Office of Enterprise Assessments
Assessment of the
Savannah River Site K-Area Complex
Surplus Plutonium Disposition Project
Conceptual Safety Design Report

December 2018

Office of Nuclear Safety and Environmental Assessments
Office of Environment, Safety and Health Assessments
Office of Enterprise Assessments
U.S. Department of Energy

Table of Contents

Acronyms

ACVS	Active Confinement Ventilation System
ARF	Airborne Release Fraction
CSDR	Conceptual Safety Design Report
CW	Co-located Worker
DBA	Design Basis Accident
DF	Dilute Facility
DiD	Defense-in-Depth
DOE	U.S. Department of Energy
DOE-SR	DOE Savannah River Operations Office
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
EG	Evaluation Guideline
FSS	Fire Suppression System
KAC	K-Area Complex
MAR	Material-at-Risk
NPH	Natural Phenomena Hazards
PCHA	Preliminary Consolidated Hazards Analysis
PDSA	Preliminary Documented Safety Analysis
PFHA	Preliminary Fire Hazards Analysis
SBRT	Safety Basis Review Team
SC	Safety Class
SPD	Surplus Plutonium Disposition
SRL	Safety Review Letter
SRNS	Savannah River Nuclear Solutions, LLC
SS	Safety Significant
SSC	Structure, System, and Component
χ/Q	Atmospheric Dispersion Factor

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EXECUTIVE SUMMARY

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 conceptual safety design report (CSDR) and the DOE Savannah River Operations Office (DOE-SR) safety review letter (SRL) for the Surplus Plutonium Disposition (SPD) project at the Savannah River Site K-Area Complex. This assessment is part of a series of targeted safety basis assessments of nuclear facility projects at DOE sites.

The assessment evaluated the SPD project CSDR and SRL against the requirements of DOE-STD-1189-2016, *Integration of Safety into the Design Process*; DOE-STD-1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*; and DOE Order 420.1C, Change 1, *Facility Safety*, for the development, review, and approval of safety basis documents. The review encompassed aspects of the CSDR, supporting hazard analysis, and supporting engineering documents. EA examined the summary of the hazard analysis in the CSDR, as well as key documents, including the preliminary consolidated hazards analysis and the fire hazards analysis. EA also examined the functional classifications, safety functions, and functional requirements for selected safety structures, systems, and components (SSCs).

The CSDR addresses the requirements of DOE-STD-1189-2016 and DOE Order 420.1C, and adequately supports the progression of the SPD project design and safety design basis. The SPD project CSDR adequately summarizes the process hazard analysis. The consequence analyses used to support the hazard analysis and control selection are suitably conservative and support the conclusion that the public Evaluation Guideline is exceeded, requiring the identification of safety class controls. There are no hazards associated with chemicals. Consistent with the logic in the hazard analysis, the CSDR appropriately designates safety significant SSCs for the protection of the co-located and facility workers. The safety strategy appropriately relies on multiple physical barriers, including robust containers, gloveboxes, active confinement ventilation systems, and the building structure to confine radiological material. A safety class fire suppression system is relied on to control fires. EA identified six discrepancies related to the hazard and accident analyses, as well as control selection and development. Savannah River Nuclear Solutions, LLC has identified actions to resolve all discrepancies in the future preliminary documented safety analysis, or supporting documents.

For the selected safety class and safety significant SSCs, the functional classifications, safety functions, functional requirements, and design requirements are generally appropriate. The CSDR integrates the supporting hazard analysis with the nuclear safety design and derives safety controls consistent with the hierarchy of controls in DOE-STD-1189-2016. The system descriptions reflect the current level of conceptual system-level design maturity.

The DOE-SR Safety Basis Review Team adequately evaluated the CSDR, as documented in the SRL, and appropriately concluded that there is no remaining impediment to proceeding to the preliminary design phase. EA identified one discrepancy in the SRL where an incorrect basis of approval was cited. DOE-SR has committed to issue an amendment to the SRL to resolve this discrepancy.

