Independent Assessment of Safety System Management at the Savannah River Site K-Area Complex

October 2025

U.S. DEPARTMENT of ENERGY | Office of Enterprise Assessments

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Acronyms

ACVS	Active Confinement Ventilation System
CFR	Code of Federal Regulations
CGD	Commercial Grade Dedication
CRAD	Criteria and Review Approach Document
CSE	Cognizant System Engineer
DOE	U.S. Department of Energy
DOE-SR	DOE Savannah River Operations Office
DP	Differential Pressure
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
FY	Fiscal Year
HEPA	High Efficiency Particulate Air
KAC	K-Area Complex
KIS	K-Interim Surveillance
LCO	Limiting Condition for Operation
NMMP	Nuclear Maintenance Management Program
NNSA	National Nuclear Security Administration
NQA	Nuclear Quality Assurance
OFI	Opportunity for Improvement
QA	Quality Assurance
SRFO	Savannah River Field Office
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SS	Safety Significant
SSCs	Structures, Systems, and Components
SSM	Safety System Management
SSO	Safety System Oversight
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
VSS	Vital Safety System

INDEPENDENT ASSESSMENT OF SAFETY SYSTEM MANAGEMENT AT THE SAVANNAH RIVER SITE K-AREA COMPLEX

Executive Summary

The U.S. Department of Energy Office of Enterprise Assessments (EA) conducted an independent assessment of safety system management (SSM) at the Savannah River Site K-Area Complex (KAC) in April and May 2025. The KAC is managed by the site management and operating contractor, Savannah River Nuclear Solutions, LLC (SRNS), which is overseen by the National Nuclear Security Administration Savannah River Field Office (SRFO). The assessment evaluated SRNS's management of the KAC active confinement ventilation system (ACVS) across eight program areas: safety basis, technical safety requirement surveillances, the engineering design process, cognizant system engineering, operations, quality assurance, maintenance, and feedback and improvement processes. This assessment also evaluated the effectiveness of applicable SRFO oversight processes.

EA identified the following strengths:

- The KAC ACVS cognizant system engineer demonstrated exceptional knowledge of safety basis requirements and proactive system ownership.
- Conduct of operations practices are consistently implemented, with effective training programs and strong facility awareness among operations personnel.
- Commercial grade dedications appropriately identify critical characteristics, inspections are conducted by qualified personnel, and components are properly stored.
- The maintenance backlog is effectively managed, and work control processes ensure that activities are properly performed and that system configuration is restored upon completion.
- SRNS has a mature issues management system, with effective management review board execution and thorough self-assessments.

EA also identified the following weakness:

- Vendor files and safety-related setpoints have not been migrated to the installed process instrumentation database. They are distributed across multiple repositories rather than maintained in the controlled technical baseline list.

In summary, SRNS has implemented effective SSM programs in all assessed program areas. However, one weakness was identified in the engineering design process. Vendor files and legacy safety-related setpoints have not been migrated to a controlled technical baseline list.

INDEPENDENT ASSESSMENT OF SAFETY SYSTEM MANAGEMENT AT THE SAVANNAH RIVER SITE K-AREA COMPLEX

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 effectiveness of safety system management (SSM) at the Savannah River Site (SRS) K-Area Complex (KAC). The KAC is managed by the site management and operating contractor, Savannah River Nuclear Solutions, LLC (SRNS), which is overseen by the National Nuclear Security Administration (NNSA) Savannah River Field Office (SRFO). The assessment also evaluated the effectiveness of SRFO oversight of SRNS's activities with respect to SSM. SRFO receives technical support from the DOE Savannah River Operations Office (DOE-SR) for oversight of KAC safety systems. The assessment was conducted in April and May 2025.

In accordance with the *Plan for the Independent Assessment of Safety System Management at SRS K-Area Complex, April 2025*, the primary purpose of the assessment was to evaluate whether selected safety system controls within the KAC active confinement ventilation system (ACVS) were appropriately developed into technical safety requirements (TSRs), and whether the structures, systems, and components (SSCs) required for the controls are operated and maintained in a manner that ensures the SSCs can reliably perform their intended safety functions of protecting workers and the public from analyzed hazards. Programs within the scope of the assessment that support safety system operability and reliability include safety basis, TSR surveillance, engineering design process, cognizant system engineer (CSE) program, operations, quality assurance (QA), nuclear maintenance, feedback and improvement, and Federal oversight.

The KAC provides interim storage of the nation's excess plutonium and other special nuclear materials and conducts plutonium downblending operations. The ACVS serves as a safety significant (SS) system providing confinement through negative differential pressure (DP) and high efficiency particulate air (HEPA) filtration.

