Office of Enterprise Assessments
Assessment of Safety System Management at the Savannah River Site Defense Waste Processing Facility

September 2017

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

APO&C	Assessment Performance Objectives & Criteria
AQM	Automated Qualification Matrix
BOPM	Balance-of-Plant Manager
CFR	Code of Federal Regulations
CGD	Commercial Grade Dedication
CM	Corrective Maintenance
CMGT	Configuration Management
CRAD	Criteria and Review Approach Document
CSE	Cognizant System Engineer
DAE	Design Authority Engineer
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
DWPF	Defense Waste Processing Facility
E&I	Electrical and Instrumentation
EA	Office of Enterprise Assessments
EDWS	Electronic Document Workflow System
EEP	Emergency Electrical Power
EPFM	Engineering Plant and Facilities Management
ESI	Engine Services, Inc.
FE	Facility Engineer
FR	Facility Representative
FSAR	Final Safety Analysis Report
HEPA	High Efficiency Particulate Air
IAP	Integrated Assessment Plan
IT	Information Technology
LCO	Limiting Condition for Operation
LW	Liquid Waste
M&TE	Measuring and Test Equipment
MAC	Material Access Center
NCR	Nonconformance Report
NFPA	National Fire Protection Association
NIST	National Institute for Standards and Technology
NMMP	Nuclear Maintenance Management Program
OFI	Opportunity for Improvement
OGP	Melter Off-Gas Process
ORPS	Occurrence Reporting and Processing System
ORPS–PAR	Occurrence Reporting and Processing System–Performance Analysis Report
PdM	Predictive Maintenance
PM	Preventive Maintenance
QA	Quality Assurance
SAC	Specific Administrative Control
SC	Safety Class
S/CI	Suspect/Counterfeit Item
SDD	System Design Description
SHR	System Health Report
SM	Shift Manager
SPF	SmartPlant Foundation
S/RID	Standards/Requirements Identification Document
SRNS	Savannah River Nuclear Solutions, LLC

DOE-SR	DOE Savannah River Operations Office
SRR	Savannah River Remediation, LLC
SRS	Savannah River Site
SS	Safety Significant
SSCs	Structures, Systems, and Components
SSO	Safety System Oversight
STAR	Site Tracking, Analysis, and Reporting
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
VCRM	Vitrification Control Room Manager
VCRO	Vitrification Control Room Operator
WDED	Waste Disposition Engineering Division
WP	Work Package

Office of Enterprise Assessments
Assessment of Safety System Management at the
Savannah River Site Defense Waste Processing Facility

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 a safety system management assessment of the emergency electrical power system and the melter off-gas system at the Savannah River Site (SRS) Defense Waste Processing Facility (DWPF). The Office of Environmental Management Savannah River Operations Office (DOE-SR) has overall responsibility for the site. Savannah River Remediation, LLC (SRR) is the DOE-SR prime contractor for liquid waste at SRS, which includes operation of DWPF, but operates under the umbrella of sitewide work processes established by the management and operating contractor for the site, Savannah River Nuclear Solutions, LLC (SRNS).

EA conducts safety system management assessments to evaluate site processes for monitoring, maintaining, and operating safety-related systems to ensure their continued capability to reliably perform their intended safety functions. EA selected specific systems for this assessment, with input from DOE-SR, based on these systems' importance to nuclear safety during operation of the facility. The assessment scope included safety basis implementation in the design, configuration management, operations, maintenance, quality assurance, technical support, and feedback and improvement processes.

EA found three areas where SRR's activities and processes constitute best practices worthy of emulation on other DOE projects:

- SRR partnered with a nuclear power industry group to determine an acceptable alternative diesel generator lubricating oil when the oil in use became unavailable.
- Human performance error reduction tools are highly integrated into the maintenance work process.
- Operations uses an automated tool linked to the watchbill for control room staffing to track proficiency hours for individual operators and aid in ensuring their continued qualification.

EA also noted positive attributes in several other areas:

- SRR engineering procedures are generally straightforward and detailed, supporting the development of quality products. The tracking process for resolution and closure of open items is effective.
- Effective implementation of quality assurance measures was evident in many of the processes reviewed and most activities observed.
- Maintenance workers exhibited good questioning attitudes and a determination to get the work done correctly.
- The system health reporting process utilizes both monthly and annual reviews to establish an effective means of tracking safety system status.
- DOE-SR facility representatives and facility engineers assigned to DWPF are highly knowledgeable of the facility and safety-related systems. Field office oversight efforts are comprehensive, exhibiting active involvement in tracking and evaluating contractor performance.

The reviewed safety systems are, in general, managed by SRR in a manner that adequately ensures their continued reliable functionality. However, EA identified some deficiencies. Most notably, there is an insufficient technical basis for National Fire Protection Association (NFPA)-1 compliance for the 292-S diesel generator battery rooms ventilation flow. Other SRR engineering documents lacked adequate

technical justification in some cases. The maintenance work package planning process is not being implemented in accordance with the procedure, and there are weaknesses in the maintenance training process. The configuration management program is inadequately documented and the implementation plan does not address most areas identified by DOE STD-1073-2003, *Configuration Management*. Finally, the SRR self-assessment program is ineffective in its review of configuration management.

Office of Enterprise Assessments
Assessment of Safety System Management at the
Savannah River Site Defense Waste Processing Facility

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 safety system management at the Savannah River Site (SRS) Defense Waste Processing Facility (DWPF). This assessment was conducted within the broader context of an ongoing program of assessments of the management of safety systems across the DOE complex at hazard category 1, 2, and 3 facilities. The purpose of this EA effort is to evaluate processes for monitoring, maintaining, and operating safety systems to ensure their continued reliable capability to perform their intended safety functions.

EA performed this assessment of the SRS DWPF from May 8 through June 15, 2017.

2.0 SCOPE

EA evaluated management of the safety significant (SS) emergency electrical power (EEP) system and melter off-gas process (OGP) system. The assessment scope included the design, operation, maintenance, testing, technical baseline, configuration management (CMGT), system engineering, and issues management processes as applied to the selected systems. Assessment of OGP system operation was prevented by the melter replacement activities underway; however, all other aspects of the system were examined.

EA also reviewed the Federal oversight process as implemented by Office of Environmental Management Savannah River Operations Office (DOE-SR) personnel.

3.0 BACKGROUND

The DWPF is a hazard category 2 facility comprised of several structures within the S-Area of SRS. The facility processes liquid radioactive waste from the F-Area and H-Area tank farms into borosilicate glass for geological disposal.

Oversight of the DWPF is the responsibility of DOE-SR, as mentioned above. Savannah River Nuclear Solutions, LLC (SRNS) is the SRS management and operating contractor, with many cross-cutting responsibilities that impact operations for other SRS prime contractors. Savannah River Remediation, LLC (SRR) is a separate prime contractor to DOE-SR for liquid waste operations, including operation of the DWPF. In most respects, SRR operates under the sitewide processes maintained by SRNS. Many of the upper-tier procedures referenced in Section 5.0 of this report are sitewide procedures. Those that are not are designated with an 'A' at the end of the procedure number. For example, Procedure E7 2.31A, *LW* [Liquid Waste] *Engineering Calculations*, is applicable to SRR only. Lower-tier procedures, such as facility operating procedures, are also SRR-specific.

In 2014, SRR identified a potential inadequacy in the safety analysis after a determination was made that the melter explosion control strategy may have been based on a non-conservative temperature interlock setpoint versus feedrate correlation. SRR took an initial action to prohibit the use of bubblers (source of

non-conservatism) while feeding the melter. Subsequent analysis resulted in a decision to limit the radioactivity level in the waste stream feed to the melter such that melter bubbler operation could resume until reanalysis using design basis feed constituents could be completed and implemented. This feed stream reduction was reflected in an update to the final safety analysis report (FSAR) for DWPF and allowed temporary changes to be made in the classification of some systems and components. The OGP has been reclassified from safety class (SC) to production support (non-safety). However, SRR continues to treat the OGP components as safety related to preserve the pre-existing higher pedigree and avoid any back-fitting analysis to support a future anticipated return to the original system classifications.

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, findings, and opportunities for improvement (OFIs)" as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also highlighted in the report and summarized in Appendix C. These deficiencies should be addressed consistent with site-specific issues management procedures.

As identified in the assessment plan, this assessment considered requirements related to all aspects of safety-related system management. EA used Criteria and Review Approach Document (CRAD) 31-15, *Safety Systems Management Review*, in its entirety to examine contractor and field office performance relative to the criteria and lines of inquiry for successful safety system management identified therein.

EA examined key documents, such as system descriptions, work packages (WPs), procedures, manuals, analyses, policies, training and qualification records, and numerous other documents. EA also conducted interviews of key personnel responsible for developing and executing the associated programs; observed maintenance and operations activities; and walked down accessible portions of the selected systems, focusing on physical attributes of the system installation. The members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. A detailed list of the documents reviewed, personnel interviewed, and observations made during this assessment, relevant to the findings and conclusions of this report, is provided in Appendix B.

EA has not conducted a recent assessment of the DWPF. Therefore, there were no items for follow-up during this assessment.

5.0 RESULTS

5.1 Engineering Design

This section discusses EA's assessment of the engineering processes and products related to the targeted systems. EA reviewed technical documents describing the design of the systems and examined implementing procedures to assess the processes used to develop and maintain those documents.

Criteria:

Objective: Engineering design documents and analyses are technically adequate and implement the requirements of the documented safety analysis such that adequate protection of the public, the workers, and the environment from facility hazards is demonstrated. (DOE-STD-3009-2014, Preparation of Nonreactor Nuclear Facility Documented Safety Analyses; 10 CFR 830, Nuclear Safety Management, Part 122)

Criteria:

1. *Engineered systems, structures, and components and processes are designed using sound engineering/scientific principles and appropriate standards. (10 CFR 830.122 Criterion 6)*
2. *Engineering design incorporates applicable requirements and design bases in design work and design changes (e.g., design calculations). (10 CFR 830.122 Criterion 6)*
3. *The adequacy of design products is verified or validated by individuals or groups other than those who performed the work. (10 CFR 830.122 Criterion 6)*
4. *Verification and validation work is completed before approval and implementation of the design. (10 CFR 830.122 Criterion 6)*
5. *Problems identified related to engineering performance and/or products are documented and corrected in a manner that prevents recurrence. (10 CFR 830.122 Criterion 3)*

Engineering Process Review

EA reviewed engineering processes for most primary engineering design functions, including preparation and approval of drawings, calculations, and design changes. The results are briefly summarized below:

- SRNS engineering procedures E7 2.30, *Drawings*; E7 1.05, *Technical Baseline Identification*; and E7 2.60, *Technical Reviews*, were adequate, straightforward, and detailed.
- SRR Procedure E7 2.31A, *LW* [Liquid Waste] *Engineering Calculations*, includes well-defined requirements for calculation origination, review/checking, verification, and approval. It requires that calculations supporting a design change be in "confirmed" status with no open items before the implemented change is placed into service. It also requires inputs to have a verified source reference. If an assumption is not technically justified, the procedure requires an open item to be created to document the assumption.
- S4-ENG.51, *Verification and Checking of Technical Documents*, documents an adequate checking and design verification process.
- S4-ENG.15, *Technical Baseline for Liquid Waste*, defines the general document categories (i.e., essential, support, general). It also identifies the system design descriptions (SDDs) as General category documents, in conflict with the typical recommended categories in E7 1.05.
- E7 2.05A, *LW Modification Traveler*, defines an adequate process for preparation of design changes by the SRR Design Services organization.
- S4-ENG.10, *Engineering Technical Review for Liquid Waste*, documents the process used to confirm that any open items in engineering documents supporting a modification are resolved prior to return to service of any affected plant structures, systems, and components (SSCs). S4-ENG.10 works in conjunction with the Operations Acceptance Checklist, which has a section for engineering to confirm closure of open items, and requires that the Design Authority verify closure of open items prior to return to service. This process proved to be an acceptable method of ensuring tracking and closure.

Engineering Output Review

EA's technical baseline review included a sampling of engineering calculations, drawings, and change packages. The calculations reviewed covered a wide timeframe, reflecting increased documentation rigor in the most recent efforts. Legacy calculations were reviewed as information sources. The more recent calculations were of good quality, clearly presenting results and technical basis, and identifying open issues where necessary. SRR Procedure E7 2.31A requires calculations with open items to be statused as Preliminary, with multiple means available to document that status for subsequent follow-up.

During a tour of the diesel generator building, EA questioned what provisions had been made for adequate ventilation in the battery rooms for each diesel to prevent buildup of hydrogen generated in the charging process. The doors for both rooms are fire doors, providing minimal capacity for air flow. SRR provided ventilation diagrams which showed both supply ducting and exhaust ducting for each room, with the exhaust duct topped by a blower on the roof of the structure. Engineers for the ventilation system stated that DWPF is committed to meet National Fire Protection Association (NFPA)-1 requirements, which are based on room size and mandate a continuous flow of 195 cubic feet per minute (cfm) for each battery room. There is no flow measuring instrument on either the supply or exhaust line for either room, although lights outside the doors to the battery rooms indicate that the blowers are functioning. An alarm to signal blower failure in the control room was modified in 2003 to 'log only' with no apparent technical justification or basis. There is also no flow model or other calculation to predict actual flow through these portions of the ventilation system. The blowers are nominally sized at 400 cfm; however, with no flow measurement and no calculation to estimate flow path resistance, actual flows are indeterminate. Based on these observations, insufficient technical basis exists to establish compliance with NFPA-1 requirements for ventilation flow through the diesel battery rooms to mitigate hydrogen generation during battery charging. **(Deficiency)**

The engineering design review included a limited sampling of eight design change packages. Most of the packages were technically adequate, clearly indicating the required changes and providing a basis for the proposed changes in the package or referencing other documents for technical justification for the changes. Two packages did not include technical justification: **(Deficiency)**

- J-DCF-S-02657, *Lowering of BUOGCT Low Level Limit*, lowered a tank low-level alarm setpoint from 4000 gallons to 3000 gallons to provide additional volume in the tank for inflow prior to receipt of a high-level alarm. It did not address the technical adequacy of this change, which might have affected related components such as pumps (reduced suction head, cavitation, vortex generation).
- J-DCF-S-02618, *S350-ZZZF-3346 Replace Quencher Flow Transmitter*, replaced a transmitter (not like-for-like) with no assessment of potential performance impacts or adequacy.

Engineering Participation in the Corrective Action Process

EA reviewed engineering participation in the Site Tracking, Analysis, and Reporting (STAR) system, the corrective action process in use across SRS and administered by SRNS. Procedure Q22 CAP-1, *Corrective Action Process*, is the governing procedure. This portion of the assessment focused on issues assigned to Engineering for resolution and closure. EA performed a limited sampling of STAR items from a list provided by SRR based on CLOSED status, coded to the EEP or OGP system, assigned to Engineering, and closed in last 12-13 months. Significant issues had commensurate increased levels of detail, addressing both extent of condition and recurrence control where appropriate, and included comprehensive corrective action plans. No issues were identified.

Engineering Design Conclusions

SRR engineering processes at DWPF, including those based on SRNS upper-tier procedures, are generally comprehensive and fundamentally sound. The procedures and the process for handling/closure of open items are effective. The corrective action process as implemented within the Engineering organization was also effective, with appropriate corrective actions and recurrence control.

EA identified two deficiencies in the review of Engineering outputs, including insufficient technical basis for the diesel battery room ventilation system and missing technical justifications for two design change packages.

5.2 Quality Assurance

This section discusses EA's assessment of quality assurance (QA) implementation to ensure that safety systems will conform to required standards and perform as designed. EA evaluated key aspects of component procurement documents, receipt inspection/commercial grade dedication (CGD) performance, measuring and test equipment (M&TE), and critical spare parts management.

Objective: Quality assurance practices and processes are implemented in a manner that ensures safety systems will conform to required standards and perform as designed. (10 CFR 830 Subpart A)

Criteria:
1. *Requirements are established for procurement and verification of items and services. (10 CFR 830.122 Criterion 7)*
2. *Processes are established and implemented that ensure that approved suppliers continue to provide acceptable items and services. (10 CFR 830.122 Criterion 7)*

As noted in Section 3.0, limits currently in place on the waste stream to be processed at DWPF have, at least temporarily, allowed the OGP system classification to be reduced. EA examined the procurement quality attributes of six selected safety-related components:

- Melter Off-Gas FISL 3221A Film Cooler Air Low Flow Switch – SC
- Melter Off-Gas S350-TCV-3682, Steam Valve – SC
- Diesel Generator Panel G200C Relay – SS
- Diesel Generator S956-SSHL-8616X Switch – SS
- Diesel Generator Diesel Engine Lubricating Oil – SS
- Diesel Generator S956-TI-8643X Temperature Gauge – SS.

Procurement Documents

Cognizant system engineers (CSEs) for the OGP and EEP systems were knowledgeable of the SRNS/SRR procurement process, including CGD. Both understood the applicable procedures and automated tools. Training records confirmed that both CSEs completed the SRR procurement training class, WENG0241, *Procurement Practices at SRR*, and that the EEP CSE completed the SRR CGD training class, WSRI0180, *CGD Training*. EA observed adept use of the engineering records system, SmartPlant Foundation® (SPF), to obtain safety systems component procurement information from the technical baseline.

SRR procured each of the six components as commercial items subject to the SRR CGD process, consistent with procedures. Material and Service Requests for the items included design/performance

specifications and functional classifications consistent with the technical baseline documents, and appropriately specified technical and quality requirements directly or by reference to, for example, data sheets, specifications, testing codes and standards, instructions, and receipt inspection/CGD plans. Material and Service Requests also appropriately identified suspect/counterfeit item (S/CI) controls, packaging, shipping, and receiving instructions, and required any supplier deviation disposition reports to be reported in a standardized format and approved prior to delivery.

One of the EA-sampled procurements was particularly effective. SRR partnered with a nuclear power industry group (Engine Services, Inc. – Electromotive Diesel (ESI-EMD) Diesel Generator Owners Group) facing the same need to select a replacement diesel generator lubricating oil in response to the phase out of the current type in use. The ESI-EMD industry group performed extensive study and performance analysis to ensure that the replacement oil was acceptable. SRR saved considerable time and resources by adopting this information. EA considered this a **Best Practice**.