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1.0 PURPOSE

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 conceptual safety design report (CSDR) and the DOE Savannah River Operations Office (DOE-SR) safety review letter (SRL) for the K-Area Complex (KAC) Surplus Plutonium Disposition (SPD) project at the Savannah River Site (SRS). The assessment evaluated aspects of the CSDR and supporting documentation. This assessment, conducted from May through September 2018, is part of a series of targeted safety basis assessments of nuclear facility projects at DOE sites.

2.0 SCOPE

This assessment covered the development and approval of the SPD project safety design basis, which includes the CSDR and SRL, and was performed in accordance with the *Plan for the Office of Enterprise Assessments Assessment of the Surplus Plutonium Disposition Project Conceptual Safety Design Report at the Savannah River Site, Fiscal Year 2018*. This assessment encompassed a review of supporting documents, including the preliminary consolidated hazards analysis (PCHA), preliminary fire hazards analysis (PFHA), and engineering calculations, reports, studies, and drawings. This assessment also included review of the SRL, which documents the approval of the CSDR by DOE-SR.

3.0 BACKGROUND

Savannah River Nuclear Solutions, LLC (SRNS), the management and operations contractor for SRS, developed the CSDR for the SPD project to support design and construction of the Dilute Facility (DF), located in Building 105-K. The SPD project provides processing capabilities for the disposition of 26.2 metric tons of surplus weapons-grade plutonium using the dilute and dispose approach. The primary activities include unpackaging of storage containers, dry blending plutonium oxide with adulterant, nondestructive analysis, and preparing the resulting product for disposal as transuranic waste at the Waste Isolation Pilot Plant. The SPD project will involve modifications to Building 105-K, including the addition of an active confinement ventilation system (ACVS), gloveboxes, diesel generator, and fire barriers. In addition, a gaseous fire suppression system (FSS) will be installed in the DF process areas to detect and mitigate fires.

The SRNS Nuclear and Criticality Safety Engineering division is responsible for the development of the CSDR. DOE-SR independently reviews and approves the safety basis. The DOE-SR Manager is the Safety Basis Approval Authority. The SPD project team is implementing the requirements of DOE-STD-1189-2016, *Integration of Safety into the Design Process*, for the development, review, and approval of the CSDR. The CSDR and SRL collectively comprise the SPD project safety design basis.

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms "deficiencies" and "findings" consistent with DOE Order 227.1A. In accordance with this order, DOE line management and/or contractor organizations must develop and implement corrective action plans for deficiencies identified as findings. Deficiencies not meeting the criteria for a finding should be addressed consistent with site-specific issues management procedures. In this report, open issues that have a commitment for closure are defined as "discrepancies." Attachment 1 provides a summary of discrepancies pending closure.

EA considered the requirements of DOE-STD-1189-2016 and DOE-STD-1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*, for its review of the SPD project safety design basis documents. To guide the CSDR assessment, EA selected objectives and criteria from EA Criteria and Review Approach Document 31-29, *Review of Nuclear Facility Safety Design Basis Development Criteria and Review Approach Document*, Rev. 1.

EA independent oversight assessments focus strategically on aspects of nuclear safety essential to ensuring effective protection of workers and the public. By reviewing the CSDR, the assessment indirectly addressed line management preparation, review, and approval processes that ensure effective integration of nuclear safety into the DF design. EA examined key supporting documents, such as the PCHA, the PFHA, calculations, and system design descriptions.

EA met with members of the SPD project team responsible for developing and reviewing the CSDR. Appendix A lists the members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment. Appendix B provides a list of the primary documents reviewed and personnel interviewed during this assessment.

EA uses a written comment and response process to address issues identified during its review of safety design basis documents. EA provided comments on the CSDR to the SPD project team and received written responses. Comments were resolved by either adequate comment responses or by commitments to resolve them in the preliminary documented safety analysis (PDSA).

