA did not perform an unreviewed-safety-question screening for the 50-year sprinkler head replacement activity due to improperly classifying the work as a like-for-like replacement.
- SRNS has not established a spare parts inventory for the fire water storage tank level alarm system.
- SRNS Construction sprinkler fitters installed sprinkler heads in the B-Wing main floor using an inappropriate tool.
- The SRS Fire Department pre-incident plans for Building 773-A contained missing or incomplete information.
- SRNS did not enter the test failure of fire door FPDR-001 into the SRS Site Tracking, Analysis, and Reporting (STAR) system.
- BSRA did not list failed fire door FPDR-001 as impaired or implement compensatory measures.

In summary, BSRA and SRNS have established a comprehensive FPP, and DOE-SR is effectively performing Federal oversight of BSRA and SRNS FPP activities at SRNL. However, this assessment identified numerous FPP implementation weaknesses. Resolution of the weaknesses identified in this report will enhance the FPP and help mitigate fire risks to SRNL-managed facilities.

INDEPENDENT ASSESSMENT OF THE FIRE PROTECTION PROGRAM AT THE SAVANNAH RIVER NATIONAL LABORATORY

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the fire protection program (FPP) at the Savannah River National Laboratory (SRNL). Remote and onsite assessment activities were conducted from June 26 to July 7 and on July 10-13, 2023, respectively. This assessment was part of an ongoing review of fire protection at hazard category 1, 2, and 3 nuclear facilities across the DOE complex.

SRNL is an applied research and development laboratory located at the Savannah River Site (SRS) and is the DOE Office of Environmental Management's only national laboratory. SRNL is managed and operated by Battelle Savannah River Alliance, LLC (BSRA) and is overseen by the DOE Savannah River Operations Office (DOE-SR). The SRNL FPP is implemented by several SRS organizations through integrated contractor agreements between BSRA and Savannah River Nuclear Solutions, LLC (SRNS), the primary management and operations contractor at SRS. BSRA serves as the overall design authority for fire protection structures, systems, and components (SSCs) and is responsible for implementing the SRNL fire hazards analysis (FHA) and safety basis. SRNS is responsible for the implementation of the FPP, including fire protection engineering and inspection, testing, and maintenance (ITM) support. The Site Utilities Department (SUD) owns and maintains the site fire water system, which supplies water to the SRNL safety significant (SS) sprinkler system. Pre-incident planning and ITM of fire doors and fire extinguishers are performed by the SRNS SRS Fire Department (SRSFD). SUD and the SRSFD are both SRNS organizations. Finally, DOE-SR provides Federal oversight of the SRNL FPP and serves as the authority having jurisdiction (AHJ) for matters relating to fire protection.

Consistent with the *Plan for the Independent Assessment of the Fire Protection Program at the Savannah River National Laboratory*, *July 2023*, this assessment evaluated the effectiveness of SRNL in managing and maintaining the FPP and related processes. This assessment also evaluated the effectiveness of DOE-SR's oversight of FPP activities at SRNL.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms "best practices, deficiencies, findings, and opportunities for improvement (OFIs)" as defined in the order.

As identified in the assessment plan, this assessment considered requirements related to the SRNL FPP. EA used sections of Criteria and Review Approach Document (CRAD) 31-12, Revision 2, *Fire Protection Program*, including review of contractor self-assessments (objectives 4.1 and 4.5); preplanning for emergency response (objective 4.1); wildland fire management (objective 4.1); fire protection SSCs and design requirements (objective 4.3); ITM of fire protection systems (objective 4.4); and FHA and documented safety analysis (DSA) integration with the FHA (objective 4.2). In addition, EA used elements of CRAD 30-07, Revision 0, *Federal Line Management Oversight Processes*, to collect and analyze data on DOE-SR oversight activities.

EA examined key documents, specifically system descriptions, work packages, procedures, manuals, analyses, policies, and training and qualification records. EA interviewed key personnel responsible for developing and executing the associated programs; observed activities; and walked down significant portions of selected support facilities, focusing on the design and condition of fire protection systems, potential fire hazards and controls, including the management of transient combustibles, and other observable FPP elements. EA also conducted interviews and reviewed assessment records to determine whether the Federal oversight program ensures fire safety systems can reliably perform as intended. The members of the assessment team, the Quality Review Board, and the management responsible for this assessment are listed in appendix A.

There were no previous findings for follow-up addressed during this assessment.

3.0 RESULTS

3.1 Fire Protection Program

This portion of the assessment evaluated the BSRA FPP, including policy and administration documents, procedures and implementation, equivalencies and exemptions, the FHA, building fire protection assessments, an emergency services baseline needs assessment (BNA), pre-incident plans, and wildland fire management planning.

Fire Protection Program Policy and Administration

BSRA has adopted and implemented the applicable elements of the SRNS comprehensive sitewide policy and FPP in accordance with DOE Order 420.1C, *Facility Safety*, attachment 2, chapter II, to ensure the effectiveness of all fire protection activities at SRNL. Manual 1-01, *Management Policies*, Procedure 5.40, *Fire Protection Policy*, and F-PP-G-00006, *Savannah River Site Fire Protection Program*, effectively define the SRS policy and FPP for implementation by BSRA as a "performing entity" at the site. F-PP-G-00006 received DOE-SR approval per DOE Order 420.1C, section 5.d.(5).

Roles, responsibilities, authorities, applicable requirements, and services provided with respect to FPP implementation are adequately defined by SRNS and BSRA in G-ICA-G-00002, *Integrated Contractor Agreement between SRNS and BSRA/SRNL for Landlord Services (LLS)*, appendix 2. AHJ roles and responsibilities formally delegated to SRNS are adequately documented in Manual Q2.1, Procedure 1.02, *Contractor Authority Having Jurisdiction (CAHJ) Roles, Responsibilities, Authorities, and Accountability (R2A2s)*, and F-PP-G-00006, section 5.2.2.