Receipt Inspection/Commercial Grade Dedication

Procured item receipt normally occurs at the SRNS N-Area receiving warehouse, which EA previously examined in September 2016. Occasionally, procurement documents specify item shipments directly to DWPF, where DWPF receiving personnel perform receipt inspection. Such items include bulk materials, chemicals, and physically large items. While DWPF did not receive any shipments during this EA assessment, EA observed a DWPF receipt inspector performing a receipt inspection activity for bulk fly ash in support of the Saltstone Facility. The certified inspector, confirmed by review of certification records, methodically fulfilled all designated inspection requirements and collected all required vendor documents. None of the sampled procurements involved the identification of a Nonconformance Report (NCR). However, the receipt inspector effectively communicated the proper processing of an NCR and subsequent item segregation until the NCR is dispositioned. He also appropriately described an example of an NCR he identified regarding the incomplete information on a Certificate of Analysis, indicating his familiarity with the system.

Procurement items with completed CGD packages are securely stored in the DWPF Material Access Center (MAC) until removed for installation. The MAC is a controlled Level B storage building (protection from the effects of temperature extremes and humidity) with roped-off access bearing restricted access signs and a locked entry door. Interior storage rooms provided ample accommodation for various size SC/SS components and bulk materials. Components stored in bins were properly "Green" tagged, indicating completed CGD activities and traceability to the QA documentation.

Receipt inspection records demonstrated proper intake processing consistent with the approved CGD plan, which provides assurance that SRR acquired the proper safety components for DWPF. Receipt inspectors who verified acceptable completion of the CGD inspection plans for three EA-sampled components were all appropriately qualified at the time of their acceptance activities. One of the sampled procurements, Melter Off-Gas S350-TCV-3682, Steam Valves, was in the construction department's lay-down yard Level B storage building awaiting installation, as the WP was not yet complete. The components were properly stored off the ground on pallets, covered with the original shipping box, and properly tagged with the appropriate information traceable to the procurement documents. The tag indicated the requirement for post-installation testing consistent with the reviewed CGD inspection plan. Interviews of the CSEs indicated that they rely on the QA inspection personnel to ensure adequate performance of CGD inspection and testing; CSEs are only involved if QA personnel have technical questions. This delineation of duties is an acceptable practice.

With one exception discussed below, CGD reports incorporated the appropriate critical characteristics and acceptance criteria consistent with the Design Authority's approved and verified CGD plans documented

in the technical baseline. Two of the five sampled procurements involved replacement of existing SSCs with alternate components. For these procurements, SRR appropriately completed required item equivalency determinations by qualified engineers with independent checks and unreviewed safety question (USQ) screening determinations. For example, the October 2016 S350-TCV-3682 Steam Valve procurement required a technical analysis of the replacement valve, which weighed 55% more than the current valve. SRR Engineering appropriately conducted a field walkdown to develop as-built drawings; analyzed deadweight, thermal, and seismic loads using an SRR-approved design tool (AutoPIPE®); documented the analysis as a Design Authority Technical Review; and obtained the required USQ (USQ-WD-2016-00183).

However, the recent procurement of the diesel generator oil was inconsistent with SRR's other EEP-sampled components procured as SC (E-CGD-S-00190 (Panel G200C Relay), E-CGD-S-00282 (S956-SSHL-8616X Switch), and J-CGD-S-00229 (S956-TI-8643X Temp Gauge)). This difference does not affect the item performance, but would require a future back fit analysis to raise the safety classification of the oil to SC, if needed. Additionally, the EEP SDD (and changes) does not address the diesel generator oil.

SRR properly procured the Diesel Generator S956-SSHL-8616X Switch as a commercial item subject to the CGD process. However, SRR QA could not find the final dedication's critical characteristics quality verification records. SRR immediately entered a STAR Item, 2017-CTS-006626, *Missing Completed Commercial Grade Dedication Packages for Work Packages*.

Measuring and Test Equipment (M&TE) Calibration

EA examined M&TE calibration performance to ensure appropriate verification of items and services. During a walkdown of the M&TE room, EA sampled three M&TE instruments used in the performance of safety system component calibration activities. SRR does not calibrate any M&TE at DWPF; the SRNS Calibration Laboratory or a subcontracted service provides all DWPF M&TE calibrations. The sampled instruments were properly labeled, stored, tracked, and maintained in a calibrated state ready for use. Each instrument possessed a current calibration certificate with traceability to National Institute for Standards and Technology (NIST) standards. Each instrument was properly labeled with the last calibration date and the next calibration due date that aligned with the electronic records system. The instrument calibration intervals were consistent with the manufacturer's specifications. SRR's hard copy calibration records system at DWPF is highly organized, stored in fire-proof cabinets in a room with a sprinkler system, and facilitated rapid retrieval of selected record samples.

Critical Spare Parts Management

EA examined SRR's management of critical spare parts to ensure procurement and verification of items and services that are time sensitive. Over the past year, SRR has implemented an asset criticality ranking system to prioritize safety system components for critical spare parts management. The EEP CSE identified 880 unique components, and the OGP CSE identified 216. However, SRR currently cannot automatically match the lists of unique critical spare components with the current procurement database to determine whether there are any gaps in critical spares assumed to be in stores; CSEs have to make inquiries manually, one component at a time. SRR is aware of this problem and provided evidence of a request on June 17, 2016, to the SRR information technology (IT) department to develop an automated tool for the CSEs to acquire this information. To date, the IT department has not taken any action on this request. Consequently, there is a vulnerability of not having an OGP or EEP critical spare in stock as expected. (See **OFI-SRR-1**.)

Qualified Vendors

SRR did not purchase any of the EA-sampled components from qualified vendors. However, SRR acquired SS diesel generator overhaul services from ESI, a qualified vendor. SRR appropriately added ESI to the SRR Qualified Suppliers List on January 22, 2015 (with a requalification due date of November 13, 2017), based on a comprehensive qualification audit by two qualified SRR QA auditors on December 8, 2014, resulting in no findings, deficiencies, or observations. SRR also appropriately conducted a CGD surveillance of ESI in February 2017, since the statement of work included ESI procurement of overhaul parts. This effort represented an adequate surveillance.

Quality Assurance Conclusions

Overall, sampled components of the OGP and EEP systems indicate that SRR has procured replacement parts consistent with technical baseline specifications. Procurement documents indicate that SRR is consistently following their procurement processes. SRR has adequately qualified safety system components procured from non-qualified vendors in accordance with the SRR CGD process, although verification records for one of the sampled procurements are missing. SRR receipt inspections at DWPF verify component conformance with procurement document requirements and provide adequate component tagging to ensure traceability of components to their QA pedigree. M&TE at DWPF is appropriately calibrated and traceable to NIST standards. Verification of documentation and/or EA observations of SRR procurement documents, receipt inspections, and M&TE calibrations provide confidence that SRR is using qualified replacement parts to maintain these safety systems' abilities to perform their safety-related functions. While SRR is attempting to effectively maintain critical spare parts as evidenced by spare parts lists, the absence of automated tools precludes effective confirmation of the onsite storage inventory.

5.3 Configuration Management

This section discusses EA's assessment of the DWPF CMGT program based on the requirements of DOE-STD-1073-2003, *Configuration Management Program*.

Objective: Configuration management programs and processes are adequate to ensure safety systems continue to meet safety basis requirements and changes are properly controlled. (DOE Order 413.3B Attachment 2, DOE Order 420.1B Chapter V (or DOE Order 420.1C as applicable to the facility), and DOE-STD-1073-2003 if applicable).

Criteria:

1. *The configuration management process adequately integrates the elements of system requirements and performance criteria, system assessments, change control, work control, and documentation control. (DOE Order 413.3B Attachment 2, DOE Order 420.1B Chapter V (or DOE Order 420.1C as applicable to the facility), and DOE-STD-1073-2003 if applicable)*
2. *Configuration management is used to develop and maintain consistency among system requirements and performance criteria, documentation, and physical configuration for the SSCs within the scope of the program. (DOE Order 420.1B Chapter V)*
3. *System design basis documentation and supporting documents are kept current using formal change control and work control processes. (DOE Order 420.1B Chapter V)*
4. *Applicable requirements and design bases are incorporated in design work and design changes. (10 CFR 830.122 Criterion 6)*
5. *Changes to system requirements, documents, and installed components are formally designed, reviewed, approved, implemented, tested, and documented.*

6. System piping and instrumentation diagrams (P&IDs) have been prepared, are maintained, and reflect the installed configuration of the associated safety system. (DOE-STD-1073-2003 Section 6.4)

DOE-STD-1073-2003 establishes five essential elements of a successful CMGT program. Those elements, addressed individually below, are implemented at DWPF through a combination of SRS sitewide processes and SRR-specific processes. This approach enhances flexibility in personnel assignments across the many facilities at SRS but, at the same time, results in a more loosely defined program, lacking specifics and permitting multiple methodologies to accomplish required functions.

DWPF has no overall CMGT program description. SRNS Manual 1-01, Management Policy 5.39, *Configuration Management*, defines high-level expectations and broad responsibilities but is not specific to DWPF. The SRR Standards/Requirements Identification Document (S/RID), SRR-RP-2009-000558-003, lists 21 sitewide procedures that implement portions of the overall CMGT program. It asserts that the program is in compliance with the requirements of DOE Order 420.1C, *Facility Safety*, but does not mention DOE-STD-1073-2003. Most aspects of a CMGT program as defined in both the order and the standard were adequately implemented at DWPF, as described in more detail below.

A recently updated SRNS manual, E7-1.05, *Technical Baseline Documentation*, addresses the five elements of CMGT as stated in DOE-STD-1073-2003. However, G-ESR-S-00017, *Liquid Waste Organization Waste Solidification Area Project Facilities Configuration Management Implementation Plan*, (the implementation plan applicable to DWPF) does not define a program that complies with either DOE Order 420.1C or E7-1.05. After EA brought this issue to the attention of SRR, the CMGT program manager created STAR Item 2017-CTS-006631 to update the CMGT implementation plan. **(Deficiency)**

Technical Baseline

Due to current limits on the waste stream that can be processed at the DWPF, many of the previously required SC SSCs no longer serve a safety-related function, and the FSAR at DWPF was updated accordingly. The OGP system functional classification is no longer designated as SC in the documented safety analysis (DSA); however, the system is being maintained to the pedigree of an SC system with the expectation that currently imposed limits will be removed in the future. EA identified a discrepancy between what the stated classification was in the FSAR and SDD for the OGP system; per Manual S4 ADM.64, *Safety Basis Document Implementation Process*, SDDs must be revised to reflect safety basis document changes. EA brought this matter to the attention of the Design Authority, and the SDD was formally amended during the review to reflect consistency with the FSAR (DCF G-DCF-S-00370). Based on EA's review of this area and the engineering output review discussed in Section 5.1, the DWPF technical baseline for the EEP and OGP systems is adequately defined and documented.

Design Change Control

The processes for design change control defined in procedures (E7 2.05, *Modification Traveler*; E7 2.37, *Design Change Form*; and E7 2.38, *Design Change Package*) are well constructed and in compliance with DOE requirements. Preparers (normally the CSEs or the Design Services Group) are required to identify both design input documents and other related documents that might be impacted by the planned change. Implementation processes are structured to establish and maintain configuration control through package closure. Requirements documents may also be prepared for large modifications. The CSEs are involved in every stage of the preparation process and again at closure. EA reviewed six design change packages for both the EEP system and the OGP system and found them to be of good quality and compliant with DOE requirements related to design change control.

Work Control

Work control aspects of CMGT are addressed in Section 5.4, below. Implementation of changes to the facility configuration is controlled by maintenance processes and procedures.

Document Control

A single document control process is in use throughout SRR. SRR uses SPF to process revisions to engineering documents and site-specific procedures. SPF has fields where the preparer can enter metadata on design input documents as well as references, although such entries are voluntary. Once approved, document revisions go to central document control and are entered into the Engineering Plant and Facilities Management database (EPFM), a sitewide records management repository for record copies of engineering documents and procedures. Maintenance information is kept on a third system, Asset Suite. Correspondence, USQs, reports, and other non-engineering documents go to yet another system, the Electronic Document Workflow System (EDWS), which receives daily updates from EPFM. This configuration represents a possible error-likely situation in that, in effect, the record copy of a drawing, calculation, procedure, etc., is available from both EPFM and EDWS and a non-record copy is available from SPF. EPFM and EDWS are based on a Documentum platform and conform to DOE-STD-1073-2003 minimum requirements for records control. However, use of these sitewide document control processes prevents facility-specific use of Documentum capabilities to track relationships between documents, such as predecessor-successor relationships between upper-tier and lower-tier records (e.g., piping and instrumentation drawings and calculations).

DOE-STD-1073-2003 requires that documents important to the facility or facility activities are properly stored and allow for timely document retrieval. EA discovered that a significant backlog of completed work orders and other facility documents were not available in EDWS. Additionally, the number of work orders completed from the beginning of the year was 1,295; however, the backlog of documents not in EDWS, to date, was in excess of 3,836. The SRR EDWS point of contact stated that the backlog was created when SRNS stopped accepting shipment of documents from SRR until process-related issues with the EDWS were resolved. The resolution process took approximately a year and a half. Due to an agreement in place between SRR and SRNS based on their respective contracts with DOE, only a limited number of boxes are authorized for shipment from DWPF. While the shipment of boxes of records has resumed at DWPF, work-off of the backlog is expected to take several months or more to complete.

Assessments

Assessments of the CMGT program comprise the final essential element of CMGT as defined in E7-1.05. DOE Order 420.1C lists assessments as an area that the contractor must address. However, self-assessments examined by EA in the area of CMGT were narrow in scope and shallow, providing little added value.

The SRR S/RID for Configuration Management, Table 1, specifies that system assessments are conducted in accordance with SRR manual E7 3.4, *SSC Performance Monitoring*. This procedure equates assessments to the system health reports (SHRs) and does not provide any expectation for CSEs to assess system physical configuration as compared to system documentation to fully satisfy DOE 420.1C. EA noted that only one assessment was conducted to verify field configuration to as-designed documentation for the OGP system and that was last completed in 2008. **(Deficiency)**

Configuration Management Conclusion

The CMGT process for DWPF is functional and adequate to control the physical configuration of the facility. However, requirements are dispersed over 20 sitewide procedures, and no governing CMGT program document is in place. The CMGT implementation plan is currently being updated to correspond to the elements of CMGT in E7 1.05, which is consistent with DOE-STD-1073.

EDWS, the SRNS records management repository, is currently facing an extensive backlog due to past process-related issues. This issue is outside the control of SRR, yet has substantially impacted recordkeeping for DWPF. Finally, EA found that the contractor assessment program in this area is narrow in scope and limited, producing few actionable results and rarely addressing actual physical configuration.

5.4 Maintenance

This section of the assessment evaluates SRR performance in maintaining safety systems so that the systems can reliably perform when required.

Objective: Maintenance activities are properly planned, scheduled, and performed to ensure that safety systems can reliably perform intended safety functions when required. (DOE Order 433.1B)

Criteria:

1. *The safety system is included in the nuclear facility maintenance management program and the DOE approved Nuclear Maintenance Management Plan required by DOE Order 433.1B.*
2. *Maintenance processes for the system are in place for corrective, preventive, and predictive maintenance and to manage the maintenance backlog; and the processes are consistent with the system's safety classification. (DOE Order 433.1B Attachment 2)*
3. *The system is periodically inspected in accordance with preventive maintenance requirements.*
4. *The reliability of the SSC is maintained through performance of vendor recommended preventive maintenance requirements.*
5. *Maintenance activities associated with the system, including work control, post-maintenance testing, material procurement and handling, and control and calibration of test equipment, are formally controlled to ensure that changes are not inadvertently introduced, that the system fulfills its requirements, and that system performance is not compromised. (DOE Order 420.1B, Chapter V and DOE Order 433.1B Attachment 2)*

EA assessed selected elements of the SRR maintenance program implemented at DWPF, including plans and programs; corrective maintenance (CM), preventive maintenance (PM), and predictive maintenance (PdM); periodic inspections; maintenance configuration control and conduct; training; and processes for precluding introduction of S/CIs. Assessment activities also included:

- Detailed walkthroughs of selected portions the OGP and EEP systems
- Review of a sample of CM, PM, and PdM records from the previous two years for the selected systems
- Interviews with key Maintenance organization management and staff
- Review of the Occurrence Reporting and Processing System (ORPS) reports from the last three years
- Observation of maintenance and calibration activities performed during the onsite planning and data collection periods
- Attendance at routine daily SRR Maintenance meetings.

At the beginning of the onsite assessment, the SRR maintenance manager stated that the maintenance process at DWPF was working well. The manager further stated that maintenance backlogs were manageable, but higher than normal due to the melter replacement outage in progress.

Nuclear Maintenance Management Plan and Program

Maintenance of safety system SSCs is acceptably addressed in the nuclear maintenance management program (NMMP), which includes DWPF, as required by DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*. The NMMP also complies with DOE Order 430.1B, *Real Property Asset Management*, as it relates to maintenance of those assets. The NMMP is implemented by an NMMP Description Document, which includes a matrix of NMMP requirements and corresponding implementing procedures. The description document acceptably meets the order requirements and has been approved by DOE-SR.

The PM program as described in the SRNS PM procedure (applicable to SRR) requires PMs to be scheduled and performed prior to the prescribed PM due date. For example, Manual 1Y, Procedure 5.02, *Preventive Maintenance Program*, Sections 4.9, 4.10, 4.11 include responsibilities for facility managers and maintenance management personnel to ensure that facility systems and resources are available so that PMs can be performed prior to the established due date. According to the DWPF maintenance manager, and from a review of records, it is routine practice for PMs to not be performed by the established due dates, with the exception of technical safety requirement (TSR) surveillance requirements, installed process instrumentation, and radiation protection instruments. There are no required management approvals for PMs to enter the grace period (typically 25% of the interval – maximum 90 days) following the PM due date, and many PMs even exceed the grace period. If a PM will exceed the grace period, a deferral form is prepared and approved with engineering justification for continued use of the SSC. There have been 121 PM deferrals for SRR for fiscal year (FY) 2017 as of the end of May 2017. Management's practice of allowing PMs to routinely enter the PM grace period is contributing to the PM backlog. EA discussed this issue with SRR management, and SRR entered the issue into the issues management system (STAR Item 2017-CTS-006802). **(Deficiency)**

Although not a requirement, DOE Guide 433.1-1A, *Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1B*, Section E.2.1.2 *Scheduling PMs*, states "Delays in the performance of scheduled PMs beyond their defined period should require escalating approval." Because SRR routinely allows use of the grace period without justification and approval from organizations such as systems engineering, operations, and facility management, the PMs are not being performed as intended.

The maintenance program is appropriately identified as a safety management program (FSAR Section 11.5.11.2.8 and TSR Administrative Control 5.8.2.8). Maintenance program self-assessments are conducted on selected individual elements of the program annually and independent assessments of the program are performed on a three-year cycle. EA reviewed the assessments performed during the last three years and did not identify any issues.

During the onsite portion of the assessment, the OGP and EEP systems were in an acceptable condition with only a few SSCs out of service or in an alarm condition. There were no temporary modifications observed on the OGP system, and all instrumentation requiring calibration was properly calibrated. Although no approved temporary modifications were installed on the EEP system, EA identified one unapproved temporary modification during a walkdown of the system. The modification involved a tygon hose attached to the DG 200 jacket water heater expansion tank and routed to a large poly bottle. The bottle contained several gallons of glycol solution. The temporary modification was discussed with balance-of-plant operators and the CSE, both of whom stated that the SRNS diesel services organization that performs most maintenance on the DGs installed the hose and poly bottle to prevent glycol that was

leaking past the fill cap on the expansion tank to spill on the floor beneath the tank. Contrary to Manual E7, Procedure 2.06A, *LW Temporary Modification Control*, this modification was installed outside the facility's temporary modification and work control processes. Section 1.0, *Purpose*, states "This procedure identifies the responsibilities, requirements, and process to ensure that Temporary Modifications (TM) made to configuration controlled structures, systems, and components (SSC) are adequately evaluated, authorized, and controlled." **(Deficiency)**

EA observed numerous hoses and temporary catch devices attached to other production support systems to compensate for leaking valves and other equipment or to periodically drain accumulated liquid to an adjacent drain trough. This condition has existed for more than a year, but SRR management considers these conditions to be outside configuration control. These conditions reflect poor housekeeping and CM, and have the potential to spread contamination or hazardous material. Although SRR management is aware of this condition and has taken certain actions to address the compatibility of hose material used in these applications (STAR Item 2016-CTS-001662), SRR has not identified any actions to correct the problem.

EA reviewed a sample of approximately 40 completed maintenance WPs (both CM and PM). Isolated noncompliances included work scope errors, inconsistent/missing use of placekeeping, and unclear documentation of work completion. EA discussed these items with SRR Maintenance management. However, in general, the work documentation was thorough and in good order.

In summary, SRR has implemented an acceptable maintenance program, and the selected safety systems were in good condition. However, managing PM performance to the grace period is adversely affecting the performance of the DWPF PM program. In addition, EA observed one unauthorized temporary modification on the EEP system.

Corrective, Preventive, and Predictive Maintenance

SRR has implemented acceptable CM, PM, and PdM processes at DWPF for the OGP and EEP systems. Although PdM techniques (e.g., vibration, thermography, ultrasound) are not applicable to the safety systems selected, PdM is performed on certain SSCs for other facility systems, such as vibration monitoring and temperature trending on ventilation fans. EA reviewed a sample of PdM work orders performed at DWPF and found no issues.

Maintenance processes are addressed in SRNS sitewide procedures and are consistent with the systems' safety designations. The work control process acceptably identifies the hazards, associated controls, and work steps for each activity.

PM activities for DWPF safety systems are performed by SRR maintenance mechanics and are developed for certain types of facility equipment. An exception to this is that most diesel generator maintenance is performed by the SRNS DG services organization as stated above. The maintenance activities associated with the OGP and EEP systems are discussed in associated SDDs and are generally consistent with industry practice for these systems. For example, diesel generator surveillance/PM tests are conducted in accordance with Section 3.8.3 of Nuclear Regulatory Commission NUREG-1431, *Standard Technical Specifications - Westinghouse Plants.*

Periodic Inspections

In addition to PM activities on the OGP and EEP systems, CSEs perform annual evaluations of the system through an SHR. These evaluations are supported by detailed system walkdowns. System availability, maintenance, and configuration attributes are analyzed for each safety system. The reports

evaluate data that relates to the system such as number of hours of availability during the period, the maintenance backlog for the system, and any system concerns. The evaluations are an acceptable means of periodic evaluations. (See Section 5.6.)

Performance Measures

The DWPF maintenance program utilizes a number of metrics to track maintenance performance, including CM backlog, deferred PM maintenance items, work window schedule performance, add-on and emergent versus total completed tasks, and delinquent PM work orders. Most of the performance measures represent an acceptable set of metrics that, when effectively implemented, are designed to identify maintenance issues needing corrective action.

Conduct of Maintenance

During the course of the assessment, EA observed pre-job briefings and numerous work activities. Human performance error reduction tools were integrated effectively into the performance of the work. During pre-job briefings, specific human performance error reduction tools related to the job activity were discussed and subsequently implemented as work was conducted. The reverse briefing technique was also consistently used during all pre-job briefs. (The supervisor conducting the pre-job brief asks each worker to state his/her understanding of the job he/she is about to perform, including the hazards that might be encountered and specific roles during the performance of work.) EA considers the integration of human performance error reduction tools into work performance and use of the reverse brief to be a **Best Practice**.

DWPF WP planning performed in accordance with procedure Manual S4, OPS-14, *Liquid Waste Facilities Work Control Procedure*, is not adequately following Section 4.U of the procedure. Section 4.U, Work Planner Function, lists the following responsibility for the planner, "Scheduling work package walkdowns and team planning AHA [assisted hazard analysis] meetings." EA found the actual practice is to only schedule walkdowns at the planners' discretion. The work planning manager indicated that managements' expectation was that the maintenance planners do not have discretion in scheduling maintenance walkdowns. SRR documented this issue in STAR Item 2017-CTS-006134.

EA also observed a sample of maintenance activities during the onsite portion of the assessment (six CMs and four PMs). For most of the observed activities, maintenance personnel were knowledgeable of the procedures and associated tasks, and adequately performed the maintenance.

However, EA observed the following issues during observation of maintenance activities.

- During the performance of an annual calibration of a ventilation Flow Indicating Transmitter 5059, the temporary power applied to the transmitter in the shop did not align with the configuration in a completed procedure step. The completed step stated to install a neutral wire, line wire, and a ground wire to the transmitter. However, only the neutral and line wire were installed by the performing technician. EA discussed this procedure violation with SRR management, who initiated STAR Item 2017-CTS-006780.
- During the pre-job brief for CM on nitric acid sump level switches (WP 1502363), the supervisor noted that the hard copy of the WP issued and approved for work did not include information that he had previously requested of the planner to be included. After comparing the hardcopy version with the version in the electronic maintenance system (Asset Suite), the supervisor determined that the hardcopy version was not the latest version of the WP. The maintenance manager issued

STAR Item 2017-CTS-006767 to address and correct this problem for which there is no current barrier to prevent recurrence because the WP stays as revision 0 until first performance.

- EA observed several WPs associated with restoration of the EEP battery banks following the failure of two SS batteries during testing. The WPs involved the removal/qualification of non-SS batteries (a total of four) from battery bank D-31 under WP 01581719 and installation of two of four newly qualified batteries in the safety-significant D-51 battery bank (WP 01581707, Tasks 1 and 2) that provides control power to one of two diesel generators. Although the work instructions required several field changes, the work was conducted acceptably.

  Subsequent to the installation and charging of the two batteries in the D-51 bank, the battery bank underwent surveillance testing (a load test). During the load test, another battery (Cell 9/10) failed. (See Figures 1 and 2 below.) Following this new failure, an additional task was prepared to remove one of the remaining newly qualified batteries to replace the failed Cell 9/10. This WP (01581707, Task 3) contained numerous weaknesses, including lack of detail regarding where work was to be conducted, failure to include a critical step (discussed in the pre-job briefing) in the work instructions for safely transporting the batteries from Building 951-S to Building 292-S, and omitting a required torque value for an interconnecting battery cell cable. In each case, the workers appropriately stopped work to get the WP instructions corrected after the issues were identified.

Figure 1. Failed Battery Cells 9/10

Figure 2. Cover of Cell 10 Highlighted in Red Oval where crack occurred

Based on limited-scope system walkdowns, configuration of the selected safety systems was consistent with as-built drawings and system alignment procedures. Maintenance of the OGP and EEP systems is conducted such that system configuration is adequately managed throughout the maintenance process.

Maintenance Training

SRR has implemented a training qualification program for maintenance workers (i.e., electrical and instrumentation (E&I) mechanics, and maintenance mechanics). The qualification program is a basic qualification that is the same for all facilities at SRS.

DOE Order 426.2, *Personnel Selection, Training, Qualification and Certification Requirements for DOE Nuclear Facilities*, which is in the SRR contract for DWPF, establishes requirements for DOE contractor training including technicians and maintenance personnel. Section b(3)(b) of the order states the following:

> Personnel who perform work on engineered safety features as identified in the facility Documented Safety Analysis must be trained on those system/components. Included in this category are systems having a direct impact on the safe operation of the facility. System training must, at a minimum, include the following elements:
>
> 1. Purpose of the system;
> 2. General description of the system including major components, relationship to other systems, and all safety implications associated with working on the system; and
> 3. Related industry and facility-specific experience.

Contrary to these requirements, the training program for SRR mechanics and E&I technicians (who perform work on systems having a direct impact on safe operation of the facility) does not include systems training and related industry and facility-specific experience. In addition, the formal qualification program for maintenance personnel does not qualify the individuals to perform the assigned tasks in DWPF. EA discussed these issues with SRR management, and they initiated STAR Items 2017-CTS-005530 and 2017-CTS-0006128 to address the issues. **(Deficiency)**

Procurement, Receipt Acceptance, and Suspect/Counterfeit Items

SRR has effectively implemented the SRNS sitewide requirements for procurement of safety system SSC spare parts through a group of engineering and QA procedures. See Section 5.2, *Quality Assurance*, of this report for additional details on procurement and spare parts.

SRR has implemented an acceptable process to guard against S/CIs. SRNS Manual 1B, Procedure 5.19, *Suspect and Counterfeit Item Program*, is used for the prevention, identification, evaluation, notification, and disposition of S/CIs. In addition, engineers and maintenance personnel receive initial and periodic training on the identification and disposition of S/CIs found in the facilities, so that, as work is performed and systems are walked down, any existing S/CIs can be identified and dispositioned. EA sampled training records for the required S/CI training and found no issues.

Maintenance Conclusions

In summary, SRR has established a maintenance program that adequately meets DOE Order 433.1B. SRR has addressed the requirements through implementation of the sitewide NMMP and its implementing documents. Procedures for conducting CM are effective in restoring functionality of safety system equipment following equipment failure. The work activities observed were performed in accordance with established controls, work hazards were properly identified and controlled, and maintenance workers exhibited good questioning attitudes, use of human performance error reduction tools, and conduct of operations behavior. The observed integration of human performance error reduction tools into work activities and use of reverse briefing techniques during pre-job briefs by SRR are identified as best practices. However, management attention is needed to improve maintenance technician training, and the scheduling and implementation of PMs to reduce the likelihood of equipment failure and increase safety system reliability.

5.5 Surveillance and Testing

EA assessed the DWPF surveillance testing program for the OGP and EEP systems to maintain compliance with the approved TSRs. Because the OGP system is presently not credited in the FSAR as a safety system and does not have any surveillance requirements defined in the TSR, this section will focus on the EEP system.

Objective: Surveillance and testing activities are properly performed in accordance with TSR Surveillance Requirements and Specific Administrative Controls.

Criteria:

1. *Requirements relating to test, calibration, or inspection assure: that the necessary operability and quality of safety structures, systems, and components is maintained; that facility operation is within safety limits; and that limiting control settings and limiting conditions for operation are met. (10 CFR 830.3 and Table 4)*
2. *Instrumentation and measurement and test equipment for the system are calibrated and maintained. (10 CFR 830.122 Criterion 8)*

The DWPF FSAR identifies the EEP system as a mitigating factor for some postulated hazard analysis events. The FSAR requirements have been properly flowed down to the TSRs and implementing procedures. The surveillance testing requirements are based on and are consistent with Nuclear Regulatory Commission NUREG-1431 for EEP diesel generators and associated batteries.

SRR has an effective process for managing the scheduled performance of surveillance testing, including a dedicated shift manager (SM) who is assigned to identify and schedule surveillances 120 days ahead of the due date. This practice has been effective in limiting missed surveillance tests, as evidenced by the fact that the last TSR violation related to surveillance testing was in January 2014.

The only surveillance test performed during the onsite portion of this assessment was an EEP system battery load test required by TSR SR 4.9.1.8. Procedure 257-8-SUR-1251, *Battery Bank D51 Service Test*, was used post maintenance to restore operability of the D51 battery bank following the battery failure discussed in Section 5.4 above. Even though the observed surveillance test could not be completed due to a second battery failure, the surveillance test was properly performed up to that point.

EA observed multiple daily and weekly operational TSR surveillance checks for the EEP system. The operations and maintenance personnel performing these surveillance activities were knowledgeable of the procedures and properly performed them.

EA also reviewed a sample of 22 surveillance testing packages completed during the last three years, including calibrations of TSR equipment and functional tests. All of the reviewed packages were properly completed and met established acceptance criteria.

M&TE Calibration Program

SRR has a single tool room that provides M&TE equipment for DWPF (and one other facility) and maintains the equipment in proper calibration. SRNS Manual 1Q, Procedure 12-1, *Control of Measuring and Test Equipment*, acceptably defines the requirements and responsibilities for control of standards and M&TE used to support calibration of EEP instrumentation. The M&TE observed during the onsite portion of the assessment was properly calibrated and maintained. (See also Section 5.2.)

Surveillance and Testing Conclusion

Surveillance testing, calibration, and inspection programs adequately maintain the SSCs associated with the EEP system in a condition that ensures the TSRs are satisfied. Surveillance testing of the EEP system demonstrates that all required components within the system are capable of accomplishing their safety functions when required. The M&TE maintenance and calibration program is well organized and effective. The observed EEP surveillance and testing activities for DWPF were generally performed properly and adequately translate the TSRs into useable procedures and programs.

5.6 Operations

This section discusses EA's assessment of the operations of the safety-related EEP system and OGP system at DWPF. Typical operations activities include daily surveillances and periodic functional checks, as well as responses to alarms. The full spectrum of surveillance and testing is discussed in Section 5.5, above. Due to the facility outage for replacing the melter during the time of the assessment, the OGP system was not in operation, so field observations were limited to the EEP system, which includes the two diesel generators and supporting components. When the OGP system is operational, it is controlled primarily by vitrification control room operators (VCROs) using the distributed control system. EA observed vitrification control room operations to assess how systems similar to OGP are operated.

EA also accompanied operations personnel on multiple occasions, primarily to observe performance of daily rounds, including daily surveillances associated with the safety-related diesel generators and their support systems. EA also observed several shift turnovers, logkeeping, lockout/tagouts, and control area activities.

Objective: Operations are conducted in a manner that ensures the safety systems are available to perform intended safety functions when required. (DOE Order 422.1, Conduct of Operations)

Criteria:

1. *The operator must establish and implement operations practices to ensure that shift operators are alert, informed of conditions, and operate equipment properly. (DOE Order 422.1, Conduct of Operations, Attachment 2)*
2. *The operator must establish and implement operations practices for developing and maintaining accurate, understandable written technical procedures that ensure safe and effective facility and equipment operation. (DOE Order 422.1, Conduct of Operations, Attachment 2)*
3. *The operator must establish and implement operations practices for initial equipment lineups and subsequent changes to ensure facilities operate with known, proper configuration as designed. (DOE Order 422.1, Conduct of Operations, Attachment 2)*
4. *Operator training must be sufficiently comprehensive to cover areas which are fundamental to the candidate's assigned tasks to ensure that personnel are capable of safely performing their job duties. The training program must include a core of subjects; such as instrumentation and control and major system facilities, as applicable to the facility and position. (DOE Order 426.2, Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities, Attachment 1 Chapter II.6)*
5. *The training program must include on-the-job and classroom training to ensure personnel are familiar with all aspects of their positions; including but not limited to: normal and emergency procedures, administrative procedures, location and function of pertinent safety systems and equipment, and TSRs. (DOE Order 426.2, Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities, Attachment 1 Chapter II.6)*
6. *Formal processes have been established to control safety system equipment and system status to ensure proper operational configuration control is maintained. (DOE Order 422.1, Conduct of Operations, Attachment 2)*

Conduct of Operations Program

Daily rounds for the diesel generator are recorded electronically using a handheld device. The rounds include a mix of daily surveillances for the diesel generators and support systems, as well as observation of other equipment located in the area. During performance of the rounds, EA found an exterior door to an electrical equipment room protected by a halon suppression system chocked open, despite the sign on the door that it should remain closed at all times due to the halon system. When EA notified the operator, he appropriately removed the chock, closed the door, and reported the incident to facility management. The facility manager had the night shift verify that no other doors associated with fire suppression systems were out of position. During other rounds observed by EA, operators were alert to off-normal conditions requiring attention.

DWPF shift turnovers are guided by a checklist, in accordance with SRNS Procedure 2S 4.1, *Shift Turnover*, and SRR Procedure SW4-V3-CO-20.9, *Logbooks (Key Positions) and Turnover Checklists*. EA observed turnovers being conducted by SMs, vitrification control room managers (VCRMs), balance-of-plant managers (BOPMs), and VCROs. All observed personnel conducted the turnovers in accordance with the procedure and in a professional manner, with a discussion of logbook entries, facility conditions, and status of work in progress.

EA also observed logkeeping by the SMs, VCRMs, BOPMs, and VCROs. Log entries were chronological, with time entries in the left margin as required by SRNS Procedure 2S 2.4, *Operating Logs*, and SRR Procedure SW4-V3-CO-20.9. EA observed regular entries, corrections, and late entries in

the logs, all of which were performed in accordance the acceptable method described in 2S 2.4. The deputy operations manager had coached SMs and operators about the level of detail expected in log entries, which was evident from the increased level of detail in more recent log entries.

EA observed a number of lockout/tagouts performed by balance-of-plant operators. Lockouts in DWPF are performed in accordance with SRNS 8Q 32, *Hazardous Energy Control (Lockout/Tagout)*, and SRR Procedure SW4-V3-CO-8.09, *Lockout/Tagout*. The observed lockouts were preceded by a pre-job brief, and all used separate performers and verifiers. Workers performed component identification, positioning, lockout device installation, verifications, and documentation in accordance with procedure requirements.

Access to control areas in both the vitrification control room and the crane control room was in accordance with SRNS Procedure 2S 5.3, *Control Area Activities*, and SRR Procedure SW4-V3-CO-3.04, *DWPF Control Area Activities*. Operators appropriately restricted access for non-assigned personnel only through the doorways that enter from the supervisory control room. EA observed numerous occasions where personnel appropriately requested permission to enter both control rooms in accordance with the requirements of Procedure 2S 5.3. EA found the implementation of access control in the control areas to be satisfactory.

EA observed both the control areas and process areas for operator aids. Operator aids were logged and reviewed as required, and EA identified no unapproved operator aids. Some handwritten or typed notes were attached to various computer monitors or similar items in the control area; however, the information on the notes (such as phone lists) did not meet the definition of an operator aid in DOE Order 420.1C Attachment 2, Section 3.i. An operator aid is posted on the diesel fuel day tank for both diesel generators in accordance with procedure. This operator aid is effective in that it illustrates the divisions of the fuel gauge on the top of the tank. Overall, the use and control of operator aids was satisfactory.

EA reviewed the SRR Conduct of Operations matrix in order to determine whether SRR asserted full compliance with DOE Order 422.1. DOE Order 422.1, Admin Change 2, requires that implementation be "… demonstrated by providing, at a minimum, a Conduct of Operations Matrix… The Conduct of Operations Matrix may be provided through direct use of Appendix A or by use of equivalent documents or electronic systems." SRR has embedded the Conduct of Operations Matrix in the S/RID, which identifies program implementation documentation for numerous DOE directives. SRNS Management Policies Manual 1-01, Procedure 4.20, *Conduct of Operations*, states, "Standard/Requirements Identification Document (S/RID) provides a listing of the implementing documents for the DOE Order to satisfy the requirement for a Conduct of Operations Matrix." This method is compliant with the order requirement.

The SRR S/RID identified a newly written sitewide (SRNS) procedure, 2S 5.14, *Control of Interrelated Processes*, as currently being "For Training Purposes Only." This procedure was written to correct a sitewide noncompliance with DOE Order 422.1, Attachment 2, Section 2.m, addressing control of interrelated processes. EA has noted shortcomings in implementation of control of interrelated processes while performing assessments of vital safety systems at other locations. The shortcomings at other sites were noted in a recent EA lessons learned report, *Office of Enterprise Assessments Lessons Learned from Targeted Reviews of the Management of Safety Systems at U.S. Department of Energy Nuclear Facilities*, in the Operations section of the report. After the SRR ConOps Functional Area Manager (who is responsible for implementation of the new procedure) reviewed the report, he initiated a self-assessment, 2017-SA-003679, *Control of Interrelated Processes Implementation*, with a stated purpose "to ensure SRR will be compliant when the new procedure is issued." The self-assessment identified five OFIs, and initiated a STAR Item for each. The use of the self-assessment for determination of compliance was thorough and complete.

Operator Training and Qualification

The DWPF operator training program consists of a mix of classroom and on-the-job training, with the specifics varying by position. Qualification cards for each position list the requirements and document completion dates. Qualified examiners administer oral boards in order to evaluate knowledge and understanding of various systems and processes. Training for all positions included both *Liquid Waste Operations, Conduct of Operations* and *DWPF Technical Safety Requirements*. The training material emphasizes the importance of safety systems for protection of the workers.

EA reviewed a sample of training material, including material pertaining to the selected safety systems, all of which was developed in a systematic manner in compliance with DOE Order 426.2. EA also examined the questions in the test bank for areas including conduct of operations, TSRs, the OGP system, and the EEP system. EA found both the training material and the related test questions to be satisfactory.

WSRC-SA-6, *Final Safety Analysis Report, Savannah River Site, Defense Waste Processing Facility*, states in Section 10.6.4 that WSRC-RP-92-226, *Training Implementation Matrix for the Defense Waste Processing Facility, Saltstone Facility, Late Wash Facility*, provides the key positions requiring qualification. However, this is no longer accurate. WWDWOQPD, *DWPF Operations Training and Qualification Program Description*, has a matrix of watchstation titles and associated qualification standards. EA notified the SRR training manager of this discrepancy, and he initiated corrective action by opening STAR Item 2017-CTS-006836, *Review of Facility Safety Basis Documents*. The actions for this STAR Item include reviewing the safety basis for the concentration, storage, and transfer facility to determine whether the same error exists there.

All VCROs are trained for all of the assignments in the vitrification control room. These assignments include melter operator, chemical process cell operator, 512-S control room operator, and facility support operator. SRR has a proficiency requirement for DWPF watchstanders to have served one watchstation shift in the last 90 days. SRR uses a computer-based tool, the Automated Qualification Matrix (AQM) to compose the watchbill for each shift. This system ensures that the watchstander is current with the required proficiency hours, and updates the proficiency hour running total. The use of AQM was first noted by EA in *Office of Enterprise Assessments Assessment of Savannah River Site Tritium Facility Safety System Management, December 2016.* As noted in that assessment, coupling the watchbill roster and proficiency database is considered a **Best Practice**.

Operations staff also receive continuing training on a variety of topics, such as the software modifications associated with new distributed control system displays. The DWPF training organization develops a continuing training plan designed around a two-year requalification schedule in accordance with WWDWOQPD. The training is presented to operating staff over a period of weeks so that shift personnel all become trained on the same material. One effective training tool is the vitrification control room simulator. EA observed the simulator training staff using the simulator to illustrate the appearance of revised distributed control system displays, and to solicit operator feedback prior to their implementation. Routine operations are also simulated, which provides facility management the opportunity to reinforce expectations on items such as logkeeping, telephone communication protocols, and pre-job briefings. Overall, the operator training and qualification program is adequate, although SRR has initiated action to correct outdated information regarding the qualification program in the FSAR.

Procedure Development, Use, and Adherence

The DWPF procedures group works with Operations, Maintenance, and Engineering to develop operating procedures, alarm response procedures, surveillance procedures, and other procedures used in the facility.

S25 PS.01, *Liquid Waste Operations Procedure Writer's Guide*, defines the format and other standardized tools to ensure that the procedures meet the requirements of DOE Order 422.1, including techniques to minimize errors.

SRR utilizes a pre-job brief process to ensure that work requiring multiple employees is adequately coordinated, and that all workers understand their roles in the evolution. EA observed several pre-job briefs for activities that involved operations, such as lockout/tagouts and maintenance activities on the diesel generator battery systems. Portions of the briefing were conducted using the "reverse briefing" process, where workers described their role in the upcoming evolution. This technique represented a useful and effective process. During observed work, workers appropriately used human performance improvement/error reduction tools including self-checking and three-way communications.

Another SRR tool for error reduction is the use of a handheld device for daily rounds. EA observed daily rounds pertaining to the diesel generators and related systems using the handheld device. The device automatically flags out-of-limits readings. It also ensures that all required readings have been taken prior to allowing the operator to submit the completed procedure for supervisory review. In addition to recording the readings, the handheld device's version of the procedure provides the ability to make explanatory comments, such as work order numbers associated with items requiring maintenance.

The diesel generators and some of the related systems have local control panels with alarm annunciation. At each of the panels is a controlled copy binder with alarm response procedures for the panel. EA verified that all of the alarm response procedures in the binders were the current versions.

However, EA identified uncontrolled copies of the FSAR and the diesel operating procedure manual at the work desk in the diesel generator building. The operating manual had some pages marked as controlled copies, however many procedures were not the correct revisions. The FSAR was also a superseded version. EA informed the operations manager, who promptly removed the uncontrolled materials and initiated corrective actions including an extent-of-condition review. The operations manager documented this in STAR Item 2017-CTS-006693, *Uncontrolled Manuals/Procedures Found at the 292-S Operator Work Station*.

Although the uncontrolled procedures were present in an operating area, EA did not observe any use of incorrect procedure versions. EA observed numerous operators correctly following the process described in 2S 1.3, *Procedure Compliance*, which requires that the procedure to be verified as the correct version by comparison to the controlled procedure index, ensuring that it has the correct number of pages, and then marking it as a working copy, with the date and signature or initials of the person performing the verification. Despite the identification of the uncontrolled (and not in use) procedures, SRR's overall procedure development, use, and adherence was satisfactory.

<u>System Lineups and Equipment Status Control</u>

SRR controls the lineup of the diesel generators and their associated support systems with initial system lineup procedures. During the course of the assessment, one of the diesel generators was removed from service due to a diesel fuel sample result that showed an unacceptably high level of particulates. Facility management was directly involved in expediting results of a resample, while at the same time Engineering reviewed the trend of prior sample results to determine whether the high level could be considered erroneous. After the resample results determined that the diesel fuel was not contaminated with particulates, operators appropriately restored the system lineup using SW4-15.15-8.1, *System Alignment Checklist*, prior to declaring the system operational and exiting the limiting condition for operation (LCO).

The diesel generators have local control panels with alarm annunciator panels. The alarms are also transmitted to the vitrification control room, and are displayed to the operators there via the distributed control system. During balance-of-plant operator rounds, prior to performing lamp and alarm tests on the annunciator panels, observed operators appropriately contacted the vitrification control room before and after the tests to alert them of an expected alarm and when the tests were complete.

Overall, operations personnel performed appropriate control of equipment and system status such that proper operational configuration control was maintained.

Operations Conclusions

The diesel generators are operated in a manner that ensures the systems will be able to perform their intended function when required. The OGP system was not operational during the assessment, however other vitrification control room operations indicated appropriate operator proficiency. Operators are well trained and informed on the importance of the systems. Procedures were technically adequate and were followed correctly by the operators. System lineup and status are adequately controlled. SRNS had previously identified an SRNS sitewide noncompliance with DOE Order 422.1, so SRR proactively addressed compliance with the DOE Order 422.1 requirements with a self-assessment. EA identified a best practice for the process used to automatically credit operator proficiency hours based on watchstanding hours. Overall, operations are conducted in a manner that ensures the safety systems are available to perform intended safety functions when required.

5.7 Cognizant System Engineer Program

Within the CSE objective, EA reviewed the CSE program, CSE training and qualifications, CSE roles and responsibilities, and performance monitoring. The scope also included interviews with the two CSEs assigned to the selected systems.

Objective: Cognizant System Engineer Program implementation is effective in ensuring that safety systems can reliably perform as intended.

Criteria:

1. *The DOE contractor has established a system engineer program to ensure continued operational readiness of systems within the program scope. (DOE Order 420.1C Attachment 2 Chapter V)*
2. *The System Engineer Program must be applied to active safety class and safety significant SSCs as defined in the facility's DOE approved safety basis, as well as to other active systems that perform important defense-in-depth functions, as designated by facility line management. (DOE Order 420.1C Chapter V.2)*
3. *Hazard category 1, 2, and 3 nuclear facilities must have a System Engineer Program, as well as a qualified cognizant system engineer (CSE) assigned to each system within the scope of the Program. (DOE Order 420.1C Chapter V.3)*

DOE Order 420.1C requires that protocols for implementing the facility CSE program address the following elements:

- Identification of the systems covered by the CSE program and the systems assigned for coverage
- Configuration management
- Support for operations and maintenance
- Training and qualifications of CSEs.

The CSE program for DWPF is mainly defined in SRNS Procedure E7-1.10, *Engineering Program Roles, Responsibilities, Accountabilities and Authorities*. The CSE program at DWPF ensures that safety systems are controlled and maintained according to the requirements established in the safety basis. SRR has assigned CSEs for the two safety systems selected for this review. Among other duties, the CSE is the focal point for ensuring that system configuration is being managed effectively, updating system documentation, and maintaining system reliability and operability. The CSE program at DWPF adequately addresses the requirements of DOE Order 420.1C, Attachment 2, Chapter V, *Cognizant System Engineers*. CSEs at DWPF conduct frequent system walkdowns, maintain extensive field presence, assist with issue resolution, and analyze system data to meet system monitoring expectations and ensure adequate system performance.

A known issue within the SRR engineering organization at DWPF is the heavy workload for CSEs, which was clear to EA through interactions with various CSEs. The STAR system has a backlog in open administrative tasks assigned to some CSEs that were past their due dates, including one for the annual SHR. DOE Order 420.1C, Attachment 2, Chapter 5, Section 3(b)(3), states, "Consistent with the graded approach, large, complex, or very important systems may require assignment of more than one CSE." The SRR engineering management team has implemented actions to reduce the burden on the CSEs, such as bringing in other resources to assist with various tasks. Additionally, the engineering organization has focused on prioritizing work such that a reasonable number of tasks can be accomplished within the work week.

Procedure S4-ENG.45, *Vital Safety System - System Design Descriptions and System Files*, provides both guidance and requirements for CSEs to maintain up-to-date documentation about their assigned systems. For both the OGP and EEP systems, the CSEs maintain an SDD. The SDD identifies applicable requirements, explains why those requirements exist, and describes the features of the system design provided to meet those requirements. Combined with the SHRs discussed below, the SDD helps communicate system information to others, facilitates turnover to new engineers, and prevents the loss of system knowledge. The SDDs contain an appropriate amount of information and contribute to the successful implementation of the overall CSE program.

System Health Reports

Procedure E7-3.04A, *LW SSC Performance Monitoring*, describes the process for monitoring and evaluating DWPF safety systems with the objective of improving their reliability and availability through early detection of degradation. CSEs are responsible for generating SHRs on a monthly and annual basis. There are specific procedures for preparing the SHRs for the OGP and EEP systems, which provide guidance on what parameters should be monitored. CSEs assign color codes (stop-light colors) to each system, which indicate the overall health of the system. A green color code indicates that there are no known problems with the system, while a red color code indicates problems with the system. SRR management meets periodically with the CSE to discuss these reports. Any action items from these meetings are required to be placed into the STAR system and are followed up on. EA followed up on selected system performance issues, including those identified in the SHRs and tracked in the STAR system. All of the relevant STAR items were adequately addressed and closed. For the systems that were reviewed, the latest SHRs indicated the color codes were green.

The most recent annual SHR for the OGP system had abnormal trends for some of the parameters that were not described in the text of the report. EA determined that the primary CSE had not been involved with the development of the SHR, and that the backup CSE had done a majority of the analysis. However, the backup CSE was not qualified on the specific system itself. DOE Order 420.1C, Attachment 2, Chapter 5, Section 3(b)(3), states, "A qualified CSE must be assigned to each active system within the scope of the program." The backup CSE at DWPF has the same authority as the primary CSE

if that individual is unavailable to approve design modifications, or other important tasks. SRR management has an informal expectation that the backup CSE is only permitted to carry out this function for urgent issues. The backup CSEs are knowledgeable about DWPF processes and requirements, as they are qualified CSEs on other related safety systems; however, the lack of any requirement for the backup CSE to be trained on the OGP system became problematic when the primary CSE was unavailable for an extended period due to temporary reassignment. (See **OFI-SRR-2**.)

CSE Training and Qualifications

SRR Procedure LWOTS000, *Engineering Technical Staff Training Program Description*, establishes and documents the CSE qualification program as required by DOE Order 426.2. CSEs at DWPF go through an extensive qualification process that takes approximately 18 months to complete. The process utilizes a systematic approach to training and is designed to ensure that these personnel have the requisite knowledge, skills, and abilities to properly perform work in accordance with the safety basis. The first qualification CSEs are required to obtain is as a design authority engineer (DAE), which covers the fundamental engineering topics and processes/requirements for DWPF. Following completion of the DAE qualification, CSEs are required to go through a system-specific qualification. Both the DAE and system-specific qualification involve the use of qualification boards and require final approval from the DWPF engineering manager. EA reviewed the CSE training records for the systems that were being reviewed and confirmed that applicable requirements were met.

SRR has established a continuing training program for CSEs, which is described in Procedure WCACAA00, *LWO Technical Staff Continuing Training Plan*. CSEs are required to take periodic training classes to refresh their knowledge, skills, and abilities. The CSE training coordinator is responsible for organizing the training classes and tracking completion of these courses for every CSE. Any identified lack of training is appropriately discussed with the DWPF engineering managers. However, SRR does not maintain a list of the required continuing training courses within the last two years. While continuing training is being offered, the CSE continuing training program is not structured to confirm that it covers the topics required by DOE Order 426.2 (see **OFI-SRR-3**). DOE Order 426.2, Attachment 1, Chapter 1, Section 7(a)(1), states, "Continuing training programs must be structured commensurate with specific position needs." The CSE training coordinator stated that this is a known issue and efforts are underway to identify a core set of classes to be included in the CSE continuing training program.

CSE Conclusions

SRR has established a CSE program that meets the requirements of DOE Order 420.1C. The CSEs assigned to the selected safety systems are knowledgeable of facility processes and their assigned systems. CSEs conduct effective performance reviews of their assigned systems that address system operability, reliability, and material condition. The CSE qualification program ensures that the requisite knowledge, skills, and abilities are obtained. EA observed several issues with the CSE program, including heavy workloads for CSEs, inadequate training for backup CSEs, and lack of structure in the CSE continuing training program.

5.8 Feedback and Improvement

This section discusses EA's assessment of the effectiveness of feedback and improvement processes in addressing and preventing the recurrence of safety system issues. SRR monitors and evaluates a variety of feedback sources to identify weaknesses and drive improvement. EA examined SRR's acquisition and use of vital safety system health information, management and independent assessments, issues management, and the use of feedback information to drive improvement.

Objective: Feedback and improvement processes are effective in addressing and preventing the recurrence of safety system issues. (10 CFR 830 Subpart A)

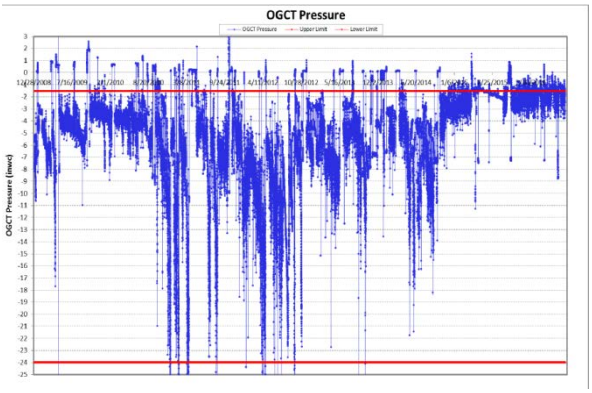
Criteria:

1. *Identify the causes of problems and work to prevent recurrence as a part of correcting the problem. (10 CFR 830.122 Criterion 3)*
2. *Contractors must monitor and evaluate all work performed under their contracts to ensure work performance meets the applicable requirements for environment, safety, and health; including quality assurance, integrated safety management, safeguards and security, cyber security, and emergency management. (DOE Order 226.1B Attachment 1 Section 1)*

Safety System Feedback

CSE interviews and SHR reviews demonstrate that CSEs currently acquire and effectively utilize feedback information, such as system operating characteristics, performance metrics, walkdown observations, STAR issues, and NCRs to monitor system performance and identify needed actions. Monthly system health assessments by the CSEs demonstrate routine and consistent system walkdowns with reported results. These monthly assessments and annual SHRs describe equipment/system issues with defined resolution actions. Component performance metrics provide effective technical bases for equipment/system issues. Overall, the CSEs adequately document system performance characteristics and planned improvements. However, SRR's past response to three safety system trends has been less than adequate from a timeliness standpoint:

- SRR recognized an upward pressure trend in the Off-Gas Condensate Tank in early 2015, indicating a downstream obstruction, and over two years later is now developing WP 1539305 to address this issue. (Note the right side of this graph excerpted from the SHR, showing routine exceedances of the upper limit depicted by the upper red line.)



- SRR recognized a substantial Zone 1 upward trend in the Sand Filter profile gamma rates in March 2009, began to examine the trend in 2013, and developed a "path forward" (SRR-WSE-2013-00105, *Gamma Profile in Sand Filter and Inlet Tunnel Collection Sump*, May 20, 2014). The April 2017 DWPF Monthly Performance Monitoring Report Zone 1 indicates that the source of the higher than expected gamma rates in the Sand Filter and Zone 1 exhaust system is being investigated and addressed to avoid further spread of material in the Zone 1 ventilation system and increased contamination in the sand filter.

- The OGP high efficiency particulate air (HEPA) filters have unexpectedly experienced no mass loading for over 16 years. This may be reflective of either significant leakage past the filters or damaged filters. Although the HEPA filters perform no safety related function, this condition warrants investigation. SRR senior engineering management began to examine the HEPA trend as early as 2012, but took no other actions until the issue was documented via an NCR approximately two years ago. Planning for filter replacement is now in progress.

Management has assigned a central point of contact to coordinate monthly CSE presentations to facility, operations, and maintenance management personnel regarding important safety system concerns and status. Actions to address the above trends are underway as evidenced, for example, by 2016-CTS-006824, *Recommended Actions for the Melter Off-Gas Annual System Health Report (2014 -2015)*.

In preparation for this EA assessment, the SRR DWPF engineering department conducted a self-assessment of the EEP and OGP systems using the EA CRADs for this EA assessment; SRR has not yet issued the report. The team of five engineers, including two managers, demonstrated positive management involvement. While the effort was notable, SRR does not perform such self-assessments on a periodic basis. While CSEs currently walk down their systems, the current CSEs do not document assessments of physical configuration compared to system documentation as required by DOE Order 420.1C, Attachment 2, Chapter V, Section 3.c.(3)(b); in the past, a former CSE conducted one such assessment of the OGP system in 2008 (see Section 5.3).

Organizational Assessment Feedback

SRR is, in general, planning and performing timely, adequate assessments (see Section 5.3 for a notable exception). The SRR FY 2017 Integrated Assessment Plan (IAP) identifies a diverse collection of self-assessments and independent assessments. The IAP includes five DWPF self-assessments related to procedure use and procedure content. Attention to these topics indicates effective use of STAR issue trending, which identified procedure use and procedure content as prevalent frequency bins in a Pareto (frequency distribution) chart of all DWPF issues. The SRR Integrated Independent Evaluation Triennial Plan indicates an adequate distribution of engineering-related independent assessments.

SRR utilizes the SRNS well-structured and comprehensive "Assessment Performance Objectives & Criteria (APO&C)" that consist of elements, performance objectives, and criteria for 19 functional areas (e.g., design, QA, conduct of operations, and maintenance) for assessment planning. For example, Functional Area 08 addresses QA; Element 03 addresses quality improvement; and, Performance Objective 03 addresses problem analysis. SRR provides a corresponding CRAD. In this case, CRAD Number FA 08-03-03, with specific acceptance criteria, provides an adequate base assessment plan to assess this area; the assessor can modify these criteria and/or add additional criteria. This approach provides a consistent baseline for conducting assessments and promotes long-term trending capability.

SRR effectively monitors the quality of self-assessments. The SRR contractor assurance organization selects a 25% random sample of assessments for quality grading using established criteria. Grades of SRR self-assessments show a gradual improvement over the past year, averaging 92% in March 2017. Of 260 SRR completed self-assessments from January 2016 to June 2017, 27 had a meaningful nexus to the OGP and EEP safety systems, e.g., CGD, the MAC storage area, procedures, maintenance, installed process instrumentation, and M&TE. The content of the EA-sampled assessments was adequate, each providing a sufficient basis for compliance with the review criteria. All included the APO&C Functional Area codes for ease of trending. Only 5 of the 27 indicated a performance-based review of field performance. (See **OFI-SRR-4**.) Overall, SRR is actively implementing a self-assessment process in most areas.

Issues Management

The OGP CSE was knowledgeable of the SRR issues management program at DWPF, understood the issue management process using the STAR system, and provided examples of self-initiated STAR issues. The OGP CSE indicated an understanding of active management involvement and support for STARs, providing confidence that the CSE will raise issues as needed. The OGP CSE understands the need for immediate reporting to the appropriate levels of management if significant conditions adverse to quality

exist. The EEP CSE was unavailable for this level of interview due to operational needs during the EA assessment. However, the EEP CSE's supervisor communicated a positive attitude towards issue identification and the corrective action process.

SRR management demonstrates active involvement and ownership of STAR issues. The DWPF management review team meets once or twice weekly with assurance personnel to examine STAR report entries for significance level determination, screening, closure status, and closure adequacy. The facility manager or deputy chairs the meetings with full participation with other managers/deputies, e.g., from Operations, Maintenance, and Engineering. Consistent senior management involvement in these meetings was evident in review of seven sets of meeting minutes from meetings May 3, 2017, to June 7, 2017. EA observed an effective management review team meeting chaired by the facility manager's deputy and led by the STAR lead analyst. Management demonstrated active involvement in and detailed discussions of all open and new STAR issues, resulting in decisions regarding proper assignments, significant level changes, appropriate corrective actions, and learning opportunities. Both the chair and the lead analyst had completed STAR training.

The most significant issues receive rigorous and timely causal analysis, extent-of-condition review, and independent effectiveness reviews of closure as evidenced by two recent issues: 2016-CTS-11469 – *DWPF/ Saltstone Saturation Review – Lockouts L/T Chain Wrapping Issue* and 2016-CTS-10901 – *Recycle Waste Tank Agitator Restart/Q-Time Issue*. A manager led each causal analysis team that included a trained causal analyst. The teams used acceptable and appropriate analysis techniques, "Why Stair Case" for 2016-CTS-11469 and "Table Top" for 2016-CTS-10901. SRR completed one causal analysis within the expected 45 days from discovery. The other causal analysis took 141 days, but SRR appropriately approved time extensions. At the time SRR discovered these issues, the DWPF issue management process did not require effectiveness reviews. All requested issues management documentation was readily available in STARs.

EA reviewed a sample of 28 OGP- and EEP-related STAR issues generated since January 1, 2016. The issues exhibited an adequate description of the issue, an appropriate significance level, proper trending codes, and practical corrective action(s) commensurate with the significance level. The DWPF issues management full-time lead monitors every reported STAR issue to ensure conformance to reporting requirements; EA's sample indicates this work is effective. Performance metrics for all DWPF issues since January 1, 2016, show SRR identified most (66%) issues, supporting DOE's expectations that the contractor self-identify issues. Also, on-time closure of higher significance issues (about 50 issues per month) is trending above 95%, indicative of effective issues closure management.

Feedback Use and Improvement

The Monthly SRR Executive Safety and Quality Board and quarterly Occurrence Reporting and Processing System Performance Analysis Reports (ORPS–PAR) demonstrate SRR management's effective use of these analyses by identifying adverse trends and taking action. For example, the January 2017 Executive Safety and Quality Board presentation shows conduct of operations/procedure content as the highest frequency of STAR issues from a Pareto analysis, resulting in an entry on the Watch List. The Watch List results in a special briefing from the responsible managers to the Board until the issue is resolved. Subsequently, SRR-ESH-2017-00042, *Integrated Independent Evaluation (2017-2-1),* also identified procedure use and quality as a needed focus area, indicative of continued oversight of this concern.

The quarterly ORPS–PARs appropriately include a specific section on System Health Reporting. The second quarter 2017 ORPS–PAR identifies 19 of 29 healthy vital safety systems. This report monitors the "Path to Green" status for the "un-healthy" systems, indicative of facility managements' attention to

and effective planning for these systems per SRR's SSC Performance Monitoring process. However, while the report references a separate "Path to Green report" and contains detail regarding degraded safety systems, this quarterly report does not specifically address systems that are in a "Red" state to bring visibility to SRR senior management of risk reduction activities and status. (See **OFI-SRR-5**.)

SRR has demonstrated consistent attention to quality improvement by completing 59 process improvement initiatives since 2015. Two lessons learned that had a positive nexus to the OGP and EEP safety systems included an April 2015 CGD improvement team that reported improvement in the quality and timeliness of CGD packages, and a September 2016 receipt inspection team that reported improvement in timely disposition of receipt inspection discrepant conditions.

The most recent official lessons learned relevant to the EEP and OGP systems were 2014-CTS-7228, *Lesson Learned - Pressure Protection of the 292-S Diesel Generator Air Start System*, and 2016-CTS-001262, *Lessons Learned – DWPF SS Work Control*. Each provided a clear description of the driving issue, acceptable analysis, and appropriate actions to preclude recurrence.

Feedback and Improvement Conclusions

SRR is effectively acquiring and utilizing feedback information to focus attention and drive improvement. CSEs are properly utilizing the corrective action process to resolve concerns. Planned self-assessment topics are diverse and provide acceptable focus on areas of weakness derived from the analysis of STAR issues. The DWPF management review team demonstrates extensive involvement in issues management, setting a positive example for the workforce and ensuring effective resolution of identified issues. SRR appropriately documents identified issues, assigns significance levels consistent with procedures, and performs appropriate causal analysis based on the significance level. Conversely, SRR did not respond in a timely manner to the negative long-term safety system trends identified early in this section. Current SRR engineering management has recognized this as a past performance issue and has implemented communication measures to achieve more timely response to future adverse system trends.

5.9 Federal Oversight Program

EA evaluated the implementation of the established DOE-SR programs and processes for conducting oversight of the management and operation of vital safety systems. Specifically, EA reviewed program and process documents, interviewed responsible managers and staff, and evaluated samples of process outputs, including assessment schedules, assessment/surveillance reports, issues management data, and contract performance-based evaluations.

Objective: Federal safety oversight programs are established and effective in ensuring safety systems can reliably perform as intended.

Criteria:

1. *All applicable DOE organizations must: (1) Establish and implement an effective oversight program consistent with DOE Policy 226.1B and the requirements of this Order, and (2) Maintain sufficient technical capability and knowledge of site and contractor activities to make informed decisions about hazards, risks, and resource allocation; provide work direction to contractors; and evaluate contractor performance. (DOE Order 226.1B Section 4)*
2. *The DOE site office has established and implemented an effective Safety System Oversight (SSO) program for qualifying staff to apply engineering expertise in its oversight of the assigned safety systems and to monitor performance of the contractor's CSE program. (DOE Order 426.1A Appendix C)*

The DOE-SR oversight program for safety systems at DWPF is adequately described in SRIP 400, Chapter 421.2, *Safety System Oversight.* The DOE-SR Waste Disposition Engineering Division (WDED), a group reporting to the Assistant Manager for Waste Disposition, is responsible for engineering oversight of DWPF. WDED utilizes a Facility Engineer (FE) model to oversee multiple safety-related systems and employ expertise in multiple engineering fields. The FE acts as the safety system oversight engineer for safety-related systems and, as such, is responsible for review of contractor safety basis documents. The FE also performs technical assessments related to system design. Within WDED, there is one FE assigned to DWPF, with 80% of the FE time spent on safety basis reviews and 20% on safety system assessments.

Overall, the DOE-SR FE is knowledgeable of the selected systems and the current system status. The FE has performed numerous safety basis reviews, including verification of safety system performance as part of the change approval process. DOE-SR has established a detailed assessment schedule for DWPF, in accordance with Procedure SRM 226.1.1F, *Integrated Performance Assurance Manual (IPAM)*, which includes independent assessments of safety system performance, equipment configuration, material condition of assigned systems, and safety management programs. In addition, the FE participates in system health review meetings, conducts system walkdowns, and performs program/document reviews, such as corrective actions, maintenance, surveillance, and design change packages.

The FE typically conducts one safety system assessment per year, focused on safety SSCs such as ventilation and purge systems. The FE assessments reviewed by EA focused on monitoring the performance of the safety systems in accordance with the DSA, the change control process, system physical configuration, and CSE performance. Additionally, DOE-SR requires management to be present in the field, either observing activities, or walking down systems. The WDED director conducts approximately four hours of field observations per month.

DOE-SR does not meet the minimal staffing to ensure full oversight of safety systems at DWPF. There is currently only one safety system oversight engineer assigned to all of the safety systems at DWPF. DOE-SR staffing analyses indicate that at least two are needed to ensure full oversight of safety systems at DWPF. DOE Order 226.1B, "Implementation of Department of Energy Oversight Policy," requires DOE-SR to "Maintain sufficient technical capability and knowledge of site and contractor activities to make informed decisions about hazards, risks, and resource allocation; provide direction to contractors; and evaluate contractor performance." This is a known issue within the field office, and management is actively pursuing requisite approvals for different options to alleviate the issue.

DOE-SR has established a qualification program for safety system oversight engineers that meets the requirements of DOE Order 426.1A, ensuring that they obtain the requisite knowledge, skills, and abilities to ensure that safety systems will perform as required by the safety basis and other applicable requirements. Additionally, DOE-SR has established a FE/Safety System Oversight Council for the purpose of continuously improving the SRS FE and Safety System Oversight Program. The council has periodic meetings to discuss issues of common interest across the site related to safety system oversight functions.

EA also reviewed the DOE-SR Facility Representative (FR) program, as described in Procedure SRIP 400, Chapter 430.1, *Facility Representative Program.* There are three FRs assigned to DWPF, which allows for full coverage. DOE-SR FRs are responsible for monitoring the safety performance of DWPF and day-to-day operational status. The FRs perform reviews and assessments of facilities such as DWPF to ensure that 1) the facilities are operated safely and conform to DOE requirements/commercial standards invoked by the contract and good industry practices, and 2) the contractor's operational performance, QA program, and management controls are effectively performed. EA observed an FR assessment of the DWPF melter change-out operation, which was documented in STAR Item 2017-SA-

003525, *Phase I Melter 2 Outage: Melter 2 preparation and movement from the melt cell to the Failed Equipment Storage Vault (FESV).* Based on review of a sampling of FR assessments from the past year, EA identified no concerns with the conduct of the assessments and the associated documentation. EA concluded that the FR program at DWPF is adequately implemented.

Federal Oversight Conclusions

DOE-SR has established a safety system oversight program that meets the requirements of DOE Order 426.1A. The FE was knowledgeable about facility conditions and effective in carrying out assigned duties, mostly related to DWPF safety basis approvals. FE personnel at DOE-SR are appropriately trained and qualified to perform their assigned duties, in accordance with the established qualification program. DOE-SR has established detailed plans and schedules for periodic assessments at DWPF to evaluate contractor programs for ensuring compliance with applicable requirements. DOE-SR has assigned appropriate FR coverage for DWPF, and the FRs provide effective day-to-day oversight of DWPF operations. The SSO/FE staffing level of one is only half the staffing level indicated by DOE-SR staffing analyses; however, DOE-SR is actively pursuing multiple options to gather additional resources.

6.0 FINDINGS

EA identified no findings during this assessment.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified some OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may also address other conditions observed during the appraisal process. EA offers these OFIs 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.

Savannah River Remediation, LLC:

OFI-SRR-1: Consider developing an automated tool for the CSEs to maintain critical spare part inventory status and preclude potential unanticipated procurement delays.

OFI-SRR-2: Consider requiring backup CSEs to receive training on the safety systems that they are assigned to as backup.

OFI-SRR-3: Consider developing a more structured system of CSE continuing training courses with tracking to ensure that the required topics per DOE Order 426.2 are being covered.

OFI-SRR-4: Consider increased management emphasis on including field work performance observations during SRR self-assessments.

OFI-SRR-5: Consider modifying the quarterly ORPS–PARs to specifically address safety systems that are in a “RED” state to bring visibility to SRR senior management of risk reduction activities and status.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: May 8-11 and June 6-15, 2017

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
William E. Miller, Deputy Director, Office of Environment, Safety and Health Assessments
C.E. (Gene) Carpenter, Jr., Director, Office of Nuclear Safety and Environmental Assessments
Kevin G. Kilp, Acting Director, Office of Worker Safety and Health Assessments
Gerald M. McAteer, Director, Office of Emergency Management Assessments

Quality Review Board

William A. Eckroade
John S. Boulden III
Thomas R. Staker
Michael A. Kilpatrick

EA Site Lead for Savannah River Site

Kevin Witt

EA Assessors

Charles Allen – Lead
Mike Marelli
Glenn Morris
Samina Shaikh
Greg Teese
Kevin Witt

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

C-CLC-S-00321, *Two-Tier Battery Rack in the 292-S Building West Battery Room*, Revision 0, 8/3/2016
C-DCF-S-00736, *Two-Tier D41 Battery Rack*, Revision 1, 12/20/2016
CBU-WSE-2003-00063, *Engineering Path Forward: Control of Piping Systems Downstream of Vent and Drain Valves (U)*, Revision 0, 3/17/2003
DRAWING 003701, *Engine Control Panel Bill of Material*, 9/11/85
DWPF/Saltstone March 2017 System Health Review Reporting Period (03/01/2017- 03/31/2017), 4/18/2017
E-BFA-S-00001, *Battery Units for D41 and D51 Battery Bank*, Revision 0, 6/8/2017
E-CGD-S-00190, *Replacement Item Evaluation, Commercial Grade Item Dedication and Material Upgrade Form*, Revision 1, 6/10/1998
85608R, *Transfer Request- Replace Relay LOFR in Panel G200C*, 6/9/2016
E-CGD-S-00282, *Replacement Item Evaluation, Commercial Grade Item Dedication and Material Upgrade Form*, Revision 2, 10/16/2001E-DCF-S-02552, *EEP SDD Appendix K & PM Strategy Update*, Revision 0, 3/19/2015
E-DCF-S-02552, *EEP SDD Appendix K & PM Strategy Update*, 3/19/15
MSR 56821M, *Replace S956-SSHL-8616X*, 1/27/2016E-DCP-S-13001, *Remove UPS YU02*, Revision 0, 1/16/14
E-SHR-S-00002, *FY 2015 Annual System Health Report for the Emergency Electrical Power (EEP) and the Dedicated Power (EI) Systems at the Defense Waste Processing Facility*, 4/19/2016
SRNS E7 1.02, *Engineering Overview And Graded Approach*, Revision 9, 07/28/2016
SRNS E7 1.05, *Technical Baseline Identification*, Revision 10, 05/11/2017
SRNS E7 1.10, *Engineering Program Roles, Responsibilities, Accountabilities And Authorities*, Revision 15, 06/23/2016
E7 2.05A, *LW Modification Traveler*, Revision 5, 1/14/16
E7 2.06A, *LW Temporary Modification Control*, Revision 7, 3/10/16
SRNS E7 2.26, *Conduct of Engineering and Technical Support Procedure Manual*, Revision 5, 03/31/14
E7 2.31A, *LW Engineering Calculations*, Revision 8, 9/29/2016
SRNS E7 2.37, *Design Change Form*, Revision 22, 11/17/2016
SRNS E7 2.38, *Design Change Package*, Revision 16, 02/23/2017
SRNS E7 2.39, *Design Safety Requirements Specification*, Revision 1, 07/28/2016
SRNS E7 2.60, *Technical Reviews*, Revision 17, 08/25/2016
E7 3.04A, *LW SSC Performance Monitoring*, Revision 7, 1/9/2017
Engineering 10 Weeks Out Work Planning Schedule, Revision 0, 6/1/2017
FY2017 Integrated Assessment Plan for Savannah River Remediation LLC, 10/31/2016
G-DCF-S-00363, *Changes to Melter Off-Gas System Design Description (SDD) (G-SYD-S-00061, Rev. 6) and Melter and Associated Equipment SDD (G-SYD-S-00060, Rev. 5) to Support 2016 Annual Update*, Revision 0, 1/12/2017
G-DCF-S-00368, *As Found Against Melter Off-Gas System Design Description*, Revision 0, 2/9/2017
G-DCF-S-00370, Revision 0, 6/01/2017
G-ESR-S-00017, *Liquid Waste Organization Waste Solidification Area Project Facilities Configuration Management Implementation Plan*, Revision 6, 6/4/2015
G-SHR-S-00001, *DWPF/Saltstone Facility Performance Monitoring Plan*, Revision 2, 3/1/2017
G-SHR-S-00032, *System Performance Monitoring Plan for the Backup Power System (EEP) and the Dedicated Power System (EI), at the Defense Waste Processing Facility*, Revision 0, 8/8/2016
G-SHR-S-00051, *System Performance Monitoring Plan Melter Off-Gas (OGP) System*, Revision 0, 12/31/2016

G-SYD-S-00023, *System Design Description – Backup Power System, SU-17*, Revision 7, 1/2012
G-SYD-S-00061, *System Design Description – Melter Off-Gas System, GP-03*, Revision 6, October 2016
J-CGD-S-00229, *Replacement Item Evaluation, Commercial Grade Item Dedication and Material Upgrade Form*, Revision 1, 12/17/2002
J-CGD-S-00238, *Replacement Item Evaluation, Commercial Grade Item Dedication and Material Upgrade Form*, Revision 2, 1/20/2004
J-CMT-S-01259, *Lower the BUOGCT Low Level Switch and Alarm, LI3365*, Revision 0, 4/15/2010
J-DCF-S-02618, *S350-ZZZF-3346 Replace Quencher Flow Transmitter*, Revision 0, 5/8/2009
J-DCF-S-03155, *Melter Vapor Space Temperature Interlock Removal*, Revision 1, 3/1/2017
J-DCF-S-03156, *FI-3221A Melter Total Air Supply Scaling Sheet Modification*, Revision 0, 12/13/2016
J-DCF-S-02657, *Lowering of BUOGCT Low Level Limit*, Revision 0, 1/29/2010
J-DCP-S-03154, *FIC-3309 Maximum Feed Rate Modification and Addition of OGCT Vapor Space HI Temperature Interlock For Melter Feed Pump*, Revision 0, 12/08/2016
J-DCP-S-16001, *Replace Existing DWPF Steam Valve S350-TCV-3682*, 10/27/2016
J-DCP-S-98036, *Melter Air Flow Switch Replacement*, 5/11/1999
J-JD-S-0359, *Data Sheet, Differential Pressure Switch/ Indicator*, 6/24/1999
J-JD-S-00745, *Film Cooler Steam Control Valve TCV-3682*, 8/16/2016
LWOTS000, *Engineering Technical Staff Training Program Description*, Revision 15, 3/23/2017
Savannah River Site Roles, Responsibilities, Accountabilities, and Authorities for Projects (R2A2), Revision 5, January 2016
M-CGD-S-00642, *Commercial Grade Dedication - EXXON/MOBIL MOBILGARD 410NC, SAE 40, Diesel Engine Lubricating Oil*, 9/27/2016
M-DCF-S-03069, *Relief Valve Design Change*, Revision 1, 6/29/2014
M-RVD-S-00789, Relief *Valve Verification Record*, Revision 4, 3/8/2016
Maintenance Performance Measures for May 2017
SRNS Management Policy 5.5, *Real Property Asset Management*
Management Review Team Meeting Minutes (7)
Melter Off-Gas (OGP) System Health Monthly Update – December 2016
Melter Off-Gas (OGP) System Health Monthly Update – February 2017
Melter Off-Gas (OGP) System Health Monthly Update – January 2017
MSR 24213M, *Replace Film Cooler Air Lo Flow Switch FISL-3221-A*, 11/6/2013
MSR 42275M, PM 01297951-01 Diesel #1 Engine Mant:144 Months, 2/4/2015
MSR 45417M, *Calibrate/Replace S956-TI-8643X At Next DG200 Outage*, 5/14/2013
MSR 58809M, *Control Valve In Accordance with Data Sheet J-JD-S-00745*, 3/9/2016
MSR 62395M, *Replace Relay LOFR in* Panel G200C, 6/8/2016
Presentation, *SRR Mission Excellence, Commercial Grade Dedication*, 4/20- 24, 2014
Presentation, *SRR Mission Excellence, Receipt Inspection Discrepancies*, 1/25-28, 2016
S-CLC-S-00154, *DWPF Off-Gas Condensate Tank Radiolytic Hydrogen Generation Rate*, Revision 0, 6/28/2016
S4-ADM.64, *Safety Basis Document Implementation Process*, Revision 1, 1/25/17
S4-ENG.02, *Safety Basis Document Revision Process*, Revision 16, 9/29/16
S4-ENG.10, *Engineering Technical Review for Liquid Waste*, Revision 27, 3/28/2017
S4-ENG.15, *Technical Baseline for Liquid Waste*, Revision 6, 1/28/2014
S4-ENG.16, *Safety Requirement Interpretations*, Revision 2, 1/12/2010
S4-ENG.18, *Guidelines for Specifying Engineering Reviews of Maintenance and Inspection and Examination*, Revision 19, 4/19/2017
S4-ENG.44, *Engineering Path Forward*, Revision 1, 12/11/2014
S4-ENG.45, *Vital Safety System - System Design Descriptions and System Files*, Revision 3, 9/24/2015
S4-ENG.51, *Verification and Checking of Technical Documents*, Revision 5, 9/29/2016
S4-ENG.53, *Design Reviews*, Revision 1, 2/4/2014
S4 MNT.06, *Spare Parts/ Equipment Guidelines for LW (Liquid Waste)*, 1/21/2016

S4 OPS.14, *Liquid Waste Facilities Work Control Procedure*, revision 4, 1/27/2017
S25-PS.01, *Liquid Waste Operations Procedure Writer's Guide*, Revision 7, 1/25/2017
SBD-S-17-005, *Safety Basis Document Change Request (CRF) Form*, Revision 0, 6/2017
SHR-S-00001, *Annual System Health Report - Melter Off-Gas System (OGP) for 2015-2016*, Revision 0, 8/31/2016
SHR-S-00002, *FY 2015 Annual System Health Report for the Emergency Electrical Power (EEP) and the Dedicated Power (EI) Systems at the Defense Waste Processing Facility*, Revision 0, 11/5/2015
SHR-WD-2016-00001, *System Health Report*, 4/15/2015,
SRR 2014 *Tri-Annual Assessment Plan* (Table)
SRR-CES-2011-00005, *SRR Engineering Designated Approvers*, Revision 29, 6/1/2017
SRR-ESH-2014-0119, *December 2014 IIE Assessment Plan*, Revision 1, 12/12/2014
SRR-ESH-2014-00022, *Assessment Plan for SRR LWO*, 4/4/2014
SRR-ESH-2015-00033, *March 2015 IIE Assessment Plan*, Revision 1, 3/27/15
SRR-ESH-2016-00001, *2016 IIE Assessment Plan*, Revision 1, 1/19/2016
SRR-ESH-2014-00063, *SRR LWO July 2014 IIE Assessment Plan*, July 18, 2014
SRR-ESH-2017-00015, *Executive Safety and Quality Board – Meeting Minutes*, 1/24/2017
SRR-ESH-2017-00042, *Savannah River Remediation Integrated Independent Evaluation (2017-2-1)*, May 4, 2017
SRR-ESH-2017-00058, *Submittal of the Savannah River Remediation (SRR) 2QFY17 Quarterly Occurrence Reporting and Processing System (ORPS) Performance Analysis Report*, Revision 0, May 8, 2017
SRR-RP-2009-00558-000, *S/RID Purpose and Development*, Revision 14-20, 2/18/15
SRR-RP-2009-00558-003, *Standards/Requirements Identification Document - Functional Area 03.0, Configuration Management*, Revision 15-01e, 3/8/2017
SRR-RP-2009-00558-004, *Training and Qualifications*, Revision 14-03, 2/9/2015
SRR-RP-2009-00558-009, *Conduct of Operations*, Revision 14-10, 2/10/2015
SRR-WSE-2011-00205, *Engineering Position on the DWPF Melter Off-Gas (OGP) HEPA Filter Life Expectancy*, Revision 0, 5/16/2012
SRR-WSE-2016-00015, *Engineering Commitment Management*, Revision 0, 5/18/2016
STAR Functional Area Codes, 5/10/2017
SW4-1.12.24, *DWPF Local Control Station Alarm Response Procedure – LCS-210*, Revision 12, 9/2/2015
SW4-1.12.24-S-LCS-210-2, *Fuel Oil Storage Tank No.1 Oil Level High High LAHH-8662*, Revision 2, 10/23/2007
SW4-1.12.24-S-LCS-210-4, *Fuel Oil Storage Tank No.2 Oil Level High High LAHH-8663*, Revision 2, 10/23/2007
SW4-1.12.24-S-LCS-210-6, *Fuel Oil Trans. Pump No.1 Disch. Flow Low Alarm FAL-8668*, Revision 6, 9/2/2015
SW4-1.12.24-S-LCS-210-7, *Fuel Oil Trans. Pump No.2 Disch. Flow Low Alarm FAL-8669*, Revision 8, 9/2/2015
SW4-1.12.24-S-LCS-210-11, *Fuel Oil Supply Line Double Wall Sump Level High Alarm LAH-8679*, Revision 5, 10/22/2007
SW4-1.12.24-S-LCS-210-12, *Fuel Oil Return Line Double Wall Sump Level High Alarm LAH-8680*, Revision 5, 10/22/2007
SW4-1.12.24-S-LCS-210-13, *Fuel Oil Stor. Tank No.1 Manway Oil Level High Alarm LAH-8681*, Revision 6, 11/25/2009
SW4-1.12.24-S-LCS-210-14, *Fuel Oil Stor. Tank No.2 Manway Oil Level High Alarm LAH-8682*, Revision 6, 11/25/2009
SW4-1.12.39, *DWPF Local Control Station Alarm Response Procedure – Load Center B9*, Revision 6, 5/1/2008
SW4-1.12.39-S-B9-1, *Diesel Generator DG100 Trouble*, Revision 2, 4/30/2008

SW4-1.12.39-S-B9-2, *Lockout 86/B9 Fault Trip*, Revision 4, 5/1/2008
SW4-1.12.39-S-B9-3, *480V Bus B9 Undervoltage*, Revision 3, 5/1/2008
SW4-1.12.39-S-B9-4, *Transformer X90 Undervoltage*, Revision 3, 5/1/2008
SW4-1.12.39-S-B9-5, *Engine DG100 Fault Trip*, Revision 4, 5/1/2008
SW4-1.12.39-S-B9-6, *Lockout 86-1/DG100 Fault Trip*, Revision 4, 5/1/2008
SW4-1.12.39-S-B9-7, *Transformer X90 Temperature High*, Revision 2, 5/1/2008
SW4-1.12.39-S-B9-8, *Diesel Generator PT Fuse Blown*, Revision 3, 5/1/2008
SW4-1.12.39-S-B9-9, *Lockout 86-2/DG100 Shutdown*, Revision 4, 5/1/2008
SW4-1.12.39-S-B9-10, *480V LC-B9 125V DC Power Loss*, Revision 3, 5/1/2008
SW4-1.12.39-S-B9-11, *Tie Breaker 52-B9/B8 Not Closed*, Revision 2, 5/1/2008
SW4-1.12.39-S-B9-13, *Operation Mode Switch Not In Auto*, Revision 3, 5/1/2008
SW4-1.12.42, *DWPF Local Control Station Alarm Response Procedure – Load Center 10*, Revision 6, 4/29/2008
SW4-1.12.42-S-B10-1, *Diesel Generator DG200 Trouble*, Revision 2, 4/29/2008
SW4-1.12.42-S-B10-2, *Lockout 86/B10 Fault Trip*, Revision 4, 4/29/2008
SW4-1.12.42-S-B10-3, *480V Bus B10 Undervoltage*, Revision 3, 4/29/2008
SW4-1.12.42-S-B10-4, *Transformer X100 Undervoltage*, Revision 3, 4/29/2008
SW4-1.12.42-S-B10-5, *Engine DG200 Fault Trip*, Revision 5, 4/29/2008
SW4-1.12.42-S-B10-6, *Lockout 86-1/DG200 Fault Trip*, Revision 4, 4/29/2008
SW4-1.12.42-S-B10-7, *Transformer X100 Temperature High*, Revision 2, 4/29/2008
SW4-1.12.42-S-B10-8, *Diesel Generator PT Fuse Blown*, Revision 3, 4/29/2008
SW4-1.12.42-S-B10-9, *Lockout 86-2/DG200 Shutdown*, Revision 4, 4/29/2008
SW4-1.12.42-S-B10-10, *480V LC-B10 125V DC Power Loss*, Revision 3, 4/29/2008
SW4-1.12.42-S-B10-11, *Tie Breaker 52-B10/B7 Not Closed*, Revision 2, 4/29/2008
SW4-1.12.42-S-B10-12, *Tie Breaker 52-B10/B9 Not Closed*, Revision 3, 4/29/2008
SW4-1.12.42-S-B10-13, *Operation Mode Switch Not In Auto*, Revision 3, 4/29/2008
SW4-1.12.43, *DWPF Local Control Station Alarm Response Procedure – Diesel Fuel Oil Tank*, Revision 4, 4/1/2008
SW4-1.12.43-S-LCS377A-1, *LAH-8664A (FOST #1 Liquid Leak Alarm)*, Revision 3, 4/1/2008
SW4-1.12.43-S-LCS377A-3, *LAH-8665-A (FOST #2 Liquid Leak Alarm)*, Revision 3, 4/1/2008
SW4-1.12.50, *DWPF Local Control Station Alarm Response Procedure – Zone 1 Backup Panel*, Revision 14, 9/2/15
SW4-1.12.50-S-LCS272-1, *JA-5750 (B9 Power Restored)*, Revision 3, 8/27/2007
SW4-1.12.50-S-LCS272-2, *JA-5751 B10 Power Restored*, Revision 3, 8/27/2007
SW4-1.12.50-S-LCS272-3, *PAH-5755A (Sand Filter Inlet Plenum Pressure Hi)*, Revision 6, 8/27/2007
SW4-1.12.50-S-LCS272-4, *PAHH-5755A (Sand Filter Inlet Plenum Pressure HiHi)*, Revision 9, 9/2/2015
SW4-1.12.50-S-LCS272-5, *XA-5750 PCM Failure*, Revision 2, 8/27/2007
SW4-1.12.59, *DWPF Local Control Station Alarm Response Procedure – S-XFMR90*, Revision 0, 4/20/2001
SW4-1.12.59-S-XFMR90-1, *B9 Transformer High Temperature*, Revision 0, 4/20/2001
SW4-1.12.59-S-XFMR90-2, *X90 Transformer Motor Overload*, Revision 0, 4/20/2001
SW4-1.12.60, *DWPF Local Control Station Alarm Response Procedure – S-XFMR100*, Revision 1, 4/19/2006
SW4-1.12.60-S-XFMR100-1, *B10 Transformer High Temperature Alarm*, Revision 1, 4/19/2006
SW4-1.12.60-S-XFMR100-2, *X100 Transformer Fan Overload for Motor Alarm*, Revision 1, 4/19/2006
SW4-15.15-2.2, *Startup*, Revision 21, 3/13/2017
SW4-15.15-2.4, *Loading with Manual Synchronization*, Revision 12, 11/5/2009
SW4-15.15-2.5, *Air Compressor Operation*, Revision 3, 2/11/2004
SW4-15.15-2.6, *Unloading*, Revision 11, 9/29/2011
SW4-15.15-2.7, *Shutdown*, Revision 6, 11/18/2010

SW4-15.15-2.8, *Post Operation*, Revision 20, 6/7/2017
SW4-15.15-3.1, *D/G100 (D/G200) Restoration Following Auto-Start when D/G is Not Loaded*, Revision 3, 9/14/2012
SW4-15.15-3.2, *D/G100 (D/G200) Restoration Following Auto-Start when D/G is Loaded*, Revision 12, 11/18/2010
SW4-15.15-3.3, *Failure of Both D/Gs During Power Loss*, Revision 0, 8/14/1995
SW4-15.15-3.4, *D/G100 Loss of Power Response/Recovery and Largest Single Load Rejection*, Revision 24, 10/7/2015
SW4-15.15-3.5, *D/G200 Loss of Power Response/Recovery and Largest Single Load Rejection*, Revision 19, 2/16/2017
SW4-15.15-5.6, *Diesel Fuel Oil Storage Tank Ten Year Cleaning*, Revision 11, 9/2/2015
SW4-15.15-5.8, *Diesel Fuel Receiving*, Revision 19, 10/29/2014
SW4-15.15-6.3, *Rodding of Underground Diesel Fuel Tanks*, Revision 17, 1/19/17
SW4-15.15-6.8, *D/G Fuel Oil Transfer Pumps Surveillance Test*, Revision 3, 9/2/2015
SW4-15.15-6.12 IPC-1, *Fuel Oil Day Tank Sampling for Particulate*, Revision 11, 12/22/2016
SW4-15.15-6.13 IPC-1, *Fuel Oil Storage Tank Sampling for Particulate*, Revision 11, 12/22/2016
SW4-15.15-6.15, *956-S Receipt Sampling of Diesel Fuel Oil for Tanker Truck*, Revision 1, 6/26/2007
SW4-15.15-6.16 IPC-1, *Fuel Oil Storage Tank Sampling for Lubricity*, Revision 3, 12/22/2016
SW4-15.15-8.1, *System Alignment Checklist*, Revision 17, 1/5/2015
SW4-15.15-8.2, *D/G100 Operating Data Sheet*, Revision 15, 3/16/2016
SW4-15.15-8.3, *D/G200 Operating Data Sheet*, Revision 14, 4/11/2016
SW4-15.15-8.4, *Diesel Fuel Storage Tank Level Conversion Chart*, Revision 1, 12/21/1995
SW4-V2, Defense Waste Processing Facility (DWPF) Organization, Revision 21, 5/14/2015
SW4-V3-CO-3.03, *Crane Control Room Operations*, Revision 4, 2/26/2014
SW4-V3-CO-3.04, *DWPF Control Area Activities*, Revision 4, 3/28/2017
SW4-V3-CO-5.01, *Administration of Technical Safety Requirements*, Revision 16, 1/13/2016
SW4-V3-CO-8.08 IPC-1, *Control of Equipment and System Status*, Revision 19, 4/25/2017
SW4-V3-CO-8.09, *Lockout/Tagout*, Revision 37, 4/20/2017
SW4-V3-CO-8.11, *Relay Configuration Control*, Revision 1, 10/21/2003
SW4-V3-CO-9.04, *Response to Alarms and Alerts*, Revision 3, 12/21/07
SW4-V3-CO-9.07, *Operations Manning Requirements, Watchbill Administration and Watchstanding Proficiency*, Revision 13, 6/8/2016
SW4-V3-CO-18.01, *S-Area Equipment and Piping Labeling Program*, Revision 6, 1/31/17
SW4-V3-CO-20.1 IPC-1, *Administrative Lock Program*, Revision 3, 5/4/2017
SW4-V3-CO-20.2 IPC-1, *Public Address System Usage*, Revision 9, 4/12/2017
SW4-V3-CO-20.6, *Operator Aid Postings*, Revision 2, 8/14/2013
SW4-V3-CO-20.9, *Logbooks (Key Positions) and Turnover Checklists*, Revision 5, 12/9/2015
SW4-V3-CO-20.10, *Notification of Events*, Revision 16, 6/8/2016
SW4-V3-CO-20.11, *Person-In-Charge (PIC) and Issue Owners Role and Responsibilities*, Revision 4, 3/18/14
SW4-V3-CO-20.13, *DWPF LCO Tracking Board Operations*, Revision 1, 5/18/2017
SW4-V3-CO-20.14, *Control Room Electronic Status Board*, Revision 2, 7/7/2014
SW4-V3-CO-20.17, *DWPF Operations Standing Order Administration*, Revision 1, 8/26/2014
System Health Monthly Updates for Melter Off Gas System, Revision 0, dated December 2015 - April 2017
System Health Monthly Updates for Emergency Diesels, Revision 0, dated December 2015 - April 2017
T-CLC-S-00140, *Seismic Adequacy of Replacement Spare Parts*, 3/31/11
T-CLC-S-00166, *Seismic Adequacy of Melter Interlock Instruments*, 5/17/1999
T-ECA-S-00026, *Engineering Calculation Amendment Replacement of Steam Valve S350-TCV-3682*, Revision 09.06.01.11, 6/28/2016
TRC-WD-2009-00429, *S350-ZZZF-3346 Replace Quencher Flow Transmitter*, Revision 0, 5/8/2009

U-CLC-S-00003, *DWPF Melter Off-Gas Flammability*, Revision 1, 7/5/2016
U-CLC-S-00005, *Inputs and Assumptions for DWPF Melter Off-Gas Flammability Analysis*, Revision 0, 6/15/2016
USQ-WD-2016-00183, *Advance Procurement Items for J-DCP-S-16001*, 3/22/2016
W5BA208B, *Study Guide – Diesel Generators*, Revision 3, 8/15/2006
W5BOPOXXQCRD000115, *Balance of Plant Operator Qual Card*, Revision 15
W5CO245D, *Study Guide – Melter Off-Gas System*, Revision 5, 4/22/2017
W5CROXXXQCRD000111, *DWPF Control Room Operator Qual Card*, Revision 11
W5CSTSR1, *Study Guide – DWPF Technical Safety Requirements*, Revision 4, 2/18/2015
W770100, *Sludge Preparation and Glass Melting, Single Line Diagram Sheet 2, 480V MCC B701 (Emergency Power)*, Revision 39, 10/15/2015
W770102, *Cold Feeds Facility, Single Line Diagram, 480V MCC B702 (Emerg Power)*, Revision 24, 10/15/2015
W775036, *SPD-2C Off-Gas Treatment System Performance Diagram*, Revision 12, 3/8/1995
W-775064, *SPD-2B Backup Off-Gas Quenching, Scrubbing and Cooling System Performance Diagram*, Revision 11, 2/19/1992
Waste Treatment Management Review Board Agenda, Revision 0, 6/13/2017
Waste Treatment Plan of the Month, Revision 0, 5/25/2017
WCACAA00, *LWO Technical Staff Continuing Training Plan*, Revision 5, 2/17/2016
WENG0054, *Liquid Waste Engineering Training - SRR Design Authority Engineer/Shift Technical Engineer/Cognizant System Engineer Task-To-Training Matrix*, Revision 2, 10/25/2016
WENG0128, *Liquid Waste Operations Engineering Training - DWPF Emergency Power (EEP) CSE Practical Factors*, Revision 1, 3/11/2015
WENG0133, *Liquid Waste Operations Engineering Training - DWPF Melter Off-Gas (OGP) CSE Practical Factors*, Revision 1, 3/23/2015
WENG0119, *DWPF Emergency Power (EEP) CSE Qualification Card*, Revision 1, 1/20/2015
WENG0124, *DWPF Melter Off-Gas (OGP) CSE Qualification Card*, Revision 1, 1/20/2015
WGIO0103, *Lesson Plan – Conduct of Operations*, Revision 0, 12/1/2016
WGIO0107, *Lesson Plan – Procedure Administration*, Revision 00, 4/2/2016
WGIO0108, *Lesson Plan – Procedure Compliance*, Revision 00, 6/6/2016
WGIO0109, *Lesson Plan – Communication*, Revision 01, 8/8/2016
WGIO0110, *Lesson Plan – Operating Logs*, Revision 00, 6/6/2016
WGIO0111, *Lesson Plan – Training*, Revision 00, 6/6/2016
WGIO0112, *Lesson Plan – Shift Turnover*, Revision 00, 9/22/2016
WGIO0113, *Lesson Plan – Shift Briefings and Watchbill Administration and Proficiency*, Revision 00, 7/26/2016
WGIO0114, *Lesson Plan – Shift Routines and Operating Practices and Timely Orders to Operators*, Revision 00, 9/22/2016
WGIO0115, *Lesson Plan – Facility Operations Organization and Administration/Issues Investigations*, Revision 00, 9/22/2016
WGIO0116, *Lesson Plan – Control Area Activities*, Revision 00, 10/4/2016
WGIO0117, *Lesson Plan – Roundsheet Preparation and Use*, Revision 00, 11/1/2016
WGIO0118, *Lesson Plan – Equipment Control and Status*, Revision 00, 10/4/2016
WGIO0119, *Lesson Plan – Operations Tags Use and Control*, Revision 00, 7/20/2016
WGIO0120, *Lesson Plan – Verification Methodologies*, Revision 00, 10/3/2016
WGIO0122, *Lesson Plan – Operator Aid Postings*, Revision 00, 10/4/2016
WGIO0123, *Lesson Plan – Equipment and Piping Labeling*, Revision 00, 10/4/2016
WO 01581707-01, Replace Cells 29/30 and 23/24 on Battery Bank D51, Revision 0, 6/9/2017
WO 01581707-03, *Replace Cells 9/10 on Battery Bank D51*, Revision 0, 6/12/2017
WO 01581719-01, *Remove Four Battery Jars from D31*, Revision 0, 6/9/2017
WO 01541862-01, *CMA Supply Fan 1 Tubing Replacement*, Revision 0, 6/12/2017

WO 01581708-01, Pull Oil Sample from Process Chiller #1, Revision 0, 6/8/2017
WO 01583642-01, CDC Supply Fan #2 Fuse Replacement, Revision 0, 6/8/2017
WO 01282803, *Cal 350-FSL-3346A OGCT Quench Pump*
WO 01290708, *Calibration of Instrument 350-PIT-3683*
WO 01298968, *Calibration of Instrument 350-PDT-3400*
WO 01298999, *6 Month PM on HEME Primary Water Filter*
WO 01309372, *Replace BUOG Heater Controller*
WO 01309373, *Replace OG Prefilter Screen*
WO 01322047, *Bench Test DG 100 Start Air*
WO 01322300, *Replace HEME Filter*
WO 01332473, *Calibration of 350-PT-3527*
WO 01334471, *6 Month Replacement of HEME Primary Water Filter*
WO 01334737, *Repair Leak on Valve ISA-117A*
WO 01335092, *Replace Load-side Fuse on Terminal Strip for B114-2B*
WO 01347429, *Calibration of 350-FT-3534*
WO 01347432, *Calibration of Instrument 350-PT-3685*
WO 01361606, *Calibration of S350-PI-3221 A/B*
WO 01361688, *Calibration of S350-FT-3221 B*
WO 01366025, *Replace Fuses on Offgas HEPA Heater Screen Controller*
WO 01373375, *6 Month Replacement of HEME Primary Water Filter*
WO 01378192, *Calibration of S956-TSH-8643*
WO 01581707-01, *Replace Cells 29/20 & 23/24 on Battery Bank D51*, Revision 0, 6/5/17
WO 01581719-01, *Remove Four Battery Jars from D31*, Revision 0, 6/1/17
WSPTS001, *DWPF Technical Staff Qualification Card*, Revision 10, 9/21/2016
WSRC-RP-92-226, *High Level Waste Management Division, Defense Waste Processing Facility, Training Implementation Matrix*, Revision 2, 10/2/1995
WSRC-SA-6, *Final Safety Analysis Report, Savannah River Site, Defense Waste Processing Facility*, Revision 35, 12/2016
WSRC-TM-95-1, *SRS Engineering Standards Program – Responsibilities and Requirements*, Revision 9, May 10, 2016
WSRC-TS-95-19, S-TSR-S-00001, *Technical Safety Requirements, Defense Waste Processing Facility, Savannah River Site*, Revision 61, 2/2017
WWDSVCRMQCRD000117, *DWPF Control Room Manager Qual Card*, Revision 17
WWDWOQPD, *DWPF Operations Training and Qualification Program Description*, Revision 16, 9/29/2016
Y-SHR-S-00001, *Annual System Health Report - Melter Off-Gas System (OGP) for 2015-2016*, 11/8/2016
01311960, *Work Order Repair Air Leak, Lo-Side of Flow Switch FISL-3221-A*, 9/3/14
SRNS 1B 5.19, *Suspect and Counterfeit Item Program*
SRNS 1Q 9-4, *Work Planning and Control*, Revision 13, 12/17/08
SRNS 1Q 6-1, *Document Control*, Revision 9, 09/08/2016
SRNS 1Q 12.3, *Control and Calibration of Radiation Monitoring Equipment*, Revision 14, 6/23/2016
SRNS 1Q 12.2, *Control of Installed Process Instrumentation (IPI)*
SRNS 1Y 2.01, *Savannah River Site Maintenance Management*, Revision 3, 9/22/2016
SRNS 1Y 2.06, *Maintenance Program Administration*, Revision 2, 3/31/2014
SRNS 1Y 5.01, Conduct of Maintenance, Revision 7, 10/1/2004
SRNS 1Y 5.02, *Preventive Maintenance Program*, Revision 12, 2/23/2017
SRNS 1Y 5.05, *Predictive Maintenance Program*, Revision 4, 5/22/2014
SRNS 1Y 8.03, *Troubleshooting*, Revision 9, 3/10/2016
SRNS 1Y 8.20, *Work Control Procedure*, Revision 26, 12/15/2016
SRNS 1Y 9.01, *Post Maintenance Testing*, Revision 7, 5/10/2016

SRNS 1-01 4.20, *Conduct of Operations*, Revision 5, 6/29/2011
SRNS 1-01 5.39, *Management Policies Configuration Management*, Revision 2, 4/27/2017
SRNS 13239-MH-20942-48(1)6, *Method of Calculating Exhauster Performance*, 1/29/1987
SRNS 2S 1.1, *Procedure Administration*, Revision 18, 4/27/2016
SRNS 2S 1.3, *Procedure Compliance*, Revision 10, 4/27/2017
SRNS 2S 2.1, *Communications*, Revision 12, 4/27/2017
SRNS 2S 2.4, *Operating Logs*, Revision 10, 4/27/2017
SRNS 2S 3.2, *Control of On-Shift Training*, Revision 4, 6/11/2015
SRNS 2S 3.3, *Facility Drills*, Revision 10, 10/13/2016
SRNS 2S 4.1, *Shift Turnover*, Revision 6, 9/22/2016
SRNS 2S 4.2, *Shift Briefings*, Revision 3, 10/22/2015
SRNS 2S 4.3, *Watchbill Administration and Watchstanding Proficiency*, Revision 8, 3/23/2017
SRNS 2S 4.4, *Shift Routines and Operating Practices*, Revision 6, 7/23/2015
SRNS 2S 4.5, *Timely Orders to Operators*, Revision 4, 4/30/14
SRNS 2S 5.3, *Control Area Activities*, Revision 3, 3/28/2014
SRNS 2S 5.4, *Round Sheets*, Revision 5, 12/21/16
SRNS 2S 5.5, *Control of Equipment and System Status*, Revision 11, 10/27/2016
SRNS 2S 5.9, *Hazardous Energy Control*, Revision 2, 3/10/16
SRNS 2S 5.10, *Operator Aid Postings*, Revision 3, 2/9/2017
SRNS 2S 5.14, *Control of Interrelated Processes (For Training Purposes Only)*, Revision 0, 6/29/17
257-8-SUR-1251, *Battery Bank D51Service Test*, Revision 12, 9/02/2015
257-8-1955, *Check UPS YU210 Battery Bank Quarterly*, Revision 23, 6/2/2015
257-8-1977, *Calibration of GEOKON Load Cell with Primary and Back-up DAS*, Revision 13, 8/30/2015
257-8-2605, *Setup/Calibration of Veltron II Model 7000 Transmitter*, Revision 9, 1/21/2017
2013-IR-05-2193 3221A, *QA Inspector Log*, 11/10/2013
2014-AR-05-0003, *Savannah River Remediation Integrated Independent Evaluation (2014-2-1) And Quality Assurance Audit*, 4/30/2014
2014-AR-05-0005, *SRR Integrated Independent Evaluation (2014-2-2) Quality Assurance Audit*, 8/18/2014
2014-AR-05-0007, *SRR Integrated Independent Evaluation (2014-2-3) Quality Assurance Audit*, January 15, 2014
2015-AR-05-0001, *SRR Integrated Independent Evaluation (2015-2-1) Quality Assurance Audit*, 4/21/2015
2016-AR-05-0001, *SRR Integrated Independent Evaluation QA Audit*, 2/18/2016
2010-CTS-015207, *Engineering System Health - Diesel Fuel Oil (DFO) Annual System Health Report - 2010*, 11/22/2010
2013-CTS-013445, *TSR LCO and SR Implementation - Technical Basis in Surveillance Procedure*, 11/11/2013
2014-CTS-004658
2014-CTS-7228, *Lesson Learned - Pressure Protection of the 292-S Diesel Generator Air Start System*
2014-CTS-010708, *Review and Disposition of 2014 Structural Integrity Reports*, 10/3/2016
2014-CTS-013825, *Annual System Health Reports, Create and track activities to develop, review, incorporate comments, and approve the Annual System Health Report for DWPF/Saltstone Vital Safety Systems (VSS)*, 11/20/2014
2015-CTS-008019, *Degradation of Slurry Mix Evaporator Steam Valve FCV3080*, 7/24/2012
2015-CTS-010772, *Melter Off-Gas Model Revision*, 9/22/2015
2015-CTS-011395, *Discrepancy in Melter Off-Gas Flammability Model Impacting Bubbled Operations*, 10/1/2015
2015-CTS-012737, *Review SAC and Non-SAC Admin Controls including implementation (DWPF)*, 10/22/2015
2016-CTS-001262, *Lessons Learned – DWPF SS Work Control*

2016-CTS-002789, *OGP/S350-TCV-3682*, 3/7/2016
2016-CTS-006824, *Recommended Actions for the Melter Off-Gas Annual System Health Report (2014 - 2015)*, 4/15/2015
2016-CTS-007364, *MISC/S350-LT-3484*, 7/11/2016
2016-CTS-008955, *DOE Order 422.1, Attachment 2, Control of Interrelated Processes*, 8/24/2016
2016-CTS-10901 – *Recycle Waste Tank Agitator Restart/Q-Time Issue*, 9/28/2016
2016-CTS-11469 – *DWPF/ Saltstone Saturation Review – Lockouts L/T Chain Wrapping Issue*, 10/27/2016
2016-CTS-011751, *Evaluate additional PMs Required for the Melter Off-Gas System*, 11/1/2016
2017-CTS-001150, *Walkdown of Diesel Generator Oil Reservoir for Welding Of Supports*, 1/29/2017
2017-CTS-002360, *Field Visit to Diesel Fuel Oil Storage Tanks*, 2/27/2017
2017-CTS-005934, *EA-31 Observation on 2S Manual*, 5/16/2017
2017-CTS-006523, *Control of Interrelated Processes Implementation*, 6/6/17
2017-CTS-006524, *Control of Interrelated Processes Implementation*, 6/6/17
2017-CTS-006525, *Control of Interrelated Processes Implementation*, 6/6/17
2017-CTS-006526, *Control of Interrelated Processes Implementation*, 6/6/17
2017-CTS-006527, *Control of Interrelated Processes Implementation*, 6/6/17
2017-CTS-006626, *Missing Completed Commercial Grade Dedication Packages for Work Packages*, June 8, 2017
2017-CTS-006693, *Uncontrolled Manuals/Procedures Found at the 292-S Operator Work Station*, 6/8/2017
2017-CTS-006836, *Review of Safety Basis Documents*, 6/15/2017
2016-GI-16-002205, *Control Valve In Accordance with Data Sheet J-JD-S-00745*, 9/27/2016
2017-IR-05-0111, *SRR QA Inspection Report - Diesel Engine Lube Oil Test Report 201612120008*, 9/27/2016
2014-NCR-05-0049, *DWPF Starting Air Compressor S956-330-101-00-K and S956-330-201-00-K*, 7/1/2014
2014-NCR-05-0081, *292-S Diesel Generator Air Start Receiver Tank Relief Valves Inadequate Failure Flow Due To Fire Exposure*, 3/1/2016
2015-NCR-05-0094, *DG100 Air Start System not passing ISLT of M-DCF-S-03092*, 12/31/2015
2015-RIR-16-SRRA077852-127290, *Gauge, Temperature*, 9/17/2015
2016-RIR-16-SRRA096097, *Control Valve In Accordance with Data Sheet J-JD-S-00745*, 10/12/2016
2008-SA-000086, Assessment Summary, *Field Configuration and Equipment Labeling-Melter Offgas*, 5/15/2008
2015-SA-000342, *Implementation of E7 2.06A LW Temporary Modifications*, 9/29/2015
2015-SA-000469, *Aging Degradation and Technical Obsolescence*, 9/2015
2015-SA-002403, *1ST Quarter 2015 SRR Engineering Focused Assessment- Configuration Control and Testing of WCS 1.5 Software*, 7/16/2015
2015-SA-003638, *WCS Online Requirements Phase Assessment*, 7/13/2015
2015-SA-005711, *Coordination between Design Services and Process Control & Engineering*, 9/6/2016
2015-SA-005842, *Tank 12 Grout Readiness Facility Self-Assessment (FSA)-F09 Configuration Management*, 11/19/2015
2015-SA-006141, *DWPF/Saltstone Installed Process Instrumentation (IPI) Program Assessment*, 11/2016
2015-SA-006160, *Linking Documents 11Q-1.06, S4-ADM.42-Team Assessment*, 9/9/2016
2015-SA-006172, *Building 251-S Assessment*, 1/2016
2015-SA-006173, *Building 292-S Assessment*, 1/2016
2015-SA-006174, *Building 221-S Assessment*, 3/2016
2015-SA-006434, *Salt Solution Receipt Tank Project Facility Self Assessment; FA09, Configuration Management*, 5/5/2016

2016-SA-000329, *Software Quality Assurance for Safety Related and Waste Form Affecting Online Applications*, 2/25/2016
2016-SA-000331, *IPI Program per 1Q, Procedure 12-2*, 3/31/2016
2016-SA-001998, *January 2016 Integrated Independent Assessment for DWPF and Saltstone Facilities for Selected SRR Functional Areas*, 7/27/2017
2016-SA-004415, *Liquid Waste Organization Structural Integrity Program*, 7/20/2016
2016-SA-006489, *VS-01 Assessment of the Low Point Pump Pit (LPPP) Safety Grade Nitrogen Purge System*, 1/25/2017
2017-SA-000402, *Software QA, Manual 1Q Procedure 20-1*, Draft
2017-SA-000404, *IPI Program per 1Q*, 5/3/2017
2017-SA-000701, *DWPF/Saltstone TSR LCOs Assessment*, 3/2017
2017-SA-000792, *PCE Software Change Management Compliance*, 4/27/2017
2017-SA-002323, *FA03 Configuration Management S/RIDS Assessment*, 3/13/2017
2017-SA-002384, *S/RIDS Flow Down Review for Functional Area 07.0, Engineering Program*, 5/10/2017
2017-SA-003525, *Phase I Melter 2 Outage: Melter 2 preparation and movement from the Melt Cell to the Failed Equipment Storage Vault (FESV)*, 5/25/2017
2017-SA-003679, *Control of Interrelated Processes Implementation*, 5/23/17
2017-SA-006172, *Integrated Independent Evaluation (IIE)*, 3/2017
2016-SUR-37-0062R1F, *Supplier Surveillance Plan/ Report - Engine Services, Inc., Commercial Grade Dedication Surveillance*, 2/1/2017
2014-VAR-18-0027, *Engine Services External Audit Checklist*, 11/25/2014
22Q CAP-1, *Corrective Action Program*, Revision 3, 5/11/2017
257-8-SUR-1251, *Battery Bank D51 Service Test Surveillance Requirement*, Revision 12, 9/2/2015
SRNS 4B 1, *Training and Qualification Program*, Revision 2, 7/31/2013
SRNS 4B 2, *Qualification/Certification Program Requirements*, Revision 5, 12/5/2013
SRNS 4B 3, *Analysis, Design and Development of Training*, Revision 2, 9/28/2012
SRNS 4B 4, *Training Implementation and Evaluation*, Revision 3, 7/31/13
SRNS 4B 5, *Training Processes, Records and Documentation*, Revision 2, 7/31/2013
77808R, *Transfer Request- Replace S956-SSHL-8616X*, 1/27/2016
SRNS 8Q 32, *Hazardous Energy Control (Lockout/Tagout)*, Revision 23, 1/28/2016

DOE-SR:
Annual Performance Assurance Plan for Calendar Year 2017, Revision 0, 12/6/2016
Charter for the Savannah River Operations Office Facility Engineer/Safety System Oversight Council (FESSOC), Revision 3, January 2017
Letter of Direction for Delegation of Limited Functions Related to 10 CFR 851, Revision 0, 4/27/2009
Organization Chart for the Office of Assistant Manager for Waste Disposition, Revision 0, January 2017
Savannah River Implementing Standard for the Safety System Oversight (SSO) Qualification Standard, Revision 0, 6/21/2006
Savannah River Operations Office 2016 Workfoce Analysis and 2017-2021 Workforce Plan – Fiscal Year 2016, Revision 0, not dated
Savannah River Operations Office Succession Plan, Revision 0, August 2013
SRIP 200, Chapter 210.2, *DOE-SR Operating Experience (OE) and Lessons Learned (LL) Program*, Revision 1, 4/1/2011
SRIP 200, Chapter 231.1, *Environment, Safety and Health Reporting Requirements*, Revision 6, 12/6/2016
SRIP 200, Chapter 251.2, *Review and Approval of Standards/Requirements Identification Document (S/RID) Change Packages*, Revision 5, 4/9/2010
SRIP 200, Chapter 243.1, *Records Management Program*, Revision 0, 1/16/2007

SRIP 400, Chapter 420.1, *DOE-SR Notification to the Contractor of an Adverse Condition/Stop Work Order*, Revision 3, 10/16/2008
SRIP 400, Chapter 421.1, *Nuclear Safety Oversight*, Revision 8, 1/20/2016
SRIP 400, Chapter 421.2, *Safety System Oversight*, Revision 3, 7/28/2016
SRIP 400, Chapter 425.1, *Nuclear Facility Startup Approval Process*, Revision 3, 12/2/2013
SRIP 400, Chapter 430.1, *Facility Representative Program*, Revision 9, 2/12/2016
SRM 226.1.1F, *Integrated Performance Assurance Manual (IPAM)*, Revision 0, 9/7/2016
SRM 300.1.1B, Part 1, Subsection 1, *Functions, Responsibilities, and Authorities Procedure (FRAP)*, Revision 7, 7/11/2014
SRM 300.1.1B, Part 1, Subsection 9, *Definitions of Codes Used in the Matrix of Safety Management Functions, Responsibilities, and Authorities*, Revision 7, 7/11/2014
SRM 300.1.1B, Part 1, Subsection 10, *DOE-SR FRAP*, Revision 7, 7/11/2014
SRM 300.1.1B, Part 2, Subsection 6, *FRAP – Office of the Assistant Manager for Waste Disposition (AMWD)*, Revision 7, 7/11/2014
SRM 300.1.1B, Chapter 6, Section 6.1, *Technical Qualification Program (TQP)*, Revision 3, 7/9/2012
SRM 300.1.1B, Chapter 6, Section 6.2, *Employee Training and Development*, Revision 2, 8/14/2013
SR Operations Office Facility Engineer/Safety System Oversight Council Meeting Agenda, Revision 0, 1/19/2017
2013-SA-006991, *WDED Self-Assessment on FE/SSO Model Effectiveness*, 1/14/2014
2016-SA-001458, *Facility Representative Program Triennial Assessment (Objective 1)*, 2/11/2016
2016-SA-001466, *2015 Facility Representative Program Trienniel Assessment (Objective 2)*, 2/11/2016
2016-SA-001531, *WDED Self-Assessment of FE/SSO Staffing and Oversight Effectiveness*, 2/17/2016
2016-SA-005503, *DOE-SR Independent Verification Review (IVR) for DWPF Glass Waste Storage Building Canister Double Stacking*, 10/25/2016
Triennial Performance Assurance Plan for Calendar Years 2017-2019, Revision 0, 12/6/2016
WDED Responses to DNFSB FE/SSO Lines of Inquiry, Revision 0, 2/17/2016

Interviews

- Asset Suite System Administrator
- Balance-of-Plant Manager (3)
- Balance-of-Plant Operator (8)
- CAS Manager
- CAS Lead Analyst
- Cognizant System Engineer, Melter Off-Gas System
- Cognizant System Engineer, Emergency Diesel Generator
- Commercial Grade Dedication Engineer
- Configuration Management Manager
- CSE supervisor (2)
- Deputy Operations Manager
- Design Services Acting Manager
- Design Services Project Engineer
- DWPF and Saltstone Facility Engineering Manager
- Electrical and I&C Maintenance Supervisor
- Electrical Engineering Manager
- Engineering Training Coordinator Operations Manager
- In-Process Instrumentation Calibration Manager
- Integration Manager (Work Control)

- Issues Management Lead
- M&TE Manager
- Mechanical Maintenance Supervisor
- Maintenance Manager
- Maintenance Planners (2)
- Maintenance Program Manager
- Melter and Saltstone Engineering Manager
- Operations Manager
- Operations Project Integration Manager
- Procedures Manager
- Procurement Manager
- QA Auditor (Vendor Qualification)
- QA Manager for DWPF
- QA Manager for SRR Independent Assessments
- Receipt Inspector (4)
- Shift Maintenance Supervisor
- Shift Manager (5)
- Simulator Instructor
- SRR Configuration Management Program Manager
- SRR Contracting Officer
- SRR ConOps Functional Area Manager
- SRR Training Manager
- SRR Assessment Coordinator
- SRR EDWS Point of Contact
- SmartPlant Foundation Administrator
- Staff Engineers (5)
- Training Instructor
- Training Manager
- Vibration Analyst
- Vitrification Building Manager
- Vitrification Control Room Manager
- Vitrification Control Room Operator (2)
- Work Week Coordinator

- DOE-SR Contracting Officer
- DOE-SR Facility Representatives (3)
- DOE-SR Facility Engineer/Safety System Oversight
- DOE-SR Waste Disposition Engineering Division Director
- DOE-SR Assistant Manager for Waste Disposition

Observations

- Battery Bank D51 Service Test
- Bulk Material Receipt Inspection
- Calibration of GEOKON Load Cell with Primary and Back-up DAS
- CDC Supply Fan #2 Fuse Replacement
- Check UPS YU210 Battery Bank Quarterly

- CMA Supply Fan 1 Tubing Replacement
- Construction Department's lay-down yard - S350-TCV-3682, Steam Valves Walk Down
- CSE Walkdown of Melter Off-Gas System
- EEP System Walkdown
- FR Assessment of Melter Changeout Operation
- Determination of Lockout/Tagout
- Fact Finding on Personnel Contamination Event
- Installation and Verification of Lockout/Tagout (2)
- Installation and Removal of Single Point Lockout/Tagout
- M&TE Equipment Room Walkdown
- Management Review Team Meeting
- Material Access Center Walkdown
- Meeting of the Facility Operations Safety Committee
- Melter Off-Gas System Walkdown
- Multiple Shift Turnover Meetings
- Multiple Pre-job Briefs
- Performance of 257-8-SUR-1251, *Battery Bank D51 Service Test Surveillance Requirement*
- Performance of Work Order 01581707-01, *Replace Cells 29/20 & 23/24 on Battery Bank D51*
- Performance of Work Order 01581719-01, *Remove Four Battery Jars from D31*
- Oil Sample from Process Chiller #1
- Removal of Four Battery Jars from D31
- Replacement of Cells 29/30 and 23/24 on Battery Bank D51
- Replacement of Cells 9/10 on Battery Bank D51
- Setup/Calibration of Veltron II Model 7000 Transmitter
- Simulation of SW4-15.15-6.3, *Rodding of Underground Diesel Fuel Tanks*

Appendix C
Deficiencies

Deficiencies that did not meet the criteria for a finding are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- Insufficient technical basis exists to establish compliance with NFPA-1 requirements for ventilation flow through the diesel battery rooms (292-S) to mitigate hydrogen generation during battery charging. (STAR Item 2017-CTS-005927)
- Two design change packages were identified that did not include or reference any technical justification for the change.
- The SRR Liquid Waste configuration management implementation plan does not address all of the requisite areas of configuration management as discussed in SRNS Procedure E7 1.05, DOE Order 420.1C, and DOE STD-1073. (STAR Item 2017-CTS-006631)
- Self-assessments performed by SRR in the area of configuration management were not effective in gauging performance as specifically required by DOE Order 420.1C, Attachment 2, Section V.3.c.
- Contrary to Manual E7, Procedure 2.06A, *LW Temporary Modification Control*, an unauthorized temporary modification of the EEP system involving a tygon hose and large poly bottle attached to the top of the DG-200 water jacket heater was identified during the assessment.
- Contrary to DOE Order 433.1B, the Savannah River NMMP, and site procedures, PMs are not performed in accordance with the frequency prescribed in the established maintenance program.
- Contrary to DOE Order 426.2, Personnel Selection, Training, Qualification and Certification Requirements for DOE Nuclear Facilities, the following two deficiencies were identified:
    - The qualification program for maintenance technicians does not include systems training and related industry and facility-specific experience. (STAR Item 2017-CTS-005530)
    - The DWPF Maintenance Group formally documented qualification program for mechanics and E&I technicians does not establish a training process that includes actual facility jobs to be performed, learning objectives for those tasks, and evaluation of trainee mastery of those objectives. (Star Item 2017-CTS-0006128)