Written responses by the SPD project team resulted in closure of a number of the comments. Eight open comments, identified as seven discrepancies in the discussion of the results below, are satisfactorily resolved through stated actions to be addressed in the PDSA or supporting documents.

EA had not conducted a recent assessment of the safety design basis at Savannah River Site KAC. Therefore, there were no items for follow-up during this assessment.

5.0 RESULTS

Criterion:

The CSDR appropriately and sufficiently summarizes the hazard analysis efforts and safety-in-design decisions incorporated into the conceptual design along with any identified project risks associated with the selected strategies. (DOE-STD-1189-2016, Section C.1)

DOE-STD-1189-2016 recommends that the CSDR document the preliminary safety positions adopted during conceptual design to ensure an appropriately conservative basis to proceed to preliminary design. These preliminary safety positions should include the following:

- Selection of the preliminary hazard categorization (Hazard Category 1, 2, or 3) of the facility
- Preliminary identification of the facility hazards and design basis accidents (DBAs)
- Assessment of the need for safety class (SC) and safety significant (SS) facility-level hazard controls based on significant hazard scenarios and DBAs
- Preliminary assessment of the applicable natural phenomena hazards (NPH) design criteria (e.g., seismic design category and limit state) for significant hazard controls
- Approach to meeting the safety design criteria of DOE Order 420.1C, Change 1, *Facility Safety*, or approved exemptions and equivalencies.

Sections 5.1 and 5.2 evaluate these safety design positions of the CSDR. Section 5.3 evaluates the Federal review and approval of the CSDR.

5.1 Hazard Analysis

5.1.1 General Information

EA reviewed the general information and the site characteristics in the CSDR to verify that, at this stage of the conceptual design, the information is sufficient to support the hazard analysis.

The SPD project design is approximately 10% complete. The supporting design media are consistent with the conceptual level of design maturity and sufficient to support facility-level hazard analysis. The information on site characteristics, which is either in the CSDR or referenced in the KAC documented safety analysis (DSA), is sufficient to support the safety-in-design decisions associated with NPH, external hazards, and site environmental considerations.

5.1.2 Hazard Identification

SRNS uses Manual SCD-11, *Consolidated Hazard Analysis Process (CHAP) Program and Methods Manual*, to perform hazard identification. Manual SCD-11 defines the process for performing and documenting a consolidated hazard analysis. SRNS personnel performed the hazard identification process using a common checklist supported by historical records (such as occurrence reports), the assumed material-at-risk (MAR), energy sources, and current KAC dilution operations at the facility level of detail.

EA reviewed the hazard identification tables documented in Attachment 1 of the CSDR and the PCHA. The hazard identification tables are adequate, and hazards for facility processes are systematically evaluated. Hazard identification builds on the hazards in the current KAC DSA, with new hazards identified as a result of studying the proposed activities. The radiological, fissile, and chemical inventories associated with the DF process are identified. MAR estimates used as input to the PCHA are conservatively based on the maximum throughput for each process and are suitable based on the conceptual design maturity. Nuclear criticality hazards are excluded from the hazard analysis scope and are planned to be addressed in the PDSA. Standard industrial hazards are identified and appropriately screened from further consideration. There are no hazards associated with chemicals as all quantities are below screening levels for worker safety. Overall, the hazard identification and screening processes are appropriate.

Subsequent to the identification of hazards, the SPD project team used the hazard analysis process to develop a spectrum of hazard event scenarios that could be initiated by upsets in facility operations, NPH, and external man-made events. From these scenarios, the project team appropriately identified and developed representative DBAs for release of radiological materials.

5.1.3 Hazard Evaluation

EA reviewed the hazard analysis to determine whether the spectrum of facility and process upset events is appropriate. EA examined the analyzed hazard scenarios related to fires, explosions, loss of confinement, NPH, and external events. EA also evaluated supporting consequence calculations to verify that unmitigated consequence estimates for workers and the public are appropriately conservative. An appropriate set of hazard scenarios and DBAs is identified. EA did not identify additional hazards or new hazard event scenarios of greater consequence than those analyzed in the CSDR.

EA reviewed the hazard analysis sections of the SPD CSDR, along with the PCHA, to evaluate the hazard identification and hazard analysis processes and the identification of candidate hazard controls. The DF is appropriately categorized as Hazard Category 2 per DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. Conceptual design information includes the general control strategy for addressing the significant hazards, including design criteria; major safety structures, systems, and components (SSCs); and the risks associated with implementing the design.

EA evaluated supporting consequence calculations to verify that the estimated dose consequences for workers and the public are appropriately conservative. The PCHA contains an appropriate set of hazard scenarios and DBAs. The hazard analysis appropriately concludes that the public Evaluation Guideline (EG) is exceeded, requiring the identification of SC controls. Additionally, unmitigated consequences to the co-located worker (CW) in several hazard events exceed the radiological consequence threshold (100 rem) and require SS controls. The CSDR provides a summary of the DBAs and their unmitigated consequences. The analysis appropriately identifies safety SSCs based on the consequences.

EA reviewed calculations for loss of confinement events due to pressurized releases and flammable gas explosions. Conservative assumptions are used in deriving the offsite atmospheric dispersion factor (χ/Q). Site-specific 95th percentile meteorological data are used as an input to calculate the site-specific χ/Q as a function of receptor distance and release duration. For the CW, the χ/Q value specified in DOE-STD-1189-2016 is used. The analytical inputs are generally conservative; however, EA identified the following discrepancy:

- The Airborne Release Fraction (ARF) for events involving releases from containers at a pressure greater than 500 psig is not fully justified because the ARF is extrapolated based on non-applicable

data (i.e., the applicable data are only available for pressures less than 500 psig).

By using non-conservative parameters, the dose consequences for the bounding fire events may be underestimated, which may impact subsequent hazard evaluation and control selection as the design evolves. SRNS has committed to provide further justification of the ARF for events involving releases from containers at a pressure greater than 500 psig.

The hazard analysis is adequate for this conceptual level of design maturity. The CSDR briefly describes the facility and its operational processes and discusses the methods and results of the hazard evaluation. The PCHA includes the inputs and assumptions developed during the hazard analysis process to establish a technical baseline. The "What-If" technique used in the PCHA to identify events is appropriate given the current state of design maturity. Qualitative estimates are provided for initiating event frequencies, and the radiological dose consequences for each unmitigated hazard event are semi-quantitatively evaluated. The summaries of the cause, frequency, consequences, recommended controls, and MAR are sufficiently detailed to understand the postulated hazards, event sequences, and hazard controls. The frequency estimates and unmitigated consequence analyses are appropriate and generally conservative. The hazard evaluation tables in the PCHA are generally complete and include the estimated risk bins for both unmitigated and mitigated events. The tables also identify the credited controls that provide preventive or mitigative functions. The results of the PCHA are adequately summarized in the CSDR.

5.1.4 Fire Hazards Analysis

EA reviewed the PFHA (F-PFHA-K-00012, *Project Fire Hazards Analysis for the Surplus Plutonium Disposition Project in the K-Area Complex*), along with the supporting design documents, to evaluate the fire hazard evaluation processes and resulting fire hazard controls. EA reviewed the analyzed fire events and potential consequences related to explosions, loss of confinement, and earthquake-induced fires. The PFHA adequately evaluates the hazards and identifies a broad set of fire hazard controls. The results are adequately integrated into the CSDR.

The PFHA addresses relevant nuclear safety requirements and objectives and is consistent with the requirements of DOE Order 420.1C. The PFHA identifies potential fire hazards and scenarios that adequately support functional classification of fire protection SSCs. EA identified the following two discrepancies that SRNS has committed to address in the PDSA with input from the revised PFHA:

- The safety function of the DF walls does not include providing confinement for the gaseous FSS.
- The justification for selection of the gaseous suppression system is incomplete in the PFHA.

Overall, the CSDR provides a sufficiently detailed description of the hazard identification and hazard analysis results and is sufficiently complete to support advancing the facility design to the preliminary design phase. The supporting PCHA addresses a comprehensive set of hazard events and is generally supported by conservative estimates of event consequences. The CSDR adequately summarizes the PFHA's evaluation of the fire scenarios and the potential impact to MAR and safety SSCs. The calculations appropriately conclude that the public EG is exceeded and SC controls are required. Hazards to both CWs and facility workers are properly identified, and appropriate hazard controls have been selected. The CSDR-derived safety SSCs are consistent with the logic in the hazard analysis. Their designation as SC or SS SSCs is appropriately identified for protecting the public, CWs, and facility workers. The safety strategy appropriately relies on multiple passive and active controls to prevent or mitigate significant accidents.

5.2 Conceptual Design

EA reviewed the CSDR and select supporting design documentation to verify that the functional classification of safety SSCs is appropriate and that adequate design criteria for these systems are identified.

The CSDR properly identifies safety SSCs and references hazard events from the PCHA. The CSDR addresses the requirements of DOE-STD-1189-2016 by including the safety function, functional requirements, and summary system description for each SSC. The safety functions described for the SSCs are consistent with the hazard analysis. Overall, the safety function and functional requirements are clearly described and conceptually demonstrate that the credited SSCs can prevent or mitigate the identified hazards. The CSDR identifies required studies or analyses that will be performed to support the ongoing design process for the SPD project. The safety functions and functional requirements for the SSCs provide adequate bases for advancing the facility design to the preliminary design phase.

EA evaluated the defense-in-depth (DiD) strategy in the CSDR per the requirements of DOE Order 420.1C and DOE-STD-1189-2016. All controls were conservatively functionally classified as SC or SS. No DiD controls were identified. Per SRNS Manual SCD-11, DiD controls will be added to hazard events when the PCHA progresses to the final hazard analysis.

The approach to meeting the nuclear safety design criteria of DOE Order 420.1C is adequately described in the CSDR. The requirements of DOE Order 420.1C, applicable to the K-Area SPD project, are documented in the facility and system design description documents for the safety SSCs. Applicable design codes and standards are appropriately referenced. An applicable list of the design requirements of DOE Order 420.1C is included in the CSDR. The CSDR references the SRNS Site/Requirements Identification Document, which provides the mechanism for implementing the requirements. No exceptions to the nuclear safety design criteria are identified, other than the proactive adoption of the most current DOE standards. The preferred design appropriately uses existing proven processes and requires minimal new technologies.

EA identified the following three discrepancies that SRNS has committed to address in the PDSA:

- The ACVS does not include a functional requirement to prevent over-pressurization of the glovebox during a potential failure of the nitrogen supply line to the can puncture device, although the glovebox is credited to mitigate this event.

- The safety function of the gloveboxes to maintain structural integrity during and after NPH events is not identified.

- Some safety SSCs lack an adequate technical basis to demonstrate that the control can perform the required safety function. Examples include the designs for the Shielded Cart and Epithermal Multiplicity Counter, which are required to prevent involvement of high density polyethylene in a fire, and the capability of the ACVS to perform its required safety function considering incurred soot loading and minimum egress time during fire events.

Although some discrepancies remain to be addressed in the PDSA, the CSDR appropriately classifies safety systems and establishes their safety functions and functional requirements for this conceptual stage of design maturity. The CSDR adequately incorporates the nuclear safety design criteria of DOE Order 420.1C.

5.3 Safety Review Letter

Criterion:

The SRL should include concise summary statements of the bases for review of the safety design basis document and any recommended actions. (DOE-STD-1104-2016, Section 8.7)

EA reviewed the SRL to determine its adequacy as the approval basis for the CSDR. DOE-SR issued SPD-SR-18-0008, *Review Plan for the Surplus Plutonium Disposition Project Conceptual Safety Design Report for the K-Area Complex Scope (U-CSDR-K-00001, Revision 0)*, which implements the safety design basis review requirements of DOE-STD-1104-2016. The Safety Basis Review Team (SBRT), comprised of DOE-SR and National Nuclear Security Administration personnel, used the review plan criteria to ensure the thoroughness of the CSDR review.

The SBRT included members with appropriate subject matter expertise in program management, nuclear safety, and safety systems oversight. The SRL adequately describes the review process and the scope of the review.

Appendix A of the SRL compares the content review of the CSDR to the requirements from DOE-STD-1189-2016 and describes where and how the CSDR meets each requirement. DOE-SR concluded that the hazards analysis performed for the SPD project CSDR is consistent with DOE-STD-1189-2016. The SRL also notes that unmitigated offsite consequences for facility-wide and seismically-induced fires exceed the EG, requiring the identification of SC controls.

The SBRT review concluded that the CSDR meets the format and content guidance of DOE-STD-1189-2016, the design information contained in the CSDR is sufficient for this phase of the design, neither significant issues nor conditions of approval are identified, and the safety positions selected are adequate and appropriate to support proceeding to the preliminary design phase. Based on this review, the SBRT recommended approval of the CSDR, and the SRL was subsequently approved.

The SRL follows the format and identifies each review criterion from DOE-STD-1104-2016. The discussion of approval bases includes site and facility information, hazard categorization, preliminary identification of facility DBAs, assessment of the need for SC and SS facility-level hazard controls, preliminary assessment of the applicable NPH design basis for the facility structure, and positions taken with respect to compliance with the nuclear safety design criteria of DOE Order 420.1C.

However, the SRL evaluation of the adequacy of key accident analysis parameters for the bounding fire releases from pressurized containers is inaccurate. The SRL asserts that the ARF values used in the CSDR for these events are consistent with DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities, Volume 1 - Analysis and Experimental Data*, whereas the values used in the analysis rely on other sources and correlations. This technical issue is identified as a discrepancy against the CSDR in Section 5.1.3 above. The SRL provides an inaccurate basis for approval in this area. DOE-SR committed to issuing an amendment to the SRL to clarify the basis for the approval.

With the exception of the discrepancy identified above, the SBRT adequately evaluated the CSDR and appropriately concluded that there is no remaining impediment to proceeding to the preliminary design phase.

6.0 FINDINGS

EA did not identify any findings during this assessment.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA did not identify any opportunities for improvement during this assessment.

8.0 ITEMS FOR FOLLOW-UP

During review of the PDSA, EA will verify closure of discrepancies.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: May 14, 2018
Offsite Assessment: May – September 2018

Office of Enterprise Assessments (EA) Management

William A. Eckroade, Acting Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
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Kevin G. Kilp, Director, Office of Worker Safety and Health Assessments
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Katherine S. Lehew
Jeffrey L. Robinson
Eliza M. Roybal

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- C-SYD-K-00001, *Surplus Plutonium Disposition Dilute Facility System Design Description for Building Structures System (08) Project-Y744,* Rev. B, 1/24/18
- E-SYD-K-00005, *System Design Description for Nuclear Criticality Monitoring System (10.2) Project – Y744*, Rev. A, 1/9/2018
- F-PFHA-K-00012, *Project Fire Hazards Analysis for the Surplus Plutonium Disposition Project in the K-Area Complex,* Rev. 2, 4/26/18
- F-TRT-K-00027, *Fire Scenario Document for the Surplus Plutonium Disposition Project In the K-Area Complex,* Rev. 3, 5/3/18
- F-TRT-K-00028, *Fire Protection Engineering, Engineering Evaluation – Technical Position Paper, Suppression System Selection for SPD Project Glovebox and Room Protection*, Rev. 0, 6/22/2017
- G-ESR-K-00027, *Gas Analysis for 3013 Cab #R601318*, Rev. 0, 2/22/2008
- G-ESR-K-00190, *K-Area Complex Plutonium Down Blend Technical Basis*, Rev. 1, December 2017
- G-FDD-K-00004, *Surplus Plutonium Disposition Dilute Facility, Facility Design Description, Project Y744,* Rev. C, 5/22/18
- LA-UR-16-25367, *The SAVY 4000 Container Storage Program at Los Alamos National Laboratory,* Rev. 1, 7/25/2016
- M-CDP-K-00012, *Surplus Plutonium Disposition Project, Preconceptual Design Package*, Rev. 0, 8/12/18
- M-CLC-A-00535, *Thermal Modeling and Pressure Response for the SAVY 4000 Container Series*, Rev. 2, 3/26/18
- M-CLC-A-00630, *Analysis of Pressurization of the Pipe Component of the Criticality Control Overpack during Exposure to a Fire, with Revised Content Parameters*, Rev. 1, 5/10/18
- M-CLC-H-02828, *Sealed Sources under Internal Pressure due to Fire Accident Scenario,* Rev. 0, 6/13/2017
- M-CLC-K-00788, *The Initial and 20-year Service Thermal Performances of the 9975 Shipping Packages due to Fire-Drop-Smoldering Accidents in KAC*, Rev. 0, 1/17/17
- M-CLC-K-00792, *The Thermal Performances of Bare-3013, 3013/PCV, and Non-3013/PCV Assemblies due to Fire Accident in KIS Vault*, Rev. 0, 8/1/17
- M-SYD-K-00036, *Surplus Plutonium Disposition Dilute Facility System Design Description for Active Confinement Ventilation (06) Project-Y744*, Rev. D, 5/2/2018
- M-SYD-K-00037, *Surplus Plutonium Disposition Dilute Facility System Design Description for Glovebox System (07) Project-Y744*, Rev. C, 5/3/2018
- M-SYD-K-00038, *Surplus Plutonium Disposition Dilute Facility System Design Description for Fire Protection System (11.3.1) Project-Y744*, Rev. D, 5/2/2018
- Manual SCD-11, *Consolidated Hazard Analysis Process (CHAP) Program and Methods Manual*, Rev. 14, 3/30/2017
- N-NCS-A-00023, *Nuclear Criticality Safety Evaluation: 9977 Shipping Package with Two 3013 Containers Analysis for SARP Addendum 7 (U),* Rev. 5, 3/22/17
- P-PFHA-K-00012, *Preliminary Fire Hazards Analysis for the Surplus Plutonium Disposition Project in the K-area Complex*, Rev. 2, 4/26/2018
- S-CHA-K-00018, *Preliminary Consolidated Hazards Analysis for the K-Area Surplus Plutonium Disposition (SPD) Project*, Rev. 1, 1/19/18
- S-CLC-G-00366, *Evaluation of Powder Release From Pressurized Containers*, Rev. 4, 9/8/2014
- S-CLC-G-00372, *Unit Total Effective Dose Factors for Onsite and Offsite Receptors at SRS (U)*, Rev.

4, 4/30/2018
- S-CLC-G-00392, *Unit TED Factors for SPD Accident Analysis (U)*, Rev. 0, 10/3/17
- S-CLC-H-01286, *Total Effective Dose Factors for use in Tritium Facilities Safety Basis Documents*, Rev. 0, 5/26/2016
- S-CLC-K-00301, *Preliminary Accident Analysis for SPD Hazard Characterization*, Rev. A, 1/22/18
- S-CLC-K-00302, *Unit TED Factors for SPD MAR Streams*, Rev. A, 4/18/18
- S-ESR-G-00045, *Thermally-Induced Complete Oxidation of Plutonium Resulting in Lung Absorption Type S*, Rev. 1, 2/28/17
- S-ESR-K-00012, *ARFs for Impacts and Fire-Induced Pressurized Releases of Container Configurations for KIS Operations Expansion*, Rev. 4, 9/18/17
- SPD-K-SK-A-004, *Project Y744 SPD Package K4, PROCESS AREA FIRST FLOOR PLAN*, Rev. D, 1/24/18
- SPD-SR-18-0013, *Safety Review Letter for the Surplus Plutonium Disposition Project Conceptual Safety Design Report*, Revision 0, August 2018
- SPD-SR-18-0008, *Review Plan for the Surplus Plutonium Disposition Project Conceptual Safety Design Report for the K-Area Complex Scope (U-CSDR-K-00001, Revision 0),* Revision 0, March 21, 2018
- SRIP 400, Chapter 421.1, *Nuclear Safety Oversight*, Revision 8, January 20, 2016
- SRNS-J6700-2017-00359, *Preliminary Dose Assessment for the Surplus Plutonium Disposition (SPD) Project*, 11/30/17
- SRNS-J6700-2018-00116, *Update of the Preliminary Dose Assessment for the Surplus Plutonium Disposition Project*, 5/10/18
- SRNS-RP-2008-00086-007-M&O, *Standards/Requirements Identification Document – Functional Area 07 – Engineering Programs*, Rev. 17-08a-MO, 2/14/18
- SRNS-RP-2008-00086-018-M&O, *Standards/Requirements Identification Document – Functional Area 18 – Nuclear and Process Safety*, Rev. 16-02b-MO, 1/30/17
- SRNL-TR-2018-00087, *Isotopic Distributions for the Surplus Plutonium Disposition Program*, Rev. 0, April 2018
- SRNS-TR-2016-00315, *Plutonium Oxide Characterization for Use in Radiation Dose Assessments Surplus Plutonium Disposition Program Dilute and Dispose Approach,* Rev. 0, 11/18/16
- SRNS-TR-2017-00195, *Safety Design Strategy for K-Area Complex Surplus Plutonium Disposition Project*, Rev. 0, September 2017
- WSRC-SA-2002-2005, *K-Area Complex Documented Safety Analysis*, Rev. 12, December 2016
- WSRC-SA-2002-2005, *K-Area Complex Documented Safety Analysis*, Rev. 13, May 2018
- WSRC-TS-96-20, *Technical Safety Requirements Savannah River Site K-Area Complex,* Rev. 43, December 2016
- U-CLC-K-00015, *K Area Complex Inputs and Assumptions*, Rev. 2, 7/26/2017
- U-CSDR-K-00001, *Conceptual Safety Design Report for the K-Area Complex Surplus Plutonium Disposition Project*, Rev. 0, May 2018

Interviews

SPD Project Personnel
- Project Nuclear Safety Manager
- Project Engineering Manager
- Project Design Authority
- Engineering Project Engineer
- Structural Lead Engineer
- Fire Protection Engineer

- HVAC Lead Engineer
- Electrical Lead Engineer
- Glovebox Lead Engineer

DOE/National Nuclear Security Administration Personnel
- National Nuclear Security Administration Federal Project Director
- DOE-SR Safety Basis Review Team Leader

Observations
- Building 105-K Facility Walkdown

Attachment 1
Summary of Discrepancies*

1. The ARF for events involving releases from containers at a pressure greater than 500 psig is not fully justified.

2. The safety function of the DF walls does not include providing confinement for the gaseous FSS.

3. The justification for selection of the gaseous suppression system is incomplete in the PFHA.

4. The ACVS does not include a functional requirement to prevent over-pressurization of the glovebox during a potential failure of the nitrogen supply line to the can puncture device, although the glovebox is credited to mitigate this event.

5. The safety function of the gloveboxes to maintain structural integrity during and after NPH events is not identified.

6. Some safety SSCs (i.e., epithermal neutron multiplicity counter, shielded cart, and ACVS) lack an adequate technical basis to demonstrate that the control can perform the required safety function for the design basis fire.

7. The SRL evaluation of the adequacy of key accident analysis parameters for the bounding fire events involving releases from pressurized containers provides an inaccurate basis for approval. The SRL incorrectly claims that the ARF values are consistent with DOE-HDBK-3010-94.

* These open issues have commitments for closure in the PDSA, amended SRL, or supporting documents.