Procedures and Implementation

The SRS FPP is implemented through a collection of adequate sitewide procedures. These procedures adequately address design; configuration management; periodic assessment and inspection; the control of combustible materials, flammable and combustible liquids, gases, chemicals, and other hazardous materials; "hot work" and control of other ignition sources; and impairment control and ITM of fire protection and life safety SSCs. Manual 2Q, *Fire Protection Program*, and G-ICA-G-00002 adequately define the FPP organizational support provided to BSRA, consisting of fire protection engineer (FPE) staffing and resources, roles, and responsibilities, along with training for effective FPP implementation as a "landlord service." BSRA implements WSRC-RP-96-233, *Fire Protection Program for Savannah River National Laboratory*, which adequately defines the facility-level FPP. WSRC-RP-96-233 adequately implements the FPP requirements of the DSA; technical safety requirements (TSRs); DOE-

STD-1066-2016, *Fire Protection*; and National Fire Protection Association (NFPA) 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*

EA observed excellent use of signage and labeling of permanent combustible material storage areas. While controls for combustible materials are adequately addressed in SRNS and BSRA procedures, EA identified one weakness. Contrary to Manual L1, Procedure 3.16, *Shielded Cell, Intermediate Level Cell, and Glovebox Fire Prevention Controls*, section 4.5, the BSRA fire protection coordinator (FPC) is not performing scheduled compliance inspections of SRNL hot cell and glovebox fire prevention and combustible material controls. (See **Deficiency D-BSRA-1**.) Missed inspections of hot cell and glovebox combustible material control implementation may allow an incipient fire to progress to a larger than anticipated fire loss and adverse impacts. The frequency of these inspections is not defined within the procedure.

Equivalencies and Exemptions

SRNS has developed and implemented an adequate process used by BSRA for developing and submitting FPP-related equivalencies and exemptions, documented within Manual 2Q, Procedure 2.12, *Evaluation and Resolution of Fire Protection Engineering Issues*, and Manual 8B, *Compliance Assessment Manual*, and appropriately based on DOE Order 420.1C. The SRNS process for performing and documenting delegated CAHJ and FPE engineering evaluations is adequately documented in Manual Q2.1, Procedure 1.02; F-PP-G-00006, section 5.2.2; and Manual 2Q, Procedure 2.12. According to F-ESR-A-00160, *Savannah River National Laboratory (SRNL) Technical Area (TA) Facilities Fire Protection Compliance Matrix*, the SRNL FPP compliance approach relies on 21 equivalencies, 4 exemptions, and 25 engineering evaluations, position papers, and technical reports. A reviewed exemption record (SRS-DOE-5480.7A-CSA-94-192, R.2, *Compliance Schedule Approval for Building 773-A (U)*) appropriately demonstrated the historical basis for DOE-SR direction and corresponding risk assumption associated with the disposition of a subset of legacy Building 773-A fire protection deficiencies.

Fire Hazards Analysis

SRNS has developed and implemented a generally adequate FHA program that applies to all SRS nuclear facilities. Manual 2Q, Procedure 2.14, *Fire Hazard Analysis Document Administration*, and SRNS-IM-2015-00060, *Fire Hazards Analysis Guide*, implement the FHA program, which is appropriately based on DOE Order 420.1C, DOE-STD-1066-2016, and NFPA 801. The following documents comprise the SRNL FHA:

- F-FHA-A-00010, *Fire Hazards Analysis for Building 773-A and Associated Structures at the Savannah River National Laboratory (SRNL)*
- F-DCF-A-00314, *Change to FHA for Building 773-A*
- F-DCF-A-00363, *New A-Area Fire Water Supply System and 773-A Sprinkler System Information for F-FHA-A-00010*
- F-ESR-A-00160.

SRNS conducts document reviews of the BSRA-developed FHA every three years. The document reviews for 2017 and 2020 appropriately evaluated document content and DSA integration, cited affecting design change forms (DCFs) and other inputs, and concluded that the 2014 FHA is still valid. The SRNS FPE explained that BSRA recently prepared an update to FHA but then delayed it due to changing decisions with respect to submitting an updated DSA. BSRA provided a June 2023 DSA project schedule confirming that an FHA update is a project deliverable due in fiscal year 2023.

The FHA adequately and appropriately analyzes most facility fire hazards, consistent with the current SRNL DSA. The FHA adequately defines the design basis of most SRNL fire protection SSCs (e.g., automatic fire sprinklers, fire detection and alarm, special extinguishing systems, fire barriers, life safety SSCs, and fire extinguishers) and provides a conclusion with respect to the adequacy of protection based on the protected hazards. F-DCF-A-00363 provides a detailed evaluation of the new A-Area fire protection water supply and adequacy of supported SRNL fire sprinkler systems. The FHA document set, through F-ESR-A-00160, appropriately includes the most current list and status of approved equivalencies, exemptions, engineering evaluations, position papers, and technical reports. The FHA adequately describes and evaluates the risk of wildland fire exposure to Buildings 773-A and 773-43A and directly adjacent facilities. The FHA document set does not include information associated with the three Vortex® glovebox fire extinguishing systems installed after 2014 (see section 3.3 for further discussion on Vortex systems).

While F-FHA-A-00010 addresses most elements of an adequate FHA, contrary to AGS-G010, *Standard of Practice for Glovebox Fire Protection*, section 6.2, SRS Manual 2Q, Procedure 2.14, and SRNS-IM-2015-00060 do not contain requirements or instructions for developing fire hazards evaluations (FHEs) for glovebox operations in SRNL Building 773-A. (See **Deficiency D-BSRA-2**.) Incomplete integration of glovebox FHEs into the FHA could result in the omission of key fire protection controls. BSRA glovebox operations in Building 773-A include pyrophoric materials as documented in M-MBD-A-00002, *SRNL Gloveboxes, Intermediate Level Cells, & Glove Cabinet Baseline Listing*. DOE-STD-1066-2016, section 4.4.2.3, invokes AGS-G010, which includes criteria for developing an FHE for glovebox operations that should be included within the FHA. However, the Building 773-A FHA does not include FHE information and resulting controls for SRNL gloveboxes.

Building Fire Protection Assessments

BSRA has implemented an adequate building fire protection assessment program that periodically evaluates the status of FPP implementation within SRNL facilities. F-PP-G-00006, section 7.3, and Manual 2Q, Procedure 2.0, *Site Fire Protection Management and Administration*, section 5.3.2, appropriately require BSRA to conduct building fire protection assessments at frequencies cited in DOE-SR letter PAD-20-019 and performed by or under the supervision of a qualified FPE. Additionally, SRNS Manual 12Q, Procedure SA-1, *Self-Assessment*, invokes the use of a standard building checklist for SRNL building fire protection assessments that is appropriately based on DOE-STD-1066-2016, section 7.2. The last three BSRA annual building fire protection assessments for Buildings 773-A, 773-2A, and 773-43A adhered to Manual 12Q, Procedure SA-1, and F-PP-G-00006. Deficiencies and issues resulting from these previous SRNL building fire protection assessments were appropriately entered into the SRS Site Tracking, Analysis, and Reporting (STAR) system.

Baseline Needs Assessment

SRNS performed a comprehensive BNA of the fire protection and emergency services organizations in 2020 that was approved by DOE-SR. F-TRT-G-00010, *Fire Department Emergency Response Baseline Needs Assessment*, was appropriately based on DOE Order 420.1C and DOE-STD-1066-2016. The 2020 BNA specified minimum on-shift fire department and emergency response staffing, apparatus, and equipment requirements; tactics; and site support needs appropriately based on bounding fire emergencies scenarios, including SRNL, in accordance with DOE-STD-1066-2016, section 6.1. The BNA also considered applicable NFPA standards and adequately justified the SRSFD staffing and resource approach to DOE-STD-1066-2016 recommendations and NFPA requirements with identified risks that were approved by DOE-SR. Field walkdowns of the first response fire station (Building 717-11A) for

SRNL confirmed that station staffing, apparatus inventory, and equipment are consistent with the approved 2020 BNA descriptions.

SRNS updated the BNA in June 2023 in accordance with the three-year review and update requirement of DOE Order 420.1C, attachment 2, chapter II, section 3.e.(1)(d). SRSFD leadership explained that the formal transmittal of the updated BNA to DOE-SR for review and approval in accordance with DOE Order 420.1C, attachment 2, chapter II, section 3.e.(1)(c), was in process.

Pre-incident Plans

SRSFD has developed and implemented a generally adequate pre-incident planning program that enhances the effectiveness and safety of emergency response activities. Manual 2Q2-4, *Fire Control Preplan Development Manual*, implements the SRSFD pre-incident planning program and is appropriately based on DOE-STD-1066-2016, section 6.3, and NFPA 1620, *Standard for Pre-Incident Planning*. SRSFD pre-incident plans for SRNL are appropriately subject to input and review by FPEs, facility subject matter experts, emergency responders, and, as appropriate, criticality safety staff for moderator-controlled areas.

Physical access and appropriate apparatus and equipment for manual firefighting were generally consistent with descriptions within the SRNL pre-incident plans and were verified during facility walkdowns. However, contrary to Manual 2Q2-4, the SRSFD Building 773-A pre-incident plans contained missing or incomplete information. (See **Deficiency D-SRNS-1**.) Missing or incomplete information in a pre-incident plan may reduce initial emergency response effectiveness to an event. Specifically, EA identified the following weaknesses:

- The designation of fire-rated barriers (e.g., for stairwell enclosures and wing separation walls) with a legend color scheme is missing from floor plans (Manual 2Q2-4, section 1, paragraph 10).
- Exterior building dimensions for multiple floor plans are missing (Manual 2Q2-4, section 1, attachment 1, paragraph 1.2.5).
- The locations in the A- and D-Wings where automatic ventilation system shutdown is provided by duct smoke detectors are not included (Manual 2Q2-4, section 1, attachment 1, paragraph 1.3.1).
- Inaccurate information associated with active and out-of-service flammable gases and distribution systems is provided (Manual 2Q2-4, section 1, attachment 1, paragraph 1.3.3).
- The location of the primary incident command post is missing from the A-Wing main floor plan (Manual 2Q2-4, section 1, attachment 1, paragraph 1.5.1).
- The coverage area of the Valve House 773-8A dry-pipe fire sprinkler system on C- and D-Wing service-level plans is not distinctly indicated or described (Manual 2Q2-4, section 1, attachment 1, paragraph 1.9.1).
- The distances to fire hydrants and sprinkler control valves are not included in plan narratives and/or on grade-level plans (Manual 2Q2-4, section 1, attachment 1, paragraph 1.9.2).
- A bounding hose lay calculation is not included in Manual 2Q2-4-A.1, section 3, subsection 1.10, to confirm the minimum nozzle discharge pressure (Manual 2Q2-4, section 1, attachment 1, paragraph 1.10.3).
- A minimum fire flow calculation is not included in Manual 2Q2-4-A.1 section 3, subsection 1.10, to confirm minimum water supply requirements (Manual 2Q2-4, section 1, attachment 1, paragraph 1.10.4).

Wildland Fire Management

In general, BSRA has established and implemented adequate wildland fire management actions in accordance with the U.S. Forest Service - Savannah River wildland fire management plan, which was accepted by DOE-SR through a Federal inter-agency agreement. Walkdowns of SRNL buildings confirmed that adequate defensible space and vegetation controls have been implemented for Buildings 773-A and 773-43A and directly adjacent structures. F-TRT-G-00054, *FPE Engineering Evaluation – Technical Position Paper, Wildland/Urban Interface*, appropriately documents a 2021 SRNS sitewide evaluation of wildland fire risk to SRS facilities. F-TRT-G-00054 identified two improvement actions associated with SRNL facilities: (1) Building 773-A ventilation system intake openings should have mesh screens installed, and (2) a larger defensible space needs to be established for the northeastern SRNL trailer complex. However, these improvement actions have not been entered into the SRS STAR system or initiated. (See **OFI-BSRA-1**.)

Fire Protection Program Conclusions

BSRA has established and implemented a comprehensive FPP for SRNL facilities, consisting of the SRS sitewide policy and associated procedures, and generally adequate SRNS and local facility-specific FPP procedures. The sitewide FPP is approved by DOE-SR, and SRNS has assigned an appropriate individual as the fire protection CAHJ. FHA, building fire protection assessment, equivalency, exemption, and engineering evaluation processes are adequately established for SRNL facilities and use sitewide procedures. SRNS has completed a comprehensive BNA and implements a generally adequate pre-incident planning program. However, BSRA is not performing scheduled compliance inspections of hot cell and glovebox fire prevention and combustible material controls and SRS procedures do not contain requirements or instructions for developing FHEs for glovebox operations in SRNL. Further, the SRSFD Building 773-A pre-incident plan contains missing or incomplete information.

3.2 Fire Hazards Analysis Integration into the Documented Safety Analysis

This portion of the assessment evaluated the effectiveness of BSRA's integration of the Building 773-A FHA into associated safety design basis documentation and fire protection controls, as described in the facility safety bases.

BSRA has appropriately integrated F-FHA-A-00010 into the facility DSA to ensure that analyzed fire hazards are sufficiently mitigated through controls for normal, abnormal, and accident conditions. The FHA and DSA appropriately evaluate credited fire sprinkler and glovebox suppression systems and associated fire scenarios. The evaluated fire scenarios and supporting conclusions in the FHA are included in the DSA hazard evaluations and accident analyses sections in accordance with Manual SCD-11, *Consolidated Hazard Analysis Process (CHAP) Program and Methods Manual*, appendix 8.17, *CHA/FHA Interface*.

The Building 773-A credited fire sprinkler and glovebox suppression systems and flammable liquid inventory controls are adequately based on fire hazard identification and supporting accident analyses to ensure the protection of workers, the public, and the environment in accordance with DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, and 10 CFR 830, *Nuclear Safety Management*.

Fire Hazards Analysis Integration into the Documented Safety Analysis Conclusions

BSRA has appropriately integrated the FHA into the facility DSA. The DSA evaluates and analyzes accidents to adequately support the implementation of the safety bases.

3.3 Fire Protection Structures, Systems, and Components Design

This portion of the assessment evaluated design requirements, engineering, and design verification for fire protection SSCs.

Design Requirements

BSRA fire protection design requirements are adequate. Reviewed procedures used to operate, test, and inspect the fire protection SSCs contained design requirements that were aligned with corresponding calculations. BSRA FPEs and cognizant system engineers (CSEs) demonstrated during interviews that they are familiar with the design requirements of these procedures.

Engineering

The BSRA conduct of engineering program establishes an appropriate design change process to implement design changes for fire protection SSCs. Requirements for fire protection design, design control, review, approval, acceptance, and configuration management are adequately defined within F-PP-G-00006, chapter 4; SRS Manual 2Q, Procedure 3.0, *Fire Protection Engineering and Design Criteria Implementation and Activities*; and Manual E7, *Conduct of Engineering*, processes and procedures. Site-specific fire protection design criteria and guidance are appropriately established within Manual WSRC-TM-95-1, *Engineering Standard 01120 SRS Fire Protection Design Criteria*, and Manual WSRC-IM-95-58 Guide 01120-G, *SRS Fire Protection Design Criteria Recommended Practices and Guidance*. In accordance with G-ICA-G-00002, BSRA implements applicable engineering program and design criteria requirements at SRNL.

Three reviewed design change packages (DCPs) (i.e., *A-Area Fire Water Supply System Replacement*, *Lab C135/139 Glovebox Fire Suppression System,* and *B138 Glovebox Fire Suppression System*) appropriately included unreviewed safety question (USQ) determinations, identification of affected documents, engineering instructions detailing the scopes of work, SSC grade levels, materials for installation, and design requirements with NFPA code references. The USQs supporting the three DCPs included adequate descriptions for the proposed activities, justifications, and screening, as required by Manual 11Q, Procedure 1.05, *Nuclear Facility Unreviewed Safety Questions*.

The *A-Area Fire Water Supply System Replacement* project included a vendor-supplied diesel and electric fire pump package, building enclosure (902-1A), fire water storage tank (902-2A), and fire water storage tank level sensor with alarms. All reviewed design inputs, analyses, and calculations supporting the modification were of high quality and consistent with the requirements of Manual E7, Procedure 1.02, *Conduct of Engineering*, and appropriate NFPA codes and standards as documented in DCP-A-16008, *A-Area Fire Water Supply System Replacement.* Acceptance and commissioning tests for the 300,000 -gallon capacity aboveground water general service storage tank and the two fire pumps, including an electric motor-driven and diesel motor-driven fire pumps, appropriately meet the established NFPA performance criteria. Reviewed flow tests and associated calculations demonstrate that the Building 773-A sprinkler systems receive adequate pressure and flow for the most hydraulically demanding systems, as documented in F-CLC-A-00086, *A-Area Fire Protection Water Supply System*.

The safety classification for the *A-Area Fire Water Supply System Replacement* is general support except for the fire water storage tank sensor and alarms. The SS fire water storage tank level alarm system adequately ensures sufficient water level through continuous monitoring and is designed to support the highest demand sprinkler system in Building 773-A and hose stream allowance. A TSR surveillance requirement (SR 4.1.1.10) supported by an uncertainty calculation (J-CLC-A-00029, *Instrumentation Uncertainties Evaluation Water Storage Tank Level A-902002-FP-LOOP-1000*) was appropriately

developed and is performed annually in accordance with TO-07-017, *Functional Check for Surveillance of 902-2A Fire Water Storage Water Tank LO-LO Level Alarm*, to ensure that the required minimum tank level is maintained. Appropriate limiting condition for operation (LCO) response actions have been developed for the low-level alarm upon receipt of an audible notification in the SRNL C-041 control room, as documented in AOP-07-001, *Response to 773-A Fire Sprinkler Systems and Shielded Cells Halon System Impairments*.

The defense-in-depth Vortex glovebox fire suppression systems, which are important to safety, included a vendor-supplied hybrid suppression system, isolation valves, nitrogen cylinders, water tanks, and manual hybrid system release stations, all of which are adequately documented in F-DCP-A-1501, *Lab C135/139 Glovebox Fire Suppression System*. The Vortex systems were installed using references from NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, and NFPA 750, *Standard on Water Mist Fire Protection Systems*, because no recognized standard for the Vortex suppression system existed at the time of installation.

Vital safety systems (VSSs) are appropriately identified, and CSEs perform VSS walkdowns as directed in Manual E7, Procedure 3.04, *SSC Performance Monitoring*. EA interviewed CSEs for the Building 773-A sprinkler systems and gloveboxes who were qualified and knowledgeable of their systems, including the status of current maintenance activities, procurement of replacement parts, and ongoing challenges to system operability and reliability. BSRA establishes appropriate training and qualification requirements for CSEs through LSENG058-PRAS-0001-02, *Design Authority Proficiency Assessment*, as described in Manual 4B, *Training and Qualification Program*, and in accordance with DOE Order 420.1C and DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*.

During interviews, CSEs demonstrated a high level of knowledge of their assigned systems. CSEs adequately document and monitor the condition and performance of fire protection SSCs. Six reviewed system health reports for the credited sprinkler and glovebox suppression systems in Building 773-A appropriately included a detailed status using a stop-light (red, yellow, green) approach, metrics for system reliability, trends of key parameters, summaries of preventive and corrective maintenance, tracking of corrective action commitments, and identification of ongoing performance issues. However, there were no identified actions to address the cycling (e.g., every three minutes) of the fire system jockey pump, and no data had been collected to document previous underground fire water leaks or pipe breaks, including the location, pipe material, condition, and year of installation to ascertain the maintainability, reliability, and aging affects for the existing piping condition. (See **OFI-BSRA-2**.)

While BSRA has a generally adequate engineering program, EA identified the following weaknesses:

- Specific to the installed Vortex glovebox suppression systems and contrary to NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems* and NFPA 750, *Standard on Water Mist Fire Protection Systems*, BSRA did not follow NFPA 750 and 2001 guidance for non-listed systems, obtain AHJ approval for use of such systems, or conduct a reconciliation and compliance evaluation with NFPA 770, *Standard on Hybrid (Water and Inert Gas) Fire Extinguishing Systems*. (See **Deficiency D-BSRA-3**.) A non-listed fire suppression system lacks the necessary acceptance testing and design and installation standards for reliable performance and extinguishment of Class A, B, C, and D fires. The available but incomplete acceptance of the Vortex glovebox fire suppression systems for laboratory C135/C139 is documented in F-TRT-A-00030, *Suitability of the Vortex 1500 Suppression System for SRNL Glovebox Protection*.
- Contrary to Manual 11Q, Procedure 1.05, BSRA did not perform a USQ screening for the 50-year sprinkler head replacement project due to improperly classifying the work as a like-for-like replacement. (See **Deficiency D-BSRA-4**.) The replaced sprinkler heads had varying attributes

affecting temperature sensitivity and activation response time. The omission of a USQ screening for a design change could adversely impact the safety bases and facility operations.

Design Verification

BSRA engineering personnel adequately verified the fire protection design of the three reviewed DCPs (i.e., *A-Area Fire Water Supply System Replacement*, *SRNL LAB C135/139 and B138 Glovebox Fire Suppression Systems*). As required by Manual E7, Procedure 2.60, *Design Verification by Document Review*, the DCPs appropriately document the adequacy of the fire protection designs and their verification by individuals and groups other than those who performed the work.

U-CMIP-A-00001, *Configuration Management Implementation Plan SRNL Technical Area Facilities (U)*, appropriately establishes the configuration management program for SRNL fire protection SSCs. The new fire system equipment and component labeling were consistent with design drawings and implemented as required by Manual E7, Procedure 1.32, *Labeling and Configuration Controlled SSCs*. EA observed excellent use of tagging and labeling of fire walls, fire panels, fire sprinkler system risers, and other fire protection components. While a critical parts list had been appropriately documented for the SS fire water storage tank level alarm system, EA identified one weakness. Contrary to Manual 1.01, Procedure 5.39, *Configuration Management*, SRNS has not established a spare parts inventory for the fire water storage tank level alarm system. (See **Deficiency D-SRNS-2**.) The lack of available spare parts for credited fire protection SSCs could impact facility operations and require LCO actions for extended durations.

Fire Protection Structures, Systems, and Components Design Conclusions

BSRA fire protection design requirements are adequate. Test data and supporting calculations demonstrate that the fire water supply system is adequate to meet system demands. Further, BSRA has established and implemented an adequate change control and comprehensive engineering process, along with design verification. However, EA observed weaknesses associated with AHJ approval for using of non-listed systems, USQ screening for the 50-year sprinkler head replacement activity, and the establishment of a spare parts inventory for credited SSCs.

3.4 Surveillances, Inspection, Testing, and Maintenance

This portion of the assessment evaluated BSRA's TSR surveillances, ITM of fire protection systems and equipment, and the impairment control program.

TSR Surveillances

BSRA adequately completes TSR surveillances to demonstrate that DSA-credited fire sprinkler systems in Building 773-A provide appropriate fire protection for other SS SSCs, critical process equipment, and high-value property and can prevent a major fire from impacting the remainder of the facility. The SRNS Fire System Test and Maintenance (FST&M) organization ITM procedures for the fire sprinkler systems contain detailed steps for performing and documenting TSR surveillance requirements to verify system operability. Reviewed ITM procedures and interviews confirmed that ITM is performed by trained personnel and supported by qualified design authority engineers to satisfy NFPA requirements. Monthly visual inspections are adequately completed by SRNL operations using TO-07-020, *Sprinkler Inspection of SRNL Facilities*. EA observed a partial performance of the TA-07-020 inspection procedure and annual testing of sprinkler systems in adjacent Buildings 735-A and 748-A, which demonstrated ITM personnel competency and performance adequacy. Acceptance criteria are well defined and serve as baseline requirements.

Annual TSR surveillances of the A-Area fire water storage tank level alarm system are adequately completed through the implementation of ST-SRNL-0425, *Perform a Calibration on the Fire Water Storage Tank (902-2A) Level Alarm*, and ST-SRNL-0426, *Perform a Functional Test on the Fire Water Storage Tank (902-2A) Level Alarm*, and referenced verification procedures. Manual 2Q7, Procedure A-902-2A-FP-TK-TEST, *902-2A Fire Water Tank Level Instrumentation Functional Test*, provides comprehensive instructions for the annual functional test, settings, and calibration of the level switch, along with verification of the alarm responses and reporting (locally and to the SRNL control room). The TSRs are appropriately verified using TO-07-015, *Bldg. 773-A Fire Water Supply System 902-2A Fire Water Storage Tank Level Indicating Transmitter Annual Calibration*, and TA-07-017, *Functional Check for Surveillance of 902-2A Fire Water Storage Tank Lo-Lo Level Alarm*, and approved by a qualified design authority engineer. Reviewed records for the last three years demonstrated adequate procedure and equipment performance.

Fire Protection System and Equipment Inspection, Testing, and Maintenance

Routine/Recurring Inspection, Testing, and Maintenance

In general, SRNS adequately operates and completes ITM of the fire protection water supply in accordance with Manual 2Q and G-ICA-G-00002 as a general service utility system. This water supply system, consisting of tank 902-2A, two fire pumps, an underground distribution system, and fire hydrants in SRS A-Area, is adequately subject to routine ITM in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. The A-Area water storage tank, electric fire pump, and diesel fire pump are subject to daily, weekly, monthly, and annual inspection and testing in accordance with formal procedures by qualified operators. EA observed that weekly inspection and operation of the electric and diesel fire pumps were adequately completed, and discrepant conditions with a heat trace system and leaking air vent were appropriately investigated and addressed through the issuance of condition tags to initiate corrective action. The reviewed 2022 annual fire pump test records confirmed generally adequate performance in accordance with NFPA 25. However, EA observed that the measuring and test equipment (M&TE) device Q15888 SRNS used to calibrate the fire pump suction and discharge pressure gauges in June 2022 under Work Order 01920319, *Perform Annual Calibration PM's on Pumps and Tanks 902-1A*, for the June 2022 annual pump tests had a calibration expiration date of March 31, 2022. The SRNS design authority engineer explained that the calibration expiration date was in error (reportedly, it should have been March 31, 2023), and an approach to remedy the documentation error was under review. Also, the installed pump suction and discharge pressure gauges lacked calibration labeling specified by NFPA 25, section 8.3.3.2.1.1.

The A-Area fire protection underground distribution system and SRNL TA fire hydrants are adequately subject to routine flow testing by SRNS per NFPA 25. Reviewed fire hydrant flow test results from 2020 (within the last five years) demonstrated that the available water supply will satisfy the calculated demands for the fire sprinkler system in Building 773-A. Reviewed inspection records for the distribution system post-indicator valves for April, May, and June 2023 demonstrated adequate routine inspection and operation by the SRNS utilities organization per NFPA 25. A walkdown of one (east leg) of the three (e.g., east, center, west) fire water distribution segments to the SRNL TA with an SRNS water utilities operator confirmed accurate physical locations, component labeling indicator valve number designations, and operational status of control valves per the design drawing F-PA-A-0001, *Outside Fire Protection A&M Areas*. The water utilities operator demonstrated adequate knowledge and understanding of the system, components, and respective configuration requirements.

BSRA performs adequate routine ITM for the wet-, dry-, and anti-freeze fire sprinkler systems in Buildings 773-A and 773-2A, in accordance with NFPA 25 requirements and TSRs. Observation of the

partial performance and review of the June 2023 record for TO-07-020 demonstrate that the monthly inspections of these systems were adequately performed by SRNL operations. Twenty reviewed ITM records for the six wet-pipe, two dry-pipe, and one anti-freeze fire sprinkler systems demonstrate that the SRNS FST&M organization adequately performs the balance of ITM services (semiannual, annual, etc.) for these systems. In addition, the reviewed 2021 full-flow trip test (triennial frequency) records for the two dry-pipe systems confirm water delivery times in accordance with NFPA 25 performance recommendations. A reviewed ITM record demonstrated the replacement of the anti-freeze solution in December 2022 as an appropriate alternative to annual inspection or sample testing.

The Building 773-A Vortex special fire extinguishing system protecting a glovebox in Room C135/C139 is subject to routine ITM in accordance with defined requirements and manufacturer's recommendations. A June 2023 record for TO-07-020 demonstrates that SRNL operations adequately completes monthly visual inspections of the Vortex systems. Five reviewed ITM records for the Room C135/C139 Vortex system demonstrates that the SRNS FST&M organization adequately performs semiannual and annual ITM services for these systems.

The fire detection and alarm system that covers Buildings 773-A and 773-43A is appropriately subject to routine ITM in accordance with NFPA 72, *National Fire Alarm and Signaling Code*, and site-established requirements. The last annual ITM record (March 2023) documented acceptable performance of the system except for backup battery load testing due to voltage readings that were below the minimum acceptance value. During this assessment, an impairment was initiated pending the installation of the replacement batteries.

SRNL portable fire extinguishers are appropriately subject to routine ITM in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, using Manual 2Q, Procedure 5.7, *Portable Fire Extinguisher Inspection*, and facility-specific instructions. Inspection records for AD-00-042, *SRNL Fire Prevention and Life-Safety Walkdown*, for March, April, and May 2023 demonstrated that SRNL operations (BSRA) adequately performed monthly visual inspections of portable fire extinguishers. A July 2023 SRSFD report documents that the annual inspections for 210 dry-chemical portable fire extinguishers in Building 773-A are current.

SRNL devices for facility emergency and exit lighting undergo adequate routine ITM in accordance with NFPA 101, *Life Safety Code®*, using Manual 2Q, Procedures 5.8, *Battery-Operated Emergency Lighting Inspection and Test*, and 5.9, *Exit Sign Inspection and Test*, and facility-specific instructions. Reviewed records for April and May 2023 demonstrated adequate monthly procedure performance, along with work orders for identified issues. The inspection and testing of these devices for June 2022, as documented in TO-14-025, *Annual Emergency Lights and Exit Sign Tests, Buildings 773-A, 773-43A, 792-A and 773-2A*, demonstrated adequate procedure performance and qualitative acceptance of lighting levels.

Designated fire barriers and associated opening protectives (i.e., fire doors and through-penetration firestop systems) in Buildings 773-A and 773-43A are subject to adequate routine ITM in accordance with applicable NFPA and DSA requirements. This ITM includes a required monthly functional check of swinging fire doors as part of AD-00-042 and annual or triennial inspection of fire barriers and annual testing of swinging fire doors in accordance with TO-07-002, *Annual Fire Barrier/Fire Door Inspection*, by SRNL operations (BSRA), along with annual inspection and testing of sliding fire doors by the SRSFD. The last two monthly and last annual SRNL inspection and test records reviewed demonstrated adequate procedure performance. The last SRSFD annual inspection record (March 2023) for the seven sliding fire doors in Building 773-A using Manual 2Q2-1.1, Procedure 116.4, *Inspecting and Testing Fire Doors in Savannah River National Laboratory (SRNL)*, documented acceptable performance for six of the seven fire doors. However, contrary to Manual 2Q2-1.1, Procedure 116.4, sections 2.2.4, 3.2.1, and 5.4.1, SRNS did not enter the test failure of fire door FPDR-001 into the SRS STAR system. (See **Deficiency D-**

SRNS-3). In addition, contrary to Manual 2Q, Procedure 5.6, sections 4.3, 5.1, and 5.6, and attachment 8.5, BSRA did not list the door as impaired or implement compensatory measures. (See **Deficiency D-BSRA-5**.) An impaired fire door may preclude effective control of a fire to the area of origin, resulting in a larger than anticipated fire loss. When EA communicated this weakness, BSRA made an impairment entry, implemented compensatory actions, and completed scheduled corrective maintenance pending the completion of a post-maintenance test (PMT). The PMT performed by SRSFD on July 14, 2023, documented continuing inoperability, issuance of a new impairment and work request for corrective maintenance, and continuation of compensatory actions.

The functionality of the lightning protection system (LPS) for Building 773-A is indeterminate. F-FHA-A-00010, section 3.7, states that an LPS is required for Building 773-A and that an adequate system is assumed to be installed based on original building design documents and building operational history. F-TRT-G-00055, *FPE Engineering Evaluation – Technical Position Paper, Lightning Risk Assessment and Guidance for SRS*, section 6.0, states that installed LPSs at SRS shall be maintained in accordance with NFPA 780, *Standard for the Installation of Lightning Protection Systems*. However, BSRA is not performing routine ITM of the Building 773-A LPS as recommended by NFPA 780 Annex D to verify system functionality. (See **OFI-BSRA-3**.) Not performing ITM on the LPS increases the likelihood of a facility fire and equipment damage due to a lightning strike event.

50-year Sprinkler Head Replacement Maintenance Project

In 2016, BSRA appropriately began replacing Building 773-A sprinkler heads (those approaching 50 years in-service) in accordance with NFPA 25, section 5.3.1. These maintenance activities are performed on a wing-by-wing basis appropriately using work orders, installation instructions, and PMT requirements generally in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 25. Replacement sprinkler heads, as SS components, were appropriately subject to commercial grade dedication evaluation documented in F-CGD-A-00003, *773-A Safety Significant Fire Sprinkler Heads*, and reviewed and released for installation in accordance with the work instructions. However, contrary to NFPA 13 (2016), section 6.2.9.6, NFPA 25 (2017), section 5.4.1.5.5, and manufacturer's requirements (Tyco data sheet TFP151), SRNS Construction sprinkler fitters installed sprinkler heads in the B-Wing main floor using an inappropriate tool. (See **Deficiency D-BSRA-6**.) Not using the proper installation tool may produce higher torques that could distort the sprinkler inlet or damage the fusible element, resulting in sprinkler head leakage or impairment. Sprinkler fitters were observed installing sprinkler heads in the B-Wing main floor using an adjustable (crescent) wrench instead of the manufacturer's sprinkler head wrench.

Fire Protection Impairment Control Program

BSRA has implemented a generally adequate impairment control program for SRNL fire protection SSCs using Manual 2Q, Procedure 5.6, *Fire Protection Impairment Control Procedure*, and AOP-07-001, *Response to 773-A Fire Sprinkler System and Shielded Cell Halon Systems Impairments*, for impairments specific to safety-related fire suppression systems. The SRNL impairment control program is appropriately based on DOE Order 420.1C, DOE-STD-1066-2016, and applicable NFPA codes and standards, and is responsive to TSR LCO 3/4.1.1 and AC 5.7.2.3. The SRNL impairment control program adequately describes coordination, communication, and approval requirements for planned and emergency outages and impairments, including the determination of appropriate compensatory actions (e.g., SRNS-IM-2015-00050, *Pre-Approved Compensatory Actions Guide*).

Walkdowns and document reviews demonstrate adequate implementation of the SRNS impairment control program. The reviewed *Impairment Summary Report* (no document number) from June 2023 contained four open impairments associated with Building 773-A fire protection features, along with a description of appropriate compensatory actions. During a walkdown of the active fire protection

impairment (fire protection database system #2023-447) for the Building 773-A B-Wing sprinkler head replacement project, EA observed adequate implementation of AOP-07-001, including assigned compensatory actions. However, EA also observed two instances where Building 773-A stairwell fire doors were improperly propped open without FPC approval or pre-entry of the condition as an impairment in accordance with Manual 2Q, Procedure 5.6. BSRA appropriately corrected these issues upon discovery.

Surveillances, Inspection, Testing, and Maintenance Conclusions

BSRA has implemented an adequate surveillance program for the safety-related Building 773-A fire sprinkler systems and the A-Area fire water storage tank level alarm system, and also a generally adequate ITM program for SRNL fire protection and life safety SSCs. SRNS has implemented a generally adequate ITM program for the A-Area fire protection water supply supporting the SRNL TA. However, EA identified weaknesses in the areas of SRNS fire pump gauge calibration documentation and BSRA required actions in response to a Building 773-A sliding fire door test failure, ITM program for the Building 773-A LPS, and replacement sprinkler head installation.

3.5 Contractor Self-assessment Program

This portion of the assessment evaluated the effectiveness of the contractor fire protection self-assessment program performed by SRNS.

SRNS has developed an adequate fire protection self-assessment program consistent with the requirements of DOE Order 420.1C and Manual 2Q, Procedure 2.0, section 5.3.1. The reviewed self-assessments covering calendar years 2020 through 2022 demonstrate that SRNS is fulfilling the requirement to assess all FPP elements within a three-year period, per DOE Order 420.1C. Identified deficiencies were properly entered in the SRS STAR system for evaluation, tracking, and closure, as required by Manual 2Q, Procedure 2.0, section 5.4.

Contractor Self-assessment Program Conclusions

SRNS has developed an adequate fire protection self-assessment program and is fulfilling the requirement to assess all FPP elements within a three-year period.

3.6 Federal Oversight

This portion of the assessment evaluated the effectiveness of DOE-SR's oversight of BSRA and SRNS FPP activities at SRNL and the management of issues identified by DOE-SR.

Technical Staff Performing Oversight

DOE-SR FPEs, Facility Representatives (FRs), and safety system oversight engineers coordinate and perform effective oversight of the SRNL FPP through recurring operational awareness activities, routine engagement with BSRA and SRNS, and formal assessments. During interviews, DOE-SR FPEs and FRs demonstrated comprehensive knowledge of fire protection SSCs, associated ITM activities, and ongoing FPP issues at SRNL. The DOE-SR Performance Assurance Division (PAD) employs one supervisory FPE and two staff FPEs. Both staff FPEs were hired during 2023, ending a period of low FPE staffing. The supervisory FPE and one staff FPE are qualified as FPEs in accordance with DOE Order 426.1B, *Department of Energy Federal Technical Capabilities*, while one staff FPE is in qualification. During interviews and discussions, all three FPEs demonstrated strong fire protection experience and training.

The DOE-SR Savannah River Laboratory Office employs two qualified FRs and one qualified safety system oversight engineer. The DOE-SR Savannah River Laboratory Office qualification card includes competencies relating to both the SRNL FPP and specific components of the facility's fire detection and suppression systems. During interviews, the SRNL FRs demonstrated a thorough knowledge of SRNL fire suppression systems and recent fire protection issues at the facility.

Oversight and Assessments

Site requirements manual (SRM) 226.1, *Integrated Performance Assurance Manual*, provides DOE-SR personnel with adequate guidance to plan and conduct FPP oversight activities, meeting the requirements of DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*. SRM 420.1.1B, *Fire Protection Program Manual*, requires triennial DOE assessments of specific contractor FPP elements, as well as triennial self-assessments of PAD's FPP oversight. PAD accomplishes the triennial assessment requirement for site contractors via multiple assessments over a three-year period. To inform the annual oversight planning process and document progress, PAD tracks the last assessment of each FPP element, for each SRS contractor, using an Excel spreadsheet. Regarding the DOE-SR FPP self-assessment, PAD acknowledged that the last triennial self-assessment was performed in 2012 and is past due. (See **OFI-DOE-SR-1**.)

PAD's most recent assessment of the BSRA FPP, *DOE-SR FY22 Fire Protection Assessment of Battelle Savannah River Alliance*, was conducted by knowledgeable FPP subject matter experts; appropriately incorporated DOE Order 420.1C, attachment 2, chapter II requirements into review criteria; included relevant interviews and document reviews; and clearly listed assessment results. PAD is currently completing its fiscal year 2023 FPP assessment of Savannah River Mission Completion.

The reviewed monthly FR daily facility tour/facility status observation reports (OP-02 reports) from July 2022 to May 2023 documented a strong field presence (i.e., multiple walkdowns per week), while reviewed FR surveillance activity observations (OP-05 assessments) detailed FR-level oversight of fire suppression system TSR surveillances. A reviewed January 2020 OP-02 report documented FR-discovered transient combustible hazards. More recent OP-02 reports detailed FR coverage of a variety of FPP-related issues, such as a ruptured sprinkler head (December 2022), loss of water tank level indication and a potential inadequacy of the safety analysis relating to fire safety system hydraulic calculations (January 2023), and a leaking sprinkler header pipe (May 2023).

Federal Issues Management

DOE-SR has performed effective FPP oversight, independently identifying issues during formal assessments and routinely engaging with BSRA and SRNS to monitor FPP trends. DOE-SR enters issues identified during oversight into the SRS STAR system, which is used by multiple contractors at SRS. Issues that DOE-SR identified during formal fire protection assessments from February 2022 to June 2023 were reviewed by EA in the SRS STAR system, along with closure statements and a DOE-SR closure review, and the records were determined to be adequate.

DOE-SR FPEs attend several regular meetings with various SRNS and BSRA FPP counterparts to discuss current issues. These meetings include a weekly meeting with the SRNS Fire Protection Manager, a monthly fire protection interface meeting with SRNS FPP staff, and a quarterly fire protection interface meeting with representatives from SRNS, BSRA, and other organizations. During the observed July 12, 2023, monthly interface meeting, DOE-SR PAD FPEs engaged with their SRNS counterparts to evaluate the progress on the fire protection project and program support and recent fire protection issues.

Reviewed quarterly meeting notes from April 2023 appropriately documented status updates on key FPP trends and issues.

Federal Oversight Conclusions

Overall, DOE-SR performs Federal oversight of BSRA and SRNS FPP activities in accordance with DOE Order 226.1B. DOE-SR appropriately communicates its fire protection oversight findings and monitors associated corrective action development, execution, and closure through close coordination with BSRA and SRNS.

4.0 BEST PRACTICES

No best practices were identified during the assessment.

5.0 FINDINGS

No findings were identified during this assessment.

6.0 DEFICIENCIES

Deficiencies are inadequacies in the implementation of an applicable requirement or standard. Deficiencies that did not meet the criteria for findings are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

Battelle Savannah River Alliance, LLC

Deficiency D-BSRA-1: The BSRA FPC is not performing scheduled compliance inspections of SRNL hot cell and glovebox fire prevention and combustible material controls. The frequency of these inspections is not defined within the procedure. (BSRA Manual L1, Procedure 3.16, sec. 4.5)

Deficiency D-BSRA-2: SRS fire protection program procedures do not contain requirements or instructions for developing FHEs for glovebox operations in SRNL Building 773-A. (DOE--STD-1066-2016, sec. 4.4.2.3, and AGS-G010, sec. 6.2)

Deficiency D-BSRA-3: BSRA did not follow applicable NFPA standards for using non-listed systems, obtain approval from the AHJ, or conduct an NFPA reconciliation and compliance evaluation for the installed Vortex glovebox suppression systems. (NFPA 2001-2012, sec. 4.2.5.1, NFPA 750-2015, sec. 6.1.1 and NFPA 770, chapter 14)

Deficiency D-BSRA-4: BSRA did not perform a USQ screening for the 50-year sprinkler head replacement activity due to improperly classifying the work as a like-for-like replacement. (Manual 11Q, Procedure 1.05)

Deficiency D-BSRA-5: BSRA did not list failed fire door FPDR-001 as impaired or implement compensatory measures. (Manual 2Q, Procedure 5.6, sections 4.3, 5.1, and 5.6, and attachment 8.5)

Deficiency D-BSRA-6: SRNS Construction sprinkler fitters installed sprinkler heads in the B-Wing main floor using an inappropriate tool. (NFPA 13 (2016), sec. 6.2.9.6; NFPA 25 (2017); sec. 5.4.1.5.5; and Tyco data sheet TFP151)

Savannah River Nuclear Solutions, LLC

Deficiency D-SRNS-1: The SRSFD Building 773-A pre-incident plan contains missing or incomplete information. (Manual 2Q2-4, sec. 1 and att. 1)

Deficiency D-SRNS-2: SRNS has not established a spare parts inventory for the fire water storage tank level alarm system. (Manual 1.0, Procedure 5.39)

Deficiency D-SRNS-3: SRNS did not enter the test failure of fire door FPDR-001 into the SRS STAR system. (Manual 2Q2-1.1, Procedure 116.4, sec. 2.2.4, 3.2.1, and 5.4.1)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the OFIs shown below to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in assessment reports, they may also address other conditions observed during the assessment process. These OFIs are offered only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

Battelle Savannah River Alliance, LLC

OFI-BSRA-1: Consider evaluating and developing improvement actions in response to wildland fire exposure recommendations for the SRNL facilities listed in F-TRT-G-00054, including entry of the recommendations into the SRS STAR system and incorporation into the SRNL FHA.

OFI-BSRA-2: Consider developing a system health report for the fire protection infrastructure, including water storage tanks, fire water pumps, and underground piping distribution supplying the credited fire suppression systems at Building 773-A.

OFI-BSRA-3: Consider implementing an ITM program for the Building 773-A LPS based on NFPA 780 Annex D recommendations responsive to the F-TRT-G-00055 Section 6.0 position that installed LPSs at the SRS will be maintained.

DOE Savannah River Operations Office

OFI-DOE-SR-1: Consider ensuring that the PAD schedules an FPP self-assessment because the last self-assessment was completed in 2012.

Appendix A
Supplemental Information

Dates of Assessment

Remote Assessment: June 26 – July 7, 2023
Onsite Assessment: July 10-13, 2023

Office of Enterprise Assessments (EA) Management

John E. Dupuy, Director, Office of Enterprise Assessments
William F. West, Deputy Director, Office of Enterprise Assessments
Kevin G. Kilp, Director, Office of Environment, Safety and Health Assessments
David A. Young, Deputy Director, Office of Environment, Safety and Health Assessments
Thomas E. Sowinski, Director, Office of Nuclear Safety and Environmental Assessments
Kimberly G. Nelson, Director, Office of Worker Safety and Health Assessments
Jack E. Winston, Director, Office of Emergency Management Assessments
Brent L. Jones, Director, Office of Nuclear Engineering and Safety Basis Assessments

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