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, the criteria used to guide this assessment were based on objectives of EA CRAD 30-11, Revision 1, *Safety Systems Management Review*, relating to engineering design processes, cognizant system engineering, TSRs, operations, QA, maintenance, feedback and improvement processes. In addition, elements of EA CRAD 30-11 were used to collect and analyze data on SRFO oversight activities. For this assessment, EA selected the ACVS, an SS system located at the SRS KAC.

EA used a written comment and response process to address significant issues identified before the onsite portion of the review. Follow-on discussions were conducted with DOE-SR and SRNS KAC personnel to clarify and resolve comments. Additional issues were identified during the onsite portion of the assessment.

EA examined the development of the selected controls as TSRs based on the hazard and accident analyses, and the flowdown of safety basis requirements into technical baseline documents. Key documents were reviewed, including the documented safety analysis (DSA), the TSR document, TSR surveillance records, selected program plans, system design documents, procedures, and training and qualification records. EA interviewed personnel responsible for developing and executing the assessed programs, observed activities related to operations and surveillance, participated in detailed discussions of procedures and process implementation, and performed walkdowns of accessible areas of the selected systems and material storage areas. EA also conducted interviews and reviewed oversight records to determine whether the Federal oversight program ensures adequate operability of associated safety systems. The members of the assessment team, the Quality Review Board, and the management responsible for the assessment are listed in appendix A.

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

3.0 RESULTS

3.1 Safety Basis

This portion of the assessment evaluated the safety basis, including control derivation and description, safety control classification, TSR development, and DSA interlocks for the ACVS to determine whether the safety basis can fulfill their required safety functions for normal operations and accident conditions, and to verify compliance with DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*.

Control Derivation and Description

In the active configuration, the exhaust fan adequately removes more air than supplied, which maintains the K-Interim Surveillance (KIS) Vault at a negative DP to the surrounding areas in accordance with the safety basis. All exhaust air from the KIS Vault, including the glovebox exhaust air, flows through the main exhaust HEPA filter prior to discharge from the exhaust stack. If not running, a redundant exhaust fan is aligned to automatically start upon detection of a low DP in the main exhaust header. The low DP in the main exhaust header will also initiate an alarm in the KIS Vault indicating a ventilation upset. In the passive configuration, the supply and exhaust fire dampers along with the KIS Vault fire door and the KIS Vault structure isolate the KIS Vault from surrounding areas.

Safety basis document WSRC-SA-2002-00005, Revision 16, *K-Area Complex Documented Safety Analysis*, chapter 4, appropriately provides detailed descriptions of the ACVS, including the safety function, system description, functional requirements, and performance criteria. The system descriptions adequately include discussions of the SS system components (e.g., ductwork, relays, switches, gauges) and operability requirements and explain how the subsystem components relate to the system functional requirements. The DSA effectively describes the performance criteria necessary for these systems to meet their functional requirements. Compliance with safety requirements is demonstrated by identifying the key design attributes that satisfy the specific requirement along with the appropriate verification documents.

SRNS-E0000-2025-0020, dated April 21 2025, *Transmittal of K-Area Complex (KAC) Annual Review of the Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR), Unreviewed Safety Question (USQ) Summary, Annual Review of Safety Basis Document List (SBDL), and Annual Authorization Agreement (AA) Review*, and N-AA-K-00001, Revision 22, *Authorization Agreement for the K Area Complex*, satisfactorily document the periodic Federal review of the safety basis.

Safety Control Classification

The ACVS is appropriately classified as SS in the accident analysis based on its role in protecting facility workers and co-located personnel. The system description in the DSA, chapter 4, clearly identifies the safety function of the ACVS as maintaining confinement during both normal operations and accident conditions. The active configuration adequately provides requirements to include the following:

- Provide confinement of radioactive material to the degree assumed in the hazard and accident analysis
- Maintain a DP of at least 1.68 inches of water (DSA value) in the exhaust header
- Start the standby fan and provide a low DP alarm if the DP is below 1.68 inches of water (DSA value) in the exhaust header
- Provide a fire screen upstream of the main HEPA filter in each bank.

The SS components are appropriately described on a site level in N-FCD-K-00001, *Uniform Listing of K Area Complex Systems, Acronyms, and Functional Classifications*.

Technical Safety Requirement Development

The information provided in chapter 5 of the DSA and the TSR bases is sufficient to derive appropriate limiting conditions for operation (LCOs) for the ACVS. The performance criteria developed for negative DP maintenance, system configuration, and HEPA filter efficiency are adequately reflected in TSR surveillance requirements and appropriately ensure that the system can perform its credited safety functions.

