



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

October 30, 2014

Mr. B. Joel Burch
Vice President and General Manager
Babcock and Wilcox
Nuclear Operations Group, Inc.
P.O. Box 785
Lynchburg, VA 24505-0785

**SUBJECT: BABCOCK AND WILCOX NUCLEAR OPERATIONS GROUP – NUCLEAR
REGULATORY COMMISSION INTEGRATED INSPECTION REPORT 70-27/2014-
004 AND INSPECTION REPORT 70-27/2014-204**

Dear Mr. Burch:

This refers to the inspections conducted from July 1 through September 30, 2014, at the Babcock and Wilcox (B&W) Nuclear Operations Group (NOG), Inc., facility in Lynchburg, VA. The inspections were conducted to determine whether activities authorized under the license were conducted safely and in accordance with U.S. Nuclear Regulatory Commission (NRC) requirements. The enclosed report presents the results of these inspections. The findings were discussed with you and members of your staff at exit meetings held on July 10, September 11, and October 3, 2014, for this integrated inspection report.

During the inspections, the NRC staff examined activities conducted under your license, as they related to public health and safety, to confirm compliance with the Commission's rules and regulations and with the conditions of your license. Areas examined during the inspections are identified in the enclosed report. Within these areas, the inspections consisted of selected examinations of procedures and representative records, observations of activities, and interviews with personnel. Based on the results of these inspections, no violations were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room, or from the NRC's Agencywide Documents Access and Management System (ADAMS), which is accessible from the NRC Website at <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions concerning these inspections, please contact me at 404-997-4629.

Sincerely,

/RA/

Marvin D. Sykes, Chief
Projects Branch 2
Division of Fuel Facility Inspection

Docket No. 70-27
License No. SNM-42

Enclosure:
NRC Inspection Report 70-27/2014-004
and NRC Inspection Report No. 70-27/2014-204
w/Attachment: Supplementary Information

cc:
Joseph G. Henry
Chief Operating Officer
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Steve Harrison, Director
Division of Radiological Health
Department of Health
109 Governor Street, Room 730
Richmond, VA 23219

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ADAMS: ACCESSION NUMBER: ML14303A410 SUNSI REVIEW COMPLETE FORM 665 ATTACHED

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NAME	SSubosits	MThomas	MCrespo	PStartz	TSippel	GChapman	NPitoniak
DATE	10/ 30 /2014	10/ 30 /2014	10/ 30 /2014	10/ 30 /2014	10/ 28 /2014	10/ 30 /2014	10/ 30 /2014
E-MAIL COPY	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
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E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

Letter to Mr. B. Joel Burch from Marvin D. Sykes dated October 30, 2014

SUBJECT: BABCOCK AND WILCOX NUCLEAR OPERATIONS GROUP – NUCLEAR
REGULATORY COMMISSION INTEGRATED INSPECTION REPORT 70-27/2014-
004 AND INSPECTION REPORT 70-27/2014-204

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No: 70-27

License No: SNM-42

Report No: 70-27/2014-004 and 70-27/2014-204

Licensee: Babcock and Wilcox

Facility: Nuclear Operations Group (NOG)

Location: Lynchburg, VA 24505

Dates: July 1 through September 30, 2014

Inspectors: S. Subosits, Senior Resident Inspector
M. Thomas, Senior Fuel Facility Project Inspector
R. Gibson, Senior Fuel Facility Project Inspector
D. Hartland, Senior Fuel Facility Project Inspector
N. Pitoniak, Fuel Facility Inspector
P. Startz, Fuel Facility Inspector
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T. Sippel, Fuel Facility Inspector
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Approved by: M. Sykes, Chief
Projects Branch 2
Division of Fuel Facility Inspection

Enclosure

EXECUTIVE SUMMARY

Babcock and Wilcox Nuclear Operations Group
NRC Integrated Inspection Report 70-27/2014-004 and Inspection Report 70-27/2014-204
July 1 – September 30, 2014

Inspections were conducted by the senior resident inspector, regional staff, and headquarters staff during normal and back shifts in the areas of safety operations, radiological controls, and facility support. The inspectors performed a selective examination of licensee 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.

Safety Operations

- The items relied on for safety (IROFS) reviewed during this period were properly maintained in order to perform their intended safety function in accordance with the license application and regulatory requirements. (Section A.1)
- The facility was operated safely in accordance with operating procedures and regulatory requirements. (Section A.2)
- The licensee adequately implemented the fire protection elements reviewed. Fire detection and suppression systems and housekeeping for the areas reviewed were maintained in accordance with fire safety requirements for special nuclear material processing areas, equipment, and storage areas. (Section A.3)
- The Nuclear Criticality Safety (NCS) program was properly implemented and maintained to assure that normal conditions and credible abnormal conditions remained subcritical as required by the license application and regulatory requirements. NCS analyses demonstrated double contingency and adequate control of NCS parameters. (Section D.1)

Radiological Controls

- The Radiation Protection program was implemented in accordance with the license and regulatory requirements. (Section B.1)

Facility Support

- The post maintenance testing and surveillance testing observed for IROFS were implemented in accordance with the license and applicable procedure. (Sections C.1 and C.2)
- Reports for tracking and resolution of safety-related issues included corrective actions to prevent recurrence. Extent of condition and extent of cause reviews were conducted when required by the governing corrective action program procedure. (Section C.3)
- The Change Management program was implemented in accordance with license requirements. (Section C.4)

- The Emergency Preparedness program was implemented in accordance with the Emergency Plan and regulatory requirements. (Section C.5)

Attachment

Key Points of Contact

List of Items Opened, Closed, and Discussed

List of Inspection Procedures Used

Documents Reviewed

REPORT DETAILS

Summary of Plant Status

During the inspection period, routine fuel manufacturing operations and maintenance activities were conducted in the fuel processing areas and in the Research Test Reactors and Targets (RTRT) facility. Routine operations and maintenance activities were conducted in the Uranium Recovery (UR) facility.

A. Safety Operations

1. Plant Operations (Inspection Procedure (IP) 88135)

a. Inspection Scope and Observations

The inspectors performed routine tours of the fuel manufacturing areas housing special nuclear material (SNM), reviewed shift turnover log sheets, and observed two shift turnover exchanges in UR. The inspectors interviewed operators, front-line managