



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

October 11, 2018

EA-16-173
EN 53504

Mr. Mike Annacone
Vice President, Columbia Fuel Operations and
Manager, Columbia Plant
Westinghouse Electric Company
5801 Bluff Road
Hopkins, SC 29061

**SUBJECT: ERRATA – WESTINGHOUSE ELECTRIC COMPANY – NUCLEAR
REGULATORY COMMISSION INTEGRATED INSPECTION REPORT NUMBER
70-1151/2018-004 AND NOTICE OF VIOLATION**

Dear Mr. Annacone:

On October 5, 2018, the U.S. Nuclear Regulatory Commission (NRC) issued the subject inspection report for Westinghouse Columbia Fuel Fabrication Facility, Agencywide Document and Management System (ADAMS) Accession Number ML18278A197. After the inspection report (IR) was issued, it was noted that the timeline information on page 8, in the body of the report, inaccurately reflected how the Soil Sampling Plan was developed in coordination with the South Carolina Department of Health and Environmental Control (SC DHEC). The coordination between Westinghouse and SC DHEC did not occur until after event was reported. Accordingly, we have revised the body of IR 70-1151/2018-004, to document the necessary changes.

This reissued report does not change any NRC position that has been communicated in the previously issued report.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

I apologize for any inconvenience this error may have caused. If you have any questions, please contact Tom Vukovinsky of my staff at (404) 997-4622.

Sincerely,

/RA/

Eric C. Michel, Chief
Projects Branch 2
Division of Fuel Facility Inspection

Docket No. 70-1151
License No. SNM-1107

Enclosure:
NRC Inspection Report 70-1151/2018-004
w/Supplemental Information

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SUBJECT: ERRATA – WESTINGHOUSE ELECTRIC COMPANY – NUCLEAR
 REGULATORY COMMISSION INTEGRATED INSPECTION REPORT NUMBER
 70-1151/2018-004 AND NOTICE OF VIOLATION

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ADAMS: Yes ACCESSION NUMBER: ML18284A095 SUNSI REVIEW COMPLETE FORM 665 ATTACHED

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NOTICE OF VIOLATION

Westinghouse Electric Company
Hopkins, SC

Docket No. 70-1151
License No. SNM-1107

During an NRC inspection conducted September 18 through September 21, 2018, one violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

- A. As stated, in part, by 10 Code of Federal Regulations (CFR) 70.61(e), the safety program established and maintained pursuant to 10 CFR 70.62 of this subpart, shall ensure that each item relied on for safety (IROFS) will be available and reliable to perform its intended function when needed and in the context of the performance requirements of this section.

As required by 10 CFR 70.62(d), each licensee shall establish management measures to ensure compliance with the performance requirements of 10 CFR 70.61. The management measures shall ensure that engineered and administrative controls and control systems that are identified as IROFS pursuant to 10 CFR 70.61(e) are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed, to comply with the performance requirements of 10 CFR 70.61.

Contrary to the above, the licensee failed to establish adequate management measures to ensure that two engineered controls identified as IROFS were designed and implemented such that they were available and reliable to perform their function. Specifically, for a minimum of three years prior to June 16, 2018, established management measures failed to ensure IROFS ADUHFS-502 and ADUHFS-902 were available and reliable to perform their intended function when needed in order to comply with the performance requirements of 10 CFR 70.61. As a result, on June 16, 2018, hydrofluoric acid (HF) solution was spilled from HF Spiking Station #2 and spilled from the diked area. This is a violation 10 CFR 70.62(d).

This is a Severity Level IV violation (Section 6.2.d.1 of the Enforcement Policy).

Pursuant to the provisions of 10 CFR 2.201, Westinghouse Electric Company is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, Region II, within 30 days of the date of the letter transmitting this Notice. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Your response will be made available electronically for public inspection in the NRC Public Document Room or in the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this NOV within two working days.

Dated this 5th day of October, 2018

U. S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket No.: 70-1151

License No.: SNM-1107

Report No.: 70-1151/2018-004

Licensee: Westinghouse Electric Company

Facility: Columbia Fuel Fabrication Facility

Location: Hopkins, SC 29061

Dates: September 17 through September 20, 2018

Inspectors: T. Vukovinsky, Senior Fuel Facility Inspector
J. Rivera, Senior Fuel Facility Inspector
B. Adkins, Senior Fuel Facility Inspector
K. Womack, Fuel Facility Inspector
J. Quintero, Project Manager, Subject Matter Expert
J. Saxton, Hydrologist, Subject Matter Expert

Approved by: E. Michel, Chief
Projects Branch 2
Division of Fuel Facility Inspection

EXECUTIVE SUMMARY

Westinghouse Electric Company
Columbia Fuel Fabrication Facility
Nuclear Regulatory Commission Integrated Inspection Report 70-1151/2018-004
September 18 through September 21, 2018

The inspection was conducted by Nuclear Regulatory Commission (NRC) regional inspectors during normal shifts in areas of operational safety, radiological controls, and other areas. The inspectors performed a selective examination of license activities that were accomplished by direct observation of safety-significant activities and equipment, tours of the facility, interviews and discussions with licensee personnel, and a review of facility records. One violation of NRC requirements was identified.

Operational Safety

- In the area of Nuclear Criticality Safety, no violations of more than minor significance were identified. (Paragraph A.1)
- In the area of Operational Safety, no violations of more than minor significance were identified. (Paragraph A.2)

Radiological Controls

- In the area of Effluent Controls and Environmental Protection, no violations of more than minor significance were identified. (Paragraph B.1)

Other

- In the area of Event Follow-up, one Severity Level IV violation of NRC requirements was identified. (Paragraph C.1)
- Review of completed Confirmatory Order commitments. (Paragraphs C.2 and C.3)

Attachments:

Key Points of Contact
List of Items Opened, Closed, and Discussed
Inspection Procedures Used
Documents Reviewed

REPORT DETAILS

Summary of Plant Status

The Westinghouse Facility converts uranium hexafluoride (UF₆) into uranium dioxide using a wet conversion process, and fabricates fuel assemblies for use in commercial nuclear power reactors. During the inspection period, normal production activities were ongoing.

A. Safety Operations

1. Criticality Safety (Inspection Procedure 88015)

a. Inspection Scope

Criticality Analysis

The inspectors reviewed the selected Criticality Safety Evaluations (CSEs) and associated assumptions and calculations to verify consistency with the commitments in the License Application, including the consideration of the Double Contingency Principle, assurance of subcriticality under normal and credible abnormal conditions with the use of subcritical margin, technical practices and methodologies, and treatment of nuclear criticality safety (NCS) parameters. The inspectors reviewed the selected CSEs to also determine whether approved CSEs were available, were of sufficient detail and clarity to permit independent review, and whether calculations were performed within the validated area of applicability and consistent with the validation report. The CSEs were selected based on factors such as risk-significance, if new or revised, the use of unusual control methods, and operating history. The CSEs reviewed included CSE-2-A and CSE-9-B, which cover bulk uranyl nitrate storage and cylinder wash within the Uranium Recycling and Recovery Services (URRS) area of the facility. The inspectors also reviewed supporting criticality calculations and computer models to verify that all normal and credible abnormal conditions were subcritical with an approved margin of subcriticality. The following calculations were reviewed: CN-CRI-07-10 and CN-CRI-07-41.

For the CSEs listed above, the inspectors reviewed the licensee's generation of accident sequences to verify whether the CSEs systematically identified normal and credible abnormal conditions for the analysis of process upsets in accordance with the commitments and methodologies in the License Application. This effort included the review of accident sequences that the licensee determined to be not credible in order to determine whether the bases for incredibility were consistent with the commitments, definitions, and methodologies in the License Application and were documented in sufficient detail to permit an independent assessment of credibility.

Criticality Implementation

The inspectors performed walk-downs of the uranyl nitrate storage and cylinder wash systems to determine whether existing plant configuration and operations were covered by, and consistent with, the process description and safety basis description in the CSEs. The inspectors reviewed process and system descriptions to verify that engineered controls established in the CSEs were included. The inspectors reviewed operating procedures and postings to verify that selected administrative controls established in the CSEs were included. The inspectors interviewed operators and

engineers to verify that administrative actions established in the CSEs were understood and implemented properly in the field. Specifically, the inspectors observed activities associated with the calibration of the cylinder wash scale which is used to implement administrative items relied on for safety (IROFS) associated with CSE-9-B. The following IROFS were inspected: WASH-103, WASH-106, and WASH-126.

Criticality Operational Oversight

The inspectors reviewed training records for one recently hired licensee NCS staff. The inspectors verified that the NCS engineer was qualified in accordance with license commitments.

The inspectors reviewed records from weekly NCS engineer walkthrough assessments to determine whether NCS staff routinely inspected fissile material operations to ascertain that criticality requirements were being satisfied.

Criticality Programmatic Oversight

The inspectors reviewed the selected CSEs listed above to verify that they were performed in accordance with NCS program procedures and received appropriate independent review and approval. The inspectors reviewed a recently completed external NCS program audit to determine if the audit was performed in accordance with Section 6.1.9 of the License Application. The inspectors verified that the licensee entered the five audit findings and twenty suggestions for improvement into the licensee's corrective action program (CAP) for further evaluation.

The inspectors reviewed recently revised NCS program procedures to verify that the changes were consistent with the requirements contained in Section 6 of the License application.

Criticality Incident Response and Corrective Action

The inspectors reviewed selected NCS-related Westinghouse Incident Reporting (Redbook) entries to verify whether anomalous conditions were identified and entered into the corrective action system, whether proposed corrective actions were sufficiently broad, whether they were prioritized on a schedule commensurate with their significance, and whether they were completed as scheduled and addressed the problem identified. The following Redbooks were reviewed: 73673, 73793, 74008, 74068, 74153, 74186, 74207, 74216, and 74218.

b. Conclusion

No violations of more than minor significance were identified.

2. Operational Safety (Inspection Procedure 88020)

a. Inspection Scope

The inspectors interviewed licensee staff, conducted plant walk-downs, and reviewed records associated with the operation of four plant processes: (1) uranyl nitrate (UN) bulk storage system, (2) URRS cylinder wash, (3) hoods and containment system, and (4) final assembly area. The inspectors selected a sample of safety significant controls

(SSCs), including IROFS, for accident sequences applicable to these processes as described in the Integrated Safety Analysis (ISA) Summary to verify that the SSCs were implemented and maintained in accordance with the applicable regulatory requirements and the licensing basis of the facility. The inspectors selected the following safety controls for a focused review:

- UN-912 – Preventive maintenance of UN bulk storage tanks
- UN-901 – Inspection of uranyl nitrate bulk storage tanks dike pad
- UN-128/UN-136 – Venting of UN bulk storage tanks T-1045 and T-1039
- UN-148/UN-149 – Confirmation that UN concentration and enrichment do not exceed the established safety limits prior to transfer to a bulk storage tank
- WASH-106 – Verification of cylinder heel mass prior to cylinder wash
- WASH-126 – Verification of cylinder gross weight difference prior to cylinder wash
- FA-123 – Design of the weld pit in the final assembly area
- FA-PIPE-101 – Integrity of overhead piping in the final assembly area
- FA-ROOF-101 – Integrity of roof over the final assembly area
- OVEN-9/OVEN-14 – Open drains in oxidation hoods

The inspectors confirmed that the SSCs listed above were present and capable of performing their intended safety function(s). The inspectors reviewed operating procedures for administrative SSCs and work instructions for those SSCs that were implemented through the preventive maintenance program. The inspectors' review included a sample of recent records documenting the implementation of the SSCs to verify that they were performed in accordance with the attributes described in the ISA Summary and the License Application. The inspectors also interviewed plant staff, particularly operators and supervisors, to assess their knowledge on the safety control functions. Additionally, the inspectors verified that management measures (i.e. procedures, training, and maintenance) were implemented for the selected SSCs as required by the licensing basis of the facility.

For UN-148/UN-149, the inspectors also observed plant operators perform UN transfer from liquid rad tanks (model LR-230) to UN bulk storage tank T-1039. The inspectors directly observed UN transfer activities from three LR-230 tanks on Trailer 4908 (Tanks LR029, LR030, and LR036). The inspectors interviewed operators prior to and during the transfer evolutions to assess their knowledge of the applicable safety controls and verify that the operating procedure instructions were followed.

For OVEN-9/OVEN-14, the inspectors performed a walk-down of various hoods in the URRS and pelleting processes to verify hoods were equipped with the proper drainage as credited in the ISA Summary. Similarly, the inspectors performed walk-downs of the final assembly area, the URRS cylinder wash area, and the building roof to verify implementation of the SSCs and assess the visible condition of those areas.

The inspectors reviewed training material and attendance records in the area of operations safety for the selected safety controls to verify that the licensee provided frequent training to the staff as described in the management measures section of the License Application. The inspectors also interviewed licensee staff and reviewed documentation to verify that: (a) safety-significant changes to procedures in the area of Operations Safety, (b) changes to the Operations Safety program organization, and (c) program audits/self-assessments performed since the last NRC inspection in this area, if any, were implemented in accordance with the license requirements.

Additionally, the inspectors reviewed a sample of plant issues entered in the Westinghouse Incident Reporting (Redbook) system and the CAP to verify that safety-significant issues were documented for evaluation and resolution. The scope of corrective action documents review included the implementation of compensatory measures for unavailable safety controls (when applicable).

b. Conclusion

No violations of more than minor significance were identified.

B. Radiological Controls

1. Effluent Controls and Environmental Protection (Inspection Procedure 88045)

a. Inspection Scope

The inspectors reviewed changes to the environmental protection program and procedural revisions since the last inspection in order to verify that the effluent control and environmental protection program was being implemented in compliance with Chapter 10 of the License Application. The inspectors interviewed licensee staff in order to verify that the licensee's organizational structure along with staff training and experience requirements were in compliance with Chapter 2 of the License Application.

The inspectors reviewed information about historic leaks which occurred in 2008 and 2011, concerning the URRS area of the facility. In 2008, one leak was identified, and in 2011, two leaks were identified in the contaminated waste water (CWW) drainage line. At the time, Westinghouse did not report these leaks to South Carolina Department of Health and Environmental Controls (SC DHEC) or NRC because Westinghouse determined it did not meet any reporting requirements due to not impacting groundwater. Westinghouse did document these leaks and their plans to remediate it in its Decommissioning Funding Plan. It was determined that the piping had most likely deteriorated from the past practice of routing a mixture of hot steam condensate and caustic solutions through this line. Corrective actions were taken to re-route acidic and/or caustic solutions to this line. In addition, portions of this line were routed above ground within the processing building to readily identify any future leaks. To determine whether contaminated liquid had been released to the subsurface soil, Westinghouse performed four core borings through the existing concrete floor slab. Soil, sludge, and water samples were collected from these locations and sent off for analysis. Details of the leak and boring samples are discussed in the Final Environmental Assessment (ML18120A318).

The inspectors noted that the licensee initiated a new CAP entry (2018-5083) in January 2018, to further investigate and characterize the 2011 and other historic leaks. Actions included obtaining a temporary well permit from the SC DHEC to drill 10 investigative borings to obtain soil and water samples along the CWW line leading to the waste water treatment facility. Additional temporary wells were also drilled during the inspection week. These temporary wells will be fully developed and water samples obtained for analysis. The results of these water samples are expected by the end of October 2018.

The inspectors noted that as part of this CAP entry, they are conducting an historic review to ensure that all leaks and information pertaining to those leaks are properly captured and identified as required by Chapter 11 of the License Application. The

inspectors reviewed a new procedure, issued in February 2016, RA-137, "Decommissioning Records." This procedure was developed to ensure compliance with 10 CFR 70.25, "Financial assurance and recordkeeping for decommissioning."

The inspectors reviewed environmental protection procedures that had been revised since the last inspection in order to verify that no safety significant changes were made without prior evaluation and approval in accordance with Chapter 3 of the License Application. The inspectors accompanied licensee staff on an observation of new and planned environmental wells added since the last inspection in order to verify that proposed additions were appropriately communicated.

The inspectors reviewed audits, including third party assessments of the licensee and licensee assessment of third party laboratories and vendors, in order to verify that audits and assessments were being completed as required by Section 10.1.8 in the License Application. The inspectors reviewed the most recent plant as low as is reasonably achievable (ALARA) report from 2016 to verify that trends and ALARA issues were being identified and monitored by the licensee.

The inspectors reviewed records of radioactive liquid effluents and accompanied licensee staff to sample collection areas in order to verify compliance with Section 10.1.2 of the License Application and 10 CFR 20.2103(b)(4). The inspectors reviewed the sanitary waste water system and toured the lagoon areas in order to verify that the licensee was in compliance with Section 10.1.3 of the License Application and 10 CFR 20.2003. The inspectors reviewed procedures, calculations, and calibration records related to radioactive airborne effluents to verify that the licensee was in compliance with Section 10.1.1 of the License Application and 10 CFR 20.1101(d).

The inspectors reviewed the July – December 2017 and January – June 2018 semi-annual effluent reports and verified that the licensee was in compliance with 10 CFR 70.59. The inspectors reviewed the public dose assessment and verified that the average annual effluent concentrations released did not exceed the values specified in Appendix B of 10 CFR Part 20 and that the total estimated dose to an individual likely to receive the highest dose from licensed operations did not exceed the regulatory limits.

b. Conclusion

No violations of more than minor significance were identified.

C. Other Areas

1. Event Follow-Up (Inspection Procedure 88075)

a. Inspection Scope

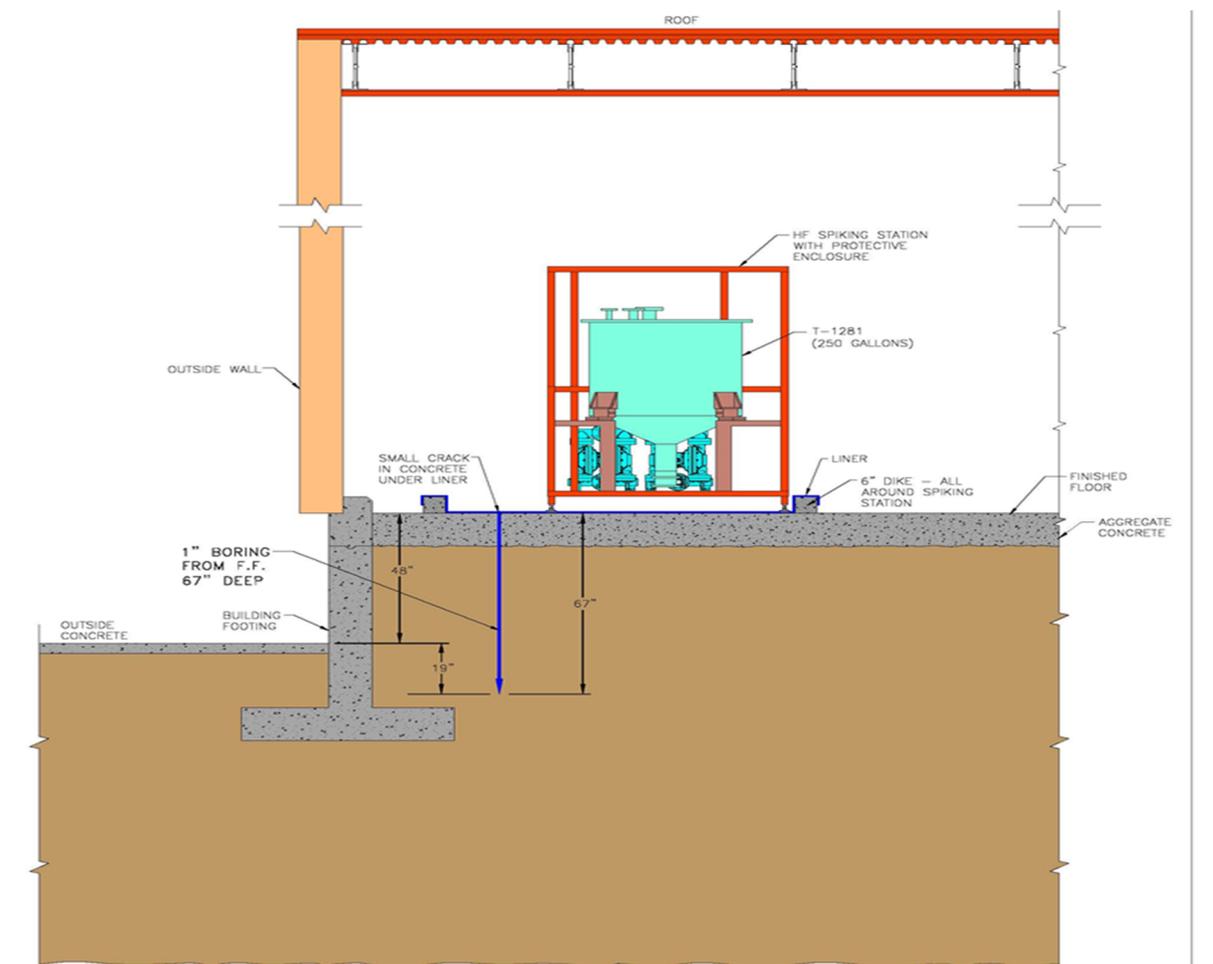
On July 10, 2018, during ongoing maintenance activities to repair the liner associated with Hydrofluoric Acid Spiking Station No. 2 (HF Spiking Station) in the conversion process area of the Westinghouse Columbia Fuel Fabrication Facility (CFFF) an equipment issue was noted. While the polypropylene liner was removed for repair work, a crack was noticed in the epoxy coating covering the diked area at the spiking station. Upon further investigation, a hole approximately 3 inches in diameter was found penetrating the concrete floor and into the soil beneath. Measurements taken indicated the hole penetrated approximately 6 feet into the soil. Several samples of soil were

obtained from the immediate area the morning of July 11, 2018. These samples were analyzed at the CFFF Chemical Laboratory with results obtained the morning of July 12. The highest measurements reported from the samples are 4,000 parts per million (ppm) Uranium and 24 ppm Fluoride, with a pH of 2.84.

For this event, a notification was made to the SC DHEC per R 61-68 E.4.b which requires 24 hour notification upon discovery of an "unauthorized discharge into waters of the State which may cause or contribute to an excursion of a water quality standard." While it was not conclusively determined that the leak migrated to the groundwater, which is a water of the State, Westinghouse made the notification based on discussions with SC DHEC. SC DHEC was notified by phone on July 12, 2018.

This event was reported to the NRC as required by 10 CFR 70 Appendix A(c), "Concurrent Reports" which states, "Any event or situation, related to the health and safety of the public or onsite personnel, or protection of the environment, for which a news release is planned or notification to other government agencies has been or will be made, shall be reported to the NRC Operations Center concurrent to the news release or other notification." The event notice (EN) number was 53504.

Cross-sectional View of HF Spiking Station



Timeline of EN 53504:

March 23, 2018

- HF Spiking station annual liner integrity test successfully completed. No leaks found.

March 23, 2018—June 12, 2018

- System in operation. No issues noted, and the dike remained dry.

June 13, 2018

- A small leak in the system was identified and repaired. There was no quantifiable accumulation of liquid in the dike.

June 16, 2018

- 8:00 a.m.:
 - The spiking station operator checked for leaks as part of daily procedure and found no leaks. (The station is checked for leaks three times/day: between midnight and 1:00 a.m., between 8:00 a.m. and 9:00 a.m., and between 4:00 p.m. and 5:00 p.m.)
- ~12:35 p.m.:
 - The same operator found ~3 gallons of solution inside the dike as a result of a flange leak.
 - While donning personal protective equipment (PPE) in order to safely isolate the leak, an additional 27 gallons entered the dike. This liquid was removed and placed into safe storage.
- The operator noticed a small patch of leaked solution (UN and HF), outside the dike area which was cleaned up.
- A leak test was then performed to investigate whether the solution had come from the dike. The operator filled the dike with ~ 1/2 inch of water (~26 gallons), and there was no noticeable loss of water level after 2 hours; however, a small patch of leaked water was identified outside the dike in the same location as before. The test water was removed and placed into safe storage.
- The spiking station was emptied of chemicals, placed into a “safe shut down” mode and removed from service.

June 16, 2018—June 20, 2018

- Assessment of next steps was performed by the licensee. The station continued to be in “safe shut down” mode and the dike remained dry.

June 20, 2018

- A work order was generated to remove the liner.

June 26, 2018

- The liner was removed so the diked area could be cleaned and inspected. Upon removal of the liner, maintenance noticed a small hole about the size of a quarter in the epoxy coating over the concrete. Prodding to investigate further resulted in a ~3 inch hole in the concrete surface.
- Maintenance was able to insert a wire down to ~30 inches into the building backfill before meeting resistance. They also noticed that the concrete was degraded around the immediate area. It should be noted that the building sits ~4 feet above the natural ground level.

June 26, 2018—July 11, 2018

- A new liner was ordered and a soil sampling plan was developed.

July 11, 2018

- Eight soil samples were taken from the leak location. Soil contamination (uranium, fluoride and pH) was identified to a depth of ~67 inches, at which point a presumed clay layer was reached.

July 12, 2018

- Westinghouse notified SC DHEC that a leak occurred.
- A concurrent report was also made to the NRC (EN 53504).

The inspectors reviewed the Soil Sampling Plan that was developed in conjunction with the SC DHEC. The plan details a three phase approach to determine the extent of contamination of the soil beneath the HF Spiking Station.

- Phase I: Following concrete removal, borings will be taken to approximately 6 feet below soil surface (bss) and samples collected at 3 intervals. The purpose of these would be to determine the extent of contamination and to determine if a clay layer exists in the soil below the spiking station. Samples would be analyzed by a state certified laboratory for radionuclides, fluorides, and pH.
- Phase II: Based upon the analytical results of the initial soil samples, Westinghouse and SC DHEC would discuss whether additional soil samples would be made to conduct further vertical (deeper) soil samples to approximately 12-13 feet bss. Again, samples would be analyzed by a state certified laboratory for radionuclides, fluorides, and pH.
- Phase III: Based upon the analytical results of the Phase II samples, Westinghouse and SC DHEC would discuss whether attempting to collect a groundwater sample in the assessment area is warranted. The groundwater sample would be analyzed by a state certified laboratory for radionuclides, fluorides, and pH.

The inspectors noted that, at the time of writing this report, Phase I and II of the Soil Sample Plan had been completed and that measured soil contamination levels decreased significantly at the approximate 9-10 foot bss level. CFFF was in discussion with SC DHEC on whether or not to proceed with Phase III. The inspectors also noted that the Soil Sampling Plan was being used to characterize the extent of contamination in order to provide survey results, as required by 10 CFR 20.1501, to evaluate the magnitude and extent of the contamination and describe the location and amount of subsurface residual radioactivity for decommissioning.

The inspectors reviewed the 60-day event (EN 53504) follow-up report (ML18255A276) and the licensee's Apparent Cause Analysis (ACA) report (2018-12123) and noted that the stated apparent cause was a gap in plant standards regarding design, design changes, operations (including system leaks), and maintenance of the spiking station liner that provide a safety barrier to the environment. The licensee determined that prolonged contact with hydrated uranyl nitrate (UNH) process fluid deteriorated the concrete as it was known that UNH solution is highly corrosive to typical concrete mixtures. Acceptance of frequent system leaks and liner degradation from foot traffic, operations, and maintenance activities allowed process fluid to contact the liner resulting in the trapping of moisture between the liner and the diked area concrete surface.

In 2002, when the liner design was implemented and installed on the spiking stations, maintenance practices were not developed to inspect the condition of the epoxy coating for the detection of the potential condition of non-visible concrete degradation beneath the epoxy coating. In addition, when the liner was installed, there were gaps with the processes and procedures for the identification of design risks and the development of preventative maintenance practices when system or component design changes were made to SSCs.

The ACA further determined that had the risk been identified during the implementation of the design change, measures would have been required to mitigate the risk such as:

- use of a different design (e.g., no liner)
- a design modification (e.g., thicker liner, thicker epoxy, or different material)
- different maintenance practices for improved prevention or detection

In addition to the actions detailed in the Soil Sampling Plan, other immediate and long term corrective actions were developed and are detailed in the ACA. These actions are discussed in the conclusion section of this report.

The inspectors noted that significant improvements with processes and procedures have taken place since 2002, many of which are detailed in the licensee's "Excellence Plan" which was established following the 2016 S-1030 scrubber event.

The inspectors interviewed managers, supervisors, and staff to verify that the licensee established an effective configuration management system in accordance with Section 3 of the License Application, to evaluate, implement, and track permanent and temporary plant modifications that could affect safety.

The inspectors noted that RA-107, "Corrective Action Process for Regulatory Events," was revised following this event to include a section on "SC DHEC Water Classifications and Standards Reporting Requirements (R61-68 E.4)." This new section details the requirements to notify SC DHEC (and conversely the NRC through the concurrent reporting process) of any unauthorized discharge into waters of the State which may cause or contribute to an excursion of a water quality standard. This was the same reporting standard used to report to the State of the HF Spiking Station event.

EN 53504, "24 Hour Event Notification based on 10 CFR 70 Appendix A(c)," and 60-day follow up letter LTR-RAC-18-63 (ML18255A276) are administratively closed to the violation detailed below.

b. Conclusion

One Severity Level IV violation of NRC requirements was identified as described below:

Failure to Properly Implement Management Measures for the HF Spiking Station

Introduction: A self-revealing violation of 10 CFR 70.62(d), "Management Measures," was identified when approximately 30 gallons of HF solution spilled from the HF Spiking Station #2. This is a Severity Level (SL) IV Notice of Violation (NOV) in accordance with the NRC's Enforcement Policy.

Description: On June 16, 2018, approximately 30 gallons of UNH solution leaked into the diked area surrounding the HF spiking station. A flanged piping connection was the source of the leaking solution. After the system was shutdown, a worker identified a small amount of solution that appeared to have migrated to the outside of the dike wall. CAP 2018-11205 was written to track the issue and Spiking Station #2 was shut down. The dike liner was removed as part of corrective measures. While the polypropylene liner was removed for repair work, a small crack was noticed in the epoxy floor covering. The plan was to repair the crack but as the loose epoxy was chipped away, a hole of approximately 3 inch diameter was revealed.

Upon discovery of the hole in the concrete, soil sampling was initiated with analysis performed by the CFFF Chemical Lab. Eight total samples of the soil were obtained on July 11, 2018, and analyzed for parts per million (ppm) Uranium, Fluoride, and pH. The deepest penetration was at approximately 67 inches. CFFF developed a soil sampling plan in conjunction with SC DHEC to further characterize the extent of contamination of the soil below the HF Spiking Station.

A 24 hour Event Notification was submitted to the SC DHEC per the Water Classifications and Standards Reporting Requirements, which requires 24 hour notification upon discovery of an “unauthorized discharge into waters of the State which may cause or contribute to an excursion of a water quality standard.” While there was no evidence that the leak migrated to the groundwater, CFFF made the notification based on the potential for such an excursion after discussions with SC DHEC. The NRC was also notified of the event per the requirements of 10 CFR 70 Appendix A, “Concurrent Reports,” EN 53504.

The following controls were cited in the ISA to prevent or mitigate a piping or tank failure inside the Spiking Station dike area:

- IROFS ADUHFS-502, “Structural integrity of system components,” was the control in place which credits the structural integrity of the piping and equipment in the HF Spiking Station system which prevents liquids from being spilled.
- ADUHFS-902, “Dike walls surrounding HF Spiking Station 1 and 2,” was credited to reduce the spill size, thus mitigating the airborne release hazard to workers.

ADUHFS-502 had management measures applied in the form annual inspections of the piping structural integrity in accordance with OM81217. These annual inspections consist of visual inspections of all connection points for possible leaks, corroded flanges, corroded bolting and supports. The HF Spiking Station did not have an operating maintenance/preventative maintenance (OM/PM) established for the type of couplings that leaked on the HF Spiking Station even though it was recommended by the manufacturer.

ADUHFS-902 had management measures applied in the form of annual inspections of the liner in accordance with OM 81215, “SI-Safety, HF Spiking Station Pad Liner.” These inspections check the dike liner for evidence of tears, penetrations, or seam separation. The inspectors reviewed the three previous year’s inspection results and noted that the inspections failed to identify the degraded condition of the liner. A review of the liner following the event indicated a penetration through the liner which allowed UNH to migrate to between the liner and the concrete floor. In addition, the inspectors noted that portions of the liner had been previously repaired with numerous patches,

indicating that damage to the liner had occurred in the past. The inspectors noted that the annual inspection provides repair instructions, however, testing of the liner is not conducted following repairs.

ADUHFS-902 was considered degraded as indicated by cracks and degradation of the concrete dike wall. The inspectors noted that here was no policy or procedure in place to periodically inspect the area below the liner for indications of degradation of the concrete floor due to liner leaks.

Analysis: This violation aligns with a more than minor violation as described in Inspection Manual Chapter (IMC) 0616, "Fuel Cycle Safety and Safeguards Inspection Reports" ISA screening question #6 in which the failure of the management measure to identify discrepancies in the piping integrity and the dike resulted in IROFS which would not be available or reliable to perform their intended safety function, to prevent worker injuries due to an airborne release of HF solution, when needed as required by 10 CFR 70.61(e) and 10 CFR 70.62(d). The failure and degradation of the two IROFS resulted in a change in likelihood from 1.00E-8 to 1.00E-4, therefore there was no remaining risk margin above the performance requirements, which is considered risk significant as described in the following paragraph.

IROFS ADUHFS-502 was credited in the licensee's ISA with a frequency and derived probability of 1.00E-03. ADUHFS-902 combined with ADUHFS-501 (HF Spiking Station Enclosure), were credited with a frequency and derived probability of 1.00E-02. The three remaining IROFS in this accident sequence, ADUHFS-501, ADUHFS-505/506, and CONV-SEP-503 were functional with a combined derived probability of 1.00E-04. The failure of ADUHFS-502 and the degradation of ADUHFS-902 resulted in a change of likelihood for the airborne release accident sequence from 1.00E-8 to 1.00E-4. The net result was an accident sequence with an overall likelihood of 1.00E-04 which meets the performance requirements as described in the License Application for a high consequence event (serious injury to worker) remaining highly unlikely ($\geq 1.00E-4$), however the change in likelihood is considered risk significant.

There was no actual safety consequence to the worker because other dermal/ocular controls remained functional and there was no significant accumulation of UNH solution outside of the diked area. There was a potential safety significance due to the loss of structural integrity of the piping system and the degradation of the diked area which could potentially lead to a dermal/ocular exposure to a facility worker above the threshold of 10 CFR 70 Intermediate or High Consequence Events.

In accordance with Section 6.2.d.1 of the NRC Enforcement Policy, the violation meets the threshold for a SL IV violation. Specifically, under 10 CFR Part 70, Subpart H, the licensee failed to meet the requirements of 10 CFR 70.61, "Performance Requirements," or Appendix A, "Reportable Safety Events," to 10 CFR Part 70, and the failure did not result in a SL I, II, or III violation.

Enforcement: 10 CFR 70.61(e) states, in part, the safety program established per 10 CFR 70.62 of this subpart, shall ensure that each IROFS will be available and reliable to perform its intended function when needed and in the context of the performance requirements of this section.

10 CFR 70.62(d) requires, in part, that each licensee shall establish management measures to ensure compliance with the performance requirements. These measures shall ensure that IROFS are available and reliable to perform their function when needed to comply with the performance requirements of 10 CFR 70.61.

Contrary to the above, the licensee failed to establish adequate management measures to ensure that two engineered controls identified as IROFS were designed and implemented such that they were available and reliable to perform their function. Specifically, for a minimum of three years prior to June 16, 2018, established management measures failed to ensure IROFS ADUHFS-502 and ADUHFS-902 were available and reliable to perform their intended function when needed in order to comply with the performance requirements of 10 CFR 70.61. As a result, on June 16, 2018, HF solution was spilled from HF Spiking Station #2 and spilled from the diked area. This is a violation 10 CFR 70.62(d). Immediate corrective action was taken to shut down both HF Spiking Stations #1 and #2 to preclude any possibility of UNH solution being processed. A Soil Sampling Plan was developed and approved by SC DHEC to further characterize the extent of soil contamination in the soil below Spiking Station #2. The annual liner inspection was performed on HF Spiking Station #1 prior to placing this station back in service. The following compensatory measures were implemented for Spiking Station #1 while it continues to be in service:

- OM81215 was updated to 1) clarify the steps needed to perform the liner leak check, 2) require notification to Environmental Health and Safety (EH&S) of any degradation, and 3) change the frequency of the inspection from annual to quarterly and following any repair.
- The Spiking Station was barricaded and posted with instructions to put down walking pads prior to stepping on the liner to prevent liner damage.
- Hourly inspections of the liner have been commenced while the spiking station is in operation.

Long term corrective actions include:

- Develop and implement an improved design for the spiking station system and dike area including a design review to prevent UNH solution from impacting the environment.
- Assess similar design configurations of a liner/environmental barrier relied on for secondary containment for proper post-maintenance and time-based PMs.
- Conduct an extent of condition for similar couplings used throughout the facility to verify PMs have been established.
- Additional long term corrective actions are detailed in ACA 2018-12123.

This violation will be tracked as VIO 70-1151/2018-004-01, "Failure to implement management measures for the HF Spiking Station #2." This is a violation 10 CFR 70.62(d).

2. Review of Confirmatory Order (CO) Section V Item 9 (Inspection Procedure 88020)

The licensee has implemented a procedure to implement the appropriate guidance in INPO 11-003, "Guideline for Excellence in Procedure and Work Instruction Use and Adherence," for risk-informed standards in the preparation of procedures and data sheets. The inspectors reviewed CA-040, "CFFF Writer's Manual," and based on the

review of the implementing procedure for the program and a sampling of revised procedures using the new format, the NRC concludes that Westinghouse has met the requirements stated in the CO, Section V, Item 9. This item is considered closed.

3. Review of Confirmatory Order (CO) Section V Item 10.a (Inspection Procedures 88015/88020)

In accordance NRC CO EA-16-173, Section V.10.a, Westinghouse has completed the implementation of all of corrective actions to prevent recurrence (CAPR) as identified in the root cause analysis (RCA).

CAPR 6: Develop or revise procedures to identify personnel in need of training on the safety basis for CSEs. The inspectors reviewed the training that was developed and those personnel identified to complete the safety basis training. The inspectors also interviewed employees who have received the training. The training was being conducted over an approximately eight week course and covered all aspects of the ISA and safety basis. The inspectors noted that the training required trainee and management participation in various case studies and scenarios. Previous CAPRs were reviewed in inspection report 2017-004 (ML17303A023). The NRC concludes that Westinghouse has met the requirements as stated in the CO, V.10.a. This item is considered closed.

D. Exit Meeting

The inspection scope and results were presented to members of the licensee's staff at various meetings throughout the inspection period and were summarized on September 21, 2018, to E. Wills and staff. No dissenting comments were received from the licensee. Proprietary information was discussed but not included in the report.

SUPPLEMENTAL INFORMATION

1. KEY POINTS OF CONTACT

<u>Name</u>	<u>Title</u>
G. Byrd	Licensing Engineer
S. Douglas	URRS Operator
T. Gregg	Chemical Operators
A. Hansen	Process Engineer
J. Howell	Environmental, Health and Safety (EH&S) Manager
R. Jacobs	URRS Operator
D. Joyner	Environmental Engineer
C. Miller	NCS manager
A. McGehee	Senior NCS Engineer
N. Parr	Licensing Manager
E. Wills	Recovery Leader

Other licensee employees contacted included engineers, technicians, production staff, and office personnel.

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

70-1151/2018-004-01 VIO Failure to implement management measures for the HF Spiking Station #2.

Closed

CO Item 9 CO Implementation of risk-informed standards for the preparation of procedures and data sheets informed by appropriate guidance in INPO 11-003, "Guideline for Excellence in Procedure and Work Instruction Use and Adherence.

CO Item 10.a CO Westinghouse shall implement the remaining corrective actions to prevent recurrence identified in their RCA.

EN 54504 (LTR-RAC-18-63) EN 60-Day letter for HF Spiking Station #2 leak

3. INSPECTION PROCEDURES USED

IP 88015, Nuclear Criticality Safety
IP 88020, Operational Safety
IP 88045, Effluent Controls and Environmental Protection
IP 88075, Event Follow-up

4. **DOCUMENTS REVIEWED**

Records:

CN-CRI-07-10, Cylinder Wash, Revision (Rev.) 3
 CN-CRI-07-41, Uranyl Nitrate Bulk Storage System, Rev. 0
 CSE-2-A, Criticality Safety Evaluation (CSE) for the Uranyl Nitrate Bulk Storage and the HF Spiking Station, Rev. 8
 CSE-9-B, Criticality Safety Evaluation (CSE) for Cylinder Wash, Rev. 6
 Q.C. Form 974, Balance Calibration Report, S/N CM8115, dated September 20, 2018
 QCI 96110, Scales, Rev. 47
 QCI 960130, Weight Standards, Rev. 22
 State of South Carolina Dept. of Agriculture Metrology Laboratory Certificate of Calibration for Test Weight CM10828 (500 lb), dated August 24, 2017
 EHS-AUDIT-16-16, Report for Shealy Consulting, LLC, dated December 2016
 EHS-AUDIT-17-2, Formal Compliance Audit, dated April 26, 2017
 EHS-AUDIT-17-19, Supplier Audit of General Engineering Laboratories, LLC, dated October 20, 2017
 NRC Semi-Annual Discharge Report January – June 2018, dated August 30, 2018
 NRC Semi-Annual Discharge Report July – December 2017, dated March 1, 2018
 PM85151, UN Bulk Storage Tanks External Mechanical Integrity 5 Yr PM, dated 9/21/17
 PSEDoc-0001806, External Visual/UT Mechanical Integrity Inspection of T1039 performed on February 20, 2014
 PSEDoc-0001807, External Visual/UT Mechanical Integrity Inspection of T1040 performed on February 20, 2014
 WO 730110, PM 73111 – Annual PM BWR and Forest Roof Inspection, dated May 2, 2016
 WO 731880, PM 85152 – Annual UN Storage Tank Vent, dated May 20, 2016
 WO 731881, PM 85152 – Annual UN Storage Tank Vent, dated May 20, 2018
 WO 732568, OM 85018 – Annual OM UN Pad and UN Offloading Pad Inspection, dated May 16, 2016
 WO 765561, PM 73111 – Annual PM BWR and Forest Roof Inspection, dated May 9, 2017
 WO 766895, PM 85152 – Annual UN Storage Tank Vent, dated May 16, 2017
 WO 766896, PM 85152 – Annual UN Storage Tank Vent, dated May 16, 2017
 WO 771839, Annual OM Verification of Oxidation Hood Drainage, dated September 1, 2017
 WO 775874, Annual OM Verification of Oxidation Hood Drainage, dated September 25, 2017
 WO 785045, Annual OM Verification of Oxidation Hood Drainage, dated November 10, 2017
 WO 785046, Annual OM Verification of Oxidation Hood Drainage, dated November 10, 2017
 WO 798930, PM 85152 – Annual UN Storage Tank Vent, dated May 24, 2018
 WO 798931, PM 85152 – Annual UN Storage Tank Vent, dated May 24, 2018
 WO 801596, PM 73111 – Annual PM BWR and Forest Roof Inspection, dated May 16, 2018
 WO 803600, PM OM85018 – Annual OM UN Pad and UN Offloading Pad Inspection, dated May 21, 2018
 WO 804264, OM 82199 – Annual OM Verification of Oxidation Hood Drainage, dated July 18, 2018

WO 804943, OM 82199 – Annual OM Verification of Oxidation Hood Drainage, dated August 8, 2018
 WO 804978, OM 86202 – Annual OM Verification of Oxidation Hood Drainage, dated August 29, 2018
 WO 805103, PM 73110 – Annual PM BWR and Forest Piping Inspection, dated May 31, 2018
 WO 806386, OM 82199 – Annual OM Verification of Oxidation Hood Drainage, dated August 19, 2018
 WO 806387, OM 82199 – Annual OM Verification of Oxidation Hood Drainage, dated August 14, 2018
 WO 808543, OM 82199 – Annual OM Verification of Oxidation Hood Drainage, dated August 29, 2018
 WO 809043, OM 82199 – Annual OM Verification of Oxidation Hood Drainage, dated September 10, 2018
 WO 811458, OM 81248 – Annual OM Verification of Oxidation Hood Drainage, dated July 30, 2018
 WO 814201, OM 81248 – Annual OM Verification of Oxidation Hood Drainage, dated August 27, 2018
 OM81215, SI-Safety, HF Spiking Station Pad Liner -13 Week OM
 WO 798516, PM 81217, SI-Safety, Conversion Area Piping External Visual Mechanical Integrity Inspection, dated October 3, 2017
 WO 776603, PM 81217, SI-Safety, Conversion Area Piping External Visual Mechanical Integrity Inspection, dated October 3, 2017
 WO 740984, PM 81217, SI-Safety, Conversion Area Piping External Visual Mechanical Integrity Inspection, dated October 3, 2016

Procedures:

CF-83-239, LR-230 Offload Checklist, Rev. 1
 COP-836047, Uranyl Nitrate Offloading from LR-230 Containers, Rev. 16
 RA-305, Nuclear Criticality Safety Computer Code Validation, Rev. 10
 RA-314, Implementation of Criticality Safety Evaluations, Rev. 18
 RA-316, NCS Facility Walkthrough Assessments, Rev. 11
 ROP-01-025, Calibration of the TENNELEC Automatic Sample Counters, Rev. 18, dated December 20, 2012
 ROP-01-026, TENNELEC Background and Efficiency Operations, Rev. 18, dated May 24, 2012
 ROP-01-028, Calibration Verification of Flowmeters, Rev. 12, dated June 22, 2017
 ROP-01-041, iMatic Background and Efficiency Operations, Rev. 1, dated May 8, 2014
 ROP-06-001, NPDES Daily, Weekly, and Monthly Effluent Sample Collection, Rev. 45, dated May 1, 2018
 ROP-06-002, Roof Effluent Air Sampling and Counting, Rev. 25, dated August 24, 2018
 ROP-06-006, Collection of Routine Weekly and Monthly Environmental Samples, Rev. 27, dated March 3, 2018
 CF-83-239, LR-230 Offload Checklist, Rev. 1
 COP-833010, Cylinder Cleaning System, Rev. 54
 COP-836015, Chemical Operating Procedure URRS, Rev. 31
 COP-836047, Uranyl Nitrate Offloading from LR-230 Containers, Rev. 16

Condition Reports Written as a Result of the Inspection:

IR-2018-16122, Failure to perform a periodic inspection per the manufacturing recommendations for the expanded convolution couplings on the HF Spiking Station
 IR-2018-16137, Verifying values on PIF for UN-149
 IR-2018-15909, Review of Historic Decommissioning Records
 IR-2018-16033, Water leak near PL3 MODCON
 IR-2018-16198, Air and Water Effluent Sampling Procedures Instructions
 IR-2018-16209, Tennelec Counter Records
 IR-2018-16400, Quality of Documentation on OM/PM Work Orders
 IR-2018-16402, Level of Detail/Training on Passive IROFS
 IR-2018-16398, Failed Calibration Check on Cylinder Wash Scale

Other Documents:

EHS-AUDIT-17-14, EHS Audit for the Nuclear Criticality Safety Program, dated September 18, 2017
 Nuclear Criticality Safety Checklist for NCS Facility Walkthrough Assessments, Product Engineering Laboratory, dated September 18, 2018
 Nuclear Criticality Safety Checklist for NCS Facility Walkthrough Assessments, Final Assembly Part 1 OPS, Rod Storage, and Handling, dated September 17, 2018
 CF-83-062, Cylinder Wash Log, PIF CW-8406, Cylinder IDs: TC0024, TC0002, TC0027, TC0005
 COLUMN Cylinder Activity Log, Cylinder IDs: TC0024, TC0002
 ECL-830055, UN Bulk Unloading of LR-230 Containers for COLUMBIA
 EHS-AUDIT-18-2, Formal Compliance Audit, Rev. 1, dated June 6, 2018
 EHS-OCC-18-1, Organization Change Control Review of Systems Engineering Manager
 EHS-OCC-18-13, Organizational Change Control Review of Grid Area Manufacturing Process Engineer
 EHS-OCC-18-13, Organizational Change Control Review of Systems Engineer
 EHS-OCC-18-14, Organizational Change Control Review of URRS Process Area Engineer
 Lab Report 2018114182, NFS LEU Uranyl Nitrate Analytical Report Batch #422
 Lab Report 2018114183, NFS UN HP Analytical Report Batch #422
 NFS Certificate of Analysis for UN Batch Number 333-DLEU-422, dated August 27, 2018
 PIF T-7627, Process Information Form UN Tank Batch Number T-1039M
 PIF T-7768, Process Information Form UN Tank Batch Number T-1039Z
 PIF T-8006, Process Information Form UN Tank Batch Number T-1039C
 PIF T-8016, Process Information Form UN Tank Batch Number T-1039D
 PIF T-8043, Process Information Form UN Tank Batch Number T-1039M
 PIF T-8576, Process Information Form UN Tank Batch Number T-1039L
 Sketch 735303-2, Safety Significant Controls – Final Assembly, Rev. 45
 Sketch 836038-1, Safety Significant Controls – URRS, Rev. 111
 Training Completion Records for S. Douglas, R. Jacobs, D. Stukes, and M. Reynolds on ECL-830055
 WO 778959, Repair or Replace LI-08 V07A Level Indicator, dated September 11, 2017
 WO 786575, Gamma Monitors Reading High, dated November 30, 2017
 Apparent Cause Evaluation, 2018-12133, Spiking Station 2 Concrete Breach and Ground Contamination

Redbook Corrective Action Entries:

IR-2018-16079, Redbook #74382 – Degraded SSCs PELGEN-101 and PELPREP-905, dated September 19, 2018

IR-2018-16137, No Documentation of Performance of SSC UN-149, dated September 20, 2018

IR-2018-16248, Cylinder Wash V07A Level Indicator (Redbook 72899), dated September 24, 2018

IR-2018-16249, Gamma Monitors T-1045 (Redbook 73138), dated September 24, 2018

IR-2018-16250, High Level Alarm T-1040 (Redbook 74242), dated September 24, 2018

IR-2018-15909, Review of Decommissioning Records, dated September 17, 2018

Redbook 72899, Cylinder Wash V07A Level Indicator, dated September 11, 2017

Redbook 73138, Gamma Monitors Reading High, dated November 30, 2017

Redbook 74242, High Level Alarm T-1040, dated August 18, 2018

Redbook 74382, Puddle of Water on the Floor on Pellet Line 3, dated September 18, 2018

Redbooks: 73673, 73793, 74008, 74068, 74153, 74186, 74207, 74216, 74218