KIS DSA Interlocks

The DSA has six interlocks, only one of which is SS (i.e., the KIS interlocks). The KIS interlocks provide adequate protection and have the appropriate functional classification. The KIS interlocks include the following:

- Shutting down the KIS Vault supply fan upon detection of a low total exhaust flow
- Shutting down the supply fan due to a glovebox low vacuum condition
- Starting the standby exhaust fan when a low total exhaust flow condition exists
- Starting the standby exhaust fan when a low vacuum condition is detected at the inlet to the main exhaust HEPA filters
- Preventing the auto-start circuit from starting the standby exhaust fan if normal power is lost to Automatic Transfer Switch-1 to prevent a potential overload of the diesel generator
- Shutting down the supply and exhaust fans, initiated by a signal (fire indication) from the KIS Vault fire detection system.

Safety Basis Conclusions

The safety basis for the ACVS is appropriately established and implemented. The systems are adequately described and appropriately evaluated in the DSA and supporting documents to ensure that the systems will perform their required safety functions.

3.2 Technical Safety Requirement Surveillance

This portion of the assessment evaluated the TSR surveillance processes for the ACVS as described in the TSR document (WSRC-TS-96-20, Revision 48, *K-Area Complex Technical Safety Requirements*).

TSR Surveillance Procedures

TSR surveillance procedures for the ACVS adequately specify required test conditions, acceptance criteria, and measurement methods necessary to verify system operability. Five reviewed TSR surveillance procedures addressing all the applicable TSR surveillances validated that all ACVS TSR surveillances met the criteria of the DSA.

SRNS schedules, tracks, and documents ACVS surveillances to ensure compliance with the TSR-required frequencies, including consideration of grace periods allowed by the TSR. A review of records from August 2021 through February 2025 showed that all required monthly surveillances were completed within the required timeframes. When surveillance extensions were needed, they were properly documented and approved in accordance with the requirements in the TSR administrative control section (section 5.5).

Reviewed TSR surveillance procedures and their implementation were adequate. A review of the results of 19 completed TSR surveillances conducted since August 2021 showed that the TSR surveillance requirements were adequately performed per the procedures and that the system was operable. Three reviewed TSR-related calculations (J-CLC-K-00106, *Instrumentation HEPA Filter Bank to Assembly DP Switch/Gauge Loop*; M-CLC-K-00691, *KIS Ventilation Setpoint Calculation*; U-CLC-K-00015, *K Area Complex Inputs and Assumptions*) demonstrated that the criteria established in the DSA were adequately met.

Walkdowns and TSR Evolutions

A walkdown of the ACVS demonstrated adequate equipment condition, labeling, and the CSE's knowledge of the safety aspects of the ventilation system; key SS components were observed to be operable and in the appropriate configuration. Adequate monitoring of the ACVS was observed during a walkdown of the control room, and alarms and annunciators were verified to be operable. The observed performance of TSR surveillance ST-KAC-0257, *Verify Status of KIS Exhaust Fans (FAN-522 and FAB-523)*, adequately proved operability by verifying that one ACVS exhaust fan was in service, and the other ACVS exhaust fan was in standby and aligned for automatic start. During an observed tabletop of TSR surveillance ST-DAC-0138, *KIS Vault Enclosure Integrity*, the personnel tasked with implementing the surveillance were knowledgeable of the inspection of the enclosure (KIS Vault) protected by the fire suppression system, including any new penetrations or changes that could adversely affect the sealing of the area.

Safety Basis Training

Personnel who perform and manage the ACVS TSR surveillances are adequately trained and qualified through the ACVS system-specific DSA qualification card. Review of training records for an operator, shift technical advisor, and safety basis manager, who manage or perform TSR surveillances, confirmed completion of the required safety basis qualifications. During interviews, personnel demonstrated thorough understanding of surveillance requirements, acceptance criteria, and required actions if acceptance criteria are not met, including how to declare equipment inoperable and implement required TSR actions.

Technical Safety Requirement Surveillance Conclusions

The TSR surveillance processes for the ACVS are effectively implemented and ensure that the system can perform its required safety functions. Surveillance procedures are technically accurate and contain appropriate acceptance criteria, personnel are properly trained to perform required tests, and surveillance scheduling ensures timely performance.

3.3 Engineering Design Process

This portion of the assessment evaluated the ACVS engineering design process, including design control procedures, quality of engineering documentation, USQ process implementation, design change documentation, and technical baseline management, to determine whether it incorporates applicable safety basis requirements and complies with 10 CFR 830.122, *Quality assurance criteria*; DOE Order 420.1C, *Facility Safety*; and SRNS-specific site procedures.

Design Control Procedures

SRNS has appropriately implemented design control procedures for the ACVS in accordance with 10 CFR 830.122, *Quality assurance criteria*, criterion 6. SRNS's procedure suite establishes comprehensive requirements for developing and controlling engineering design criteria, performing calculations, generating drawings, conducting technical reviews, and managing design changes. These procedures appropriately describe how design inputs are gathered, how analyses and drawings are prepared, and how independent technical reviews are conducted. The procedures implement a graded approach based on safety significance, with enhanced controls for SS systems like the ACVS.

Quality of Design Documents

Reviewed design documents for the ACVS demonstrated effective implementation of design control processes. Three reviewed documents (a calculation, a design change package, and a commercial grade dedication [CGD] package) fully complied with procedure 1Q 7-3, *Commercial Grade Item Dedication*, for technical reviews, independent checking, and management approval, each clearly tracing functional requirements to the facility's DSA and TSRs. Field verification confirmed that diagrams, schematics, and calculations accurately represented installed instruments. The level of fidelity between reviewed documents and field installations demonstrated effective configuration control and adherence to design requirements.

USQ Process Implementation

A USQ process has been adequately established and implemented for ACVS modifications in accordance with 10 CFR 830.203, *Unreviewed safety question process*, and procedure 11Q 1.01, *Nuclear Facility Unreviewed Safety Question*. Reviewed USQ screening appropriately evaluated potential safety basis impacts and provided adequate technical justification for conclusions reached. No open USQ issues were identified during the assessment.

Design Change Documentation

Reviewed design change documentation for the ACVS demonstrated effective implementation of the design change process. Reviewed design changes were properly described with sufficient detail, underwent appropriate technical and management reviews, received required approvals, and resulted in updates to affected documents per procedure E7 1.05, *Technical Baseline Identification*. The design

change process ensures proper engineering review and approval of proposed modifications while maintaining traceability to safety basis requirements.

Technical Baseline Management

Technical baseline management processes for the ACVS provide a structured framework for maintaining essential engineering documentation in support of ongoing safety system operations and reliability. However, vendor files and safety-related setpoints that have not been migrated to the installed process instrumentation database are distributed across multiple repositories rather than maintained in the controlled technical baseline list U-TBL-K-00005, *K-Area Complex Technical Baseline List*. The higher tier procedure, E7 1.05, specifically identifies vendor files and setpoints as technical baseline items that should be centrally managed. The absence of these items from the current technical baseline list results in incomplete alignment with procedure requirements and risks personnel not having critical data to execute operations. (See **OFI-SRNS-1**.)

Engineering Design Process Conclusions

Engineering design procedures provide adequate processes for performing calculations, developing drawings, and managing design changes. The reviewed calculation and design packages were appropriately approved and incorporated applicable requirements from the facility safety design basis. The USQ process is adequately implemented. While the engineering design process demonstrates a generally adequate implementation of design control procedures and change management processes, a weakness was identified regarding database migration of safety-related setpoint and vendor files.

3.4 Cognizant System Engineer Program

This portion of the assessment evaluated the implementation of SRNS's CSE program for the ACVS to determine compliance with DOE Order 420.1C and procedure E7 1.10, *Engineering Program Roles, Responsibilities, Accountabilities and Authorities*.

SRNS has adequately established and implemented the CSE program for the ACVS through procedure E7 1.10, which designates the primary qualified CSE for the system. Interviews and reviewed documents demonstrated that the CSE has extensive technical knowledge of the ACVS design and safety basis and actively manages system health. The CSE's notebook contained current TSR limits, system drawings, open work orders, and critical spares status, indicating comprehensive system ownership. While there is currently no formally qualified alternate CSE for the ACVS, SRNS plans to formally qualify a backup engineer to ensure program continuity and resilience.

The reviewed CSE qualification card demonstrates adequate training and qualifications, in accordance with DOE Order 426.2A, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*. The qualification process appropriately evaluated system knowledge, understanding of safety basis requirements, and familiarity with applicable procedures and standards.

The CSE conducts comprehensive system health assessments and maintains detailed system health documentation. Reviewed monthly reports and the annual system health report effectively documented availability metrics, preventive maintenance completion, vibration trends, and filter loading conditions. These reports proactively identified emerging issues and recommended corrective actions that management has accepted and implemented. Walkdowns, condition reports, and the response to extent-of-condition reports demonstrate that the CSE program is responsive and effective at identifying and resolving system issues.

The CSE demonstrated effective leadership in operational improvement initiatives, particularly evident in proactive identification and procurement of critical spare parts. This approach significantly enhances system reliability and readiness, directly supporting ongoing compliance with facility safety and operability standards. The CSE's proactive engagement in system evaluations and documentation of thorough assessments supports reliability in system performance.

Cognizant System Engineer Program Conclusions

SRNS has adequately established and implemented the CSE program for the ACVS. The program effectively fulfills its role in maintaining system operability and configuration control. The CSE is adequately trained and qualified and has demonstrated effective leadership in operational improvement initiatives.

3.5 Operations

This portion of the assessment evaluated operating practices, procedures, and operator training to determine whether KAC operations are conducted in a manner that ensures that the ACVS can perform its intended safety functions.

SRNS has effectively implemented conduct of operations requirements for the ACVS through Manual 2S, *Conduct of Operations Manual*, and implementing procedures, which appropriately address the requirements of DOE Order 422.1, *Conduct of Operations*. The KAC *Conduct of Operations Applicability Matrix* clearly identifies which aspects of the order apply to ACVS operations and the implementing procedures for each requirement. During observed operations activities, operators consistently demonstrated formal communications, procedure compliance, and conservative decision-making. Observed pre-job briefings for ACVS-related activities were thorough, addressing system status, potential hazards, and emergency response actions.

Operating practices for the ACVS effectively support safe and reliable system operation. During observed shift activities, operators conducted thorough system walkdowns using detailed checklists that verified key parameters, component positions, and material condition. Shift turnovers included comprehensive review of system status, abnormal conditions, and planned activities. Safety issues and changes in radiological conditions were also discussed. Operations management demonstrated appropriate involvement through reinforcement of procedural compliance and a questioning attitude. Reviewed operating procedures for the ACVS were technically accurate, reflected current system configuration, and provided clear instructions for normal and abnormal operations.

The equipment status control program effectively supports operator awareness of ACVS component status and configuration. Procedures 2S 5.5, *Control of Equipment and System Status*, and 2S 5.6, *Operations Tags Use and Control*, establish clear requirements for component tagging, status tracking, and configuration control. During system walkdowns, components were observed to be properly labeled, and status tags were correctly applied according to procedure. The control room electronic status board accurately reflected the ACVS configuration. Shift turnover discussions included thorough review of equipment status changes and their operational implications.

Operator training for the ACVS effectively ensures that personnel have sufficient knowledge and skills to safely operate and monitor the system. The operator training program includes classroom instruction on system design and operation, hands-on equipment familiarization, and performance demonstrations on key tasks such as system lineup, parameter monitoring, and response to abnormal conditions. Reviewed training materials accurately reflected current system configuration and operating procedures. Continuing

training effectively addresses procedure changes, system modifications, and lessons learned from industry and site operating experience. Qualified and certified personnel qualifications and proficiency are tracked in an electronic system that links to the shift watchbill development, ensuring that only properly trained, qualified, and proficient personnel stand watch.

Operations Conclusions

KAC operations effectively ensure that the ACVS can perform its intended safety functions. Conduct of operations principles are consistently implemented, operating procedures are technically accurate and usable, and equipment status control maintains system configuration awareness. Operator training develops and maintains necessary knowledge and skills. The strong operational focus on system monitoring provides reasonable assurance that the ACVS will remain capable of performing its safety functions during both normal and abnormal conditions.

3.6 Quality Assurance

This portion of the assessment evaluated the QA program and procurement verification to determine whether they are implemented in a manner that ensures ACVS components will conform to required standards and perform as designed, consistent with DOE Order 414.1D, *Quality Assurance*.

SRNS has established and implemented an effective QA program for the ACVS through Manual 1Q, *Quality Assurance*, and implementing procedures. The QA program applies a graded approach based on the safety significance of SSCs, with enhanced quality requirements for SS systems like the ACVS. QA personnel involved in ACVS activities were properly trained and qualified as evidenced by reviewed qualification records for two receipt inspectors.

Procurement processes for ACVS components effectively ensure that items meet design and quality requirements. Procedures 1Q 7-2, *Control of Purchased Items and Services*; E7 3.10, *Determination of Quality Requirements for Procured Items*; and 3E 1.1, *General Process for Specifying Procurement Requirements*, establish appropriate requirements for procurement planning, supplier selection, and verification of purchased items. Reviewed purchase requisitions for replacement HEPA filters properly specified technical requirements, including efficiency ratings, physical dimensions, and pressure drop characteristics, along with applicable standards and testing requirements. Quality requirements were clearly identified, including required certifications, test reports, and receipt inspection criteria. The procurement package received appropriate reviews from engineering, QA, and operations before approval.

When qualified suppliers are not available for SS ACVS components, CGD is effectively implemented through procedure E7 3.46, *Replacement Item Evaluation/Commercial Grade Dedication [NQA-1-2008/2009]*. Reviewed CGD packages F-CGD-K-00028, *FM-200 Cylinder Assembly*, and E-CGD-K-00047, *Honeywell Actuator*, appropriately identified critical characteristics based on the component's safety function, including range, accuracy, and environmental qualification. The packages specified suitable verification methods for each characteristic, including special tests, certificate review, and source inspection. Personnel performing CGD activities were properly trained and qualified, and the results of the dedication process were fully documented, providing reasonable assurance that the dedicated items would perform their intended safety functions.

Procurement documentation for ACVS components contains appropriate technical specifications and quality requirements. Three reviewed purchase orders for HEPA filters correctly referenced specification M-SPP-G-00344. The specification provided requirements for performance; design; service conditions; fabrication and assembly; quality; packaging, handling, shipping, and storage; and inspection and testing.

The specification also included applicable industry standards, required certifications, and documentation requirements. The procurement package contained evidence of appropriate technical and quality reviews prior to issuance, ensuring that all necessary requirements were included. Supplier submittals were properly reviewed and approved by engineering personnel before accepting delivered items, providing verification that the supplier understood and could meet specified requirements.

Receipt inspection of ACVS components is performed in accordance with procedure 1Q 13-1, *Packaging, Handling, Shipping, Storage and Receiving*, and related procedures, which ensure that procured items conform to purchase requirements before acceptance. A review of receipt inspection records for two recent HEPA filter deliveries showed that inspections were performed by qualified personnel using appropriate acceptance criteria derived from procurement documents. Reviewed inspection reports properly documented results, including verification of part numbers, physical condition, required documentation, and any discrepancies. Measuring and test equipment used during inspections was properly calibrated and controlled. Non-conforming items were appropriately identified, documented, and segregated pending disposition in accordance with procedure 1Q 15-1, *Control of Nonconforming Items*.

Storage and handling of ACVS components is performed in accordance with procedure 1Q 13-1 and related procedures, which establish requirements based on item classification and susceptibility to damage or deterioration. During walkdowns of storage areas, components that could be used in the ACVS were observed to be properly identified, protected, and stored in environments suitable for their preservation. Temperature and humidity controls were in place for sensitive electronic components, and shelf-life items were appropriately labeled with expiration dates.

Quality Assurance Conclusions

The QA program for the ACVS effectively ensures that components conform to specified requirements and can perform their intended safety functions. The QA program appropriately implements applicable requirements from DOE Order 414.1D and NQA-1, with a graded approach based on safety significance. Procurement processes ensure that technical and quality requirements are properly specified and verified, with effective use of CGD when qualified suppliers are not available. Receipt inspection confirms conformance to requirements before acceptance, and storage and handling practices protect items from damage or deterioration.

3.7 Nuclear Maintenance

This portion of the assessment evaluated whether SRNS has an approved nuclear maintenance management program (NMMP) that addresses resources, types of maintenance, maintenance personnel training and qualification, and spare parts and materials.

SRNS has established a comprehensive NMMP for the ACVS through SRNS-IM-2024-00034, *Nuclear Maintenance Management Program*, and implementing procedures that effectively meet the requirements of DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*. SRFO reviewed and formally approved the NMMP. The NMMP adequately addresses all 17 elements required by the order, including maintenance organization, training, types of maintenance, maintenance processes, and performance measurement. SRNS-IM-2024-00034 appropriately applies a graded approach based on the ACVS's SS classification, with enhanced planning, documentation, and testing requirements for maintenance activities that could affect safety functions.

The maintenance processes for the ACVS effectively ensure that activities are properly planned, scheduled, and coordinated with facility operations. Procedure 1Y 8.20, *Conduct of Maintenance Work Control*

Procedure, establishes appropriate requirements for maintenance planning, scheduling, and execution. During the observed plan-of-the-week meeting, maintenance activities were properly prioritized based on system health, compliance requirements, and operational impacts. The maintenance schedule effectively balances the need to complete TSR-required surveillances with other preventive and corrective maintenance needs, while ensuring that adequate craft resources are available for each activity.

The preventive maintenance program for the ACVS is appropriately based on vendor recommendations, industry standards, and operating experience, and effectively prevents age-related degradation. Ten reviewed preventive maintenance procedures for air handling units, such as work order 02108529, *GS 18M, Perform Aerosol Test - KIS Lower Glovebox Exhaust Hepa*, contained appropriate inspection criteria, acceptance standards, and required frequencies. Ten completed preventive maintenance records for the past two years demonstrated consistent performance within required frequencies. Reviewed records for unplanned preventive maintenance deferrals showed that the corresponding metric was "Green" (denoting effective performance) for 9 out of the last 12 months. A review of recent system health reports showed that the unplanned deferred preventive maintenance metric was Green at the time of this assessment.

Corrective maintenance for the ACVS is performed in a timely manner based on the safety significance of the deficiency and its potential impact on safety system operation. Twelve reviewed work order records showed that deficiencies affecting system operability, such as work order 01609029, *(SS) Replace Motor on KIS-GBEX-Fan-523*, received appropriate priority and were completed within established timeframes. All reviewed work orders contained adequate technical information, including reference to vendor manuals, drawings, and equipment specifications. Each reviewed work order contained post-maintenance testing requirements, which were clearly specified and implemented to verify that repaired components could perform their required functions before returning to service.

The maintenance backlog for the ACVS is effectively managed to ensure system reliability and availability. Monthly maintenance metrics reports show that the corrective maintenance backlog has been stable over the past year, with approximately four weeks backlog. This performance is well below the established Green threshold of nine weeks of open work orders at any given time.

Control of maintenance activities for the ACVS effectively ensures that work is performed safely, and that system configuration is properly restored upon completion. For example, work order 02086216, *(SS) Install Horn and Fuses in Alarm Circuit Box UA-5552A*, contained appropriate technical specifications, quality requirements, and post-maintenance testing criteria. Further, this work order included comprehensive lockout/tagout requirements, verification of replacement part conformance to specifications, and detailed restoration steps. Quality control hold points were properly identified for critical activities, with documented verification of completion. Post-maintenance testing effectively demonstrated that the work met performance requirements before the system was returned to service.

Nuclear Maintenance Conclusions

SRNS has established a comprehensive NMMP for the ACVS that effectively ensures that safety systems can reliably perform their safety functions. The maintenance processes for the ACVS effectively ensure that activities are properly planned, scheduled, and coordinated. Reviewed preventive and corrective maintenance of the ACVS was adequately performed. The maintenance backlog is effectively managed, and work control processes ensure that activities are properly performed, and that system configuration is restored upon completion.

3.8 Feedback and Improvement

This portion of the assessment evaluated SRNS's collection, analysis, and use of feedback information to promote safety-related improvement processes for the ACVS, including issues management and performance assurance, to determine whether SRNS complies with DOE Order 414.1D.

SRNS has established an issues management system. Procedure 22Q CAP-1, *Corrective Action Program*, addresses requirements in accordance with DOE Order 414.1D and NQA-1. Issues affecting the ACVS are appropriately entered into the condition report database, with eight condition reports generated for ACVS-related issues over the past four years. The Issues Review Committee appropriately screened the issues and assigned appropriate significance levels to ensure that safety-related issues receive adequate management attention and resources for resolution.

Causal analysis implementation for ACVS issues is appropriately conducted based on issue significance through procedure 22Q CA-1, *Causal Analysis*. Root cause analysis 2024-CTS-012085, *Technical Specification Requirement Violation for not entering LCO 3.61 Condition B*, demonstrated thorough investigation techniques, including barrier analysis, event and causal factor charting, and management system evaluation. Personnel performing causal analyses are properly trained through the site's root cause analysis training program. Reviewed training records demonstrated that current certification is maintained for all active analysts.

Corrective action development for ACVS issues effectively addresses identified causes and includes appropriate measures to prevent recurrence. Corrective action plan 2024-CTS-003596 UA-5552A, *Horn Failure issue*, included both immediate corrective actions to address the specific problem and comprehensive corrective actions to prevent similar occurrences. Actions were clearly defined with specific deliverables, assigned to appropriate responsible individuals, and included realistic completion dates based on resource availability and technical complexity. The plan appropriately addressed procedure revisions, training enhancements, and equipment modifications. Extent-of-condition and extent-of-cause evaluations were conducted to identify similar vulnerabilities in other ventilation systems, with appropriate corrective actions implemented.

Effectiveness reviews for ACVS corrective actions are conducted in accordance with procedure 22Q CAP-1 to verify that implemented actions have resolved the original issues and prevented recurrence. Effectiveness review 22-CTS-005248, *Activation of Safety Significant Alarm due to Power Interruption from Severe Weather corrective actions*, was conducted seven months after action completion (an appropriate length of time for this issue) and included review of performance data, interviews with affected personnel, and assessment of recurrence indicators. Effectiveness review criteria were appropriately established prior to corrective action implementation, providing objective measures for success.

Performance monitoring and trending for the ACVS effectively identifies adverse trends before significant issues develop through comprehensive data collection and analysis. Monthly system performance trend data for key ACVS parameters includes DP variations, alarm frequency, maintenance costs, system availability, and component failure rates. System health report trend analysis identified adequate performance of the system.

SRNS's implementation of assessment programs effectively evaluates ACVS performance and provides meaningful feedback on program implementation. SRNS's implementation of procedures 22Q MRB-1, *Management Review Board*; 22Q SA-1, *Self Assessments*; and 22Q MFO-1, *Management Field Observations*, effectively evaluates ACVS operations and maintenance practices through a comprehensive methodology that includes document reviews, personnel interviews, field observations, and performance data analysis. Reviewed SRNS assessments included personnel with appropriate technical expertise and

sufficient independence from the assessed activities to provide objective evaluation. Reviewed assessment findings from 2022-2024 assessment reports were properly prioritized based on safety significance, with comprehensive corrective action plans developed for identified deficiencies.

Feedback and Improvement Conclusions

The feedback and improvement processes for the ACVS effectively identify, analyze, and resolve issues while implementing measures to prevent recurrence. Assessment programs provide independent evaluation of program effectiveness and identify opportunities for continuous improvement. These feedback and improvement processes provide reasonable assurance that ACVS performance issues will be promptly identified, thoroughly analyzed, and effectively corrected.

3.9 Federal Oversight

This portion of the assessment evaluated the effectiveness of SRFO oversight of SRNS's SSM and CSE programs.

The SRFO safety system oversight (SSO) program is adequately established in Savannah River Implementing Procedure 421.2, *Safety System Oversight*. The SRFO SSO program is consistent with DOE Order 420.1C. SSO personnel are responsible for overseeing assigned safety systems to ensure that the systems will perform as required.

SRFO has performed effective SSO at the KAC in accordance with DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, through routine field observations, close engagement with SRNS's engineering organization, and formal assessments. SRFO staff members maintain a strong presence at the KAC. The staff performs vital safety system (VSS) and system engineering program assessments, self-assessments, and readiness assessments, and serves on safety basis review teams. During interviews, SRFO Facility Representatives demonstrated comprehensive knowledge of assigned safety systems and emphasized their close coordination with the SRNS CSE.

The reviewed SRFO oversight activities for fiscal year (FY) 2025 (listed in the *National Nuclear Security Administration Site Integrated Assessment Plan*) include formal assessments of VSSs and the CSE program. SRFO completed six VSS assessments during FYs 2022 to 2025 at the KAC. The reviewed assessments demonstrated that SRFO is providing adequate oversight of KAC safety systems and the SRNS CSE program. Specifically, reviewed SRFO oversight products identified issues, provided constructive feedback to SRNS, and documented the tracking of those issues through closure.

The *National Nuclear Security Administration Memorandum of Agreement Between the Department of Energy Savannah River Operations Office and the National Nuclear Security Administration Savannah River Field Office on Oversight Responsibilities at the K-Area Complex at the Savannah River Site* provides the roles and positions for oversight responsibilities between DOE-SR and SRFO at the KAC because of the SRS landlord transition to NNSA in FY 2024. Specifically, the personnel and transfer agreements involved two fully qualified Facility Representatives, a nuclear safety specialist, and a criticality safety engineer from DOE-SR. These employees are currently funded by DOE-SR but are on detail to NNSA until funding becomes available in FY 2026. The nuclear safety specialist assigned to the KAC is fully qualified to develop safety basis safety evaluation reports but is not qualified to perform SSO duties. As a result, support from other qualified SSOs at SRFO facilities will be required until the individual completes the SSO qualification. Additionally, DOE-SR recently lost two fully qualified criticality safety engineers in the DOE-SR Nuclear Materials Engineering Division. As a result, there were no qualified Federal criticality safety engineers at DOE-SR or SRFO at the time of this assessment.

Federal Oversight Conclusions

SRFO has performed effective SSO of SRNS's SSM and CSE programs in accordance with DOE Order 226.1B. SRFO has appropriately communicated its VSS findings and monitored associated corrective action development, execution, and closure through close coordination with SRNS.

4.0 BEST PRACTICES

No best practices were identified during this assessment.

5.0 FINDINGS

No findings were identified during this assessment.

6.0 DEFICIENCIES

No deficiencies were identified during this assessment.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the OFI 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. This OFI is offered only as a recommendation for line management consideration; it does not require formal resolution by management through a corrective action process and is not intended to be prescriptive or mandatory. Rather, it is a suggestion that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

Savannah River Nuclear Solutions, LLC

OFI-SRNS-1: Consider incorporating vendor files into the controlled technical baseline list and migrating legacy safety-related setpoints into the installed process instrumentation database.

Appendix A
Supplemental Information

Dates of Assessment

April 10 to May 21, 2025

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
Brent L. Jones, Acting Director, Office of Nuclear Safety and Environmental Assessments
David Olah, Acting 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

Quality Review Board

William F. West, Advisor
Kevin G. Kilp, Chair
Todd M. Angel
Jack E. Winston
William A. Eckroade

EA Site Lead for Savannah River Site

Samina A. Shaikh

EA Assessment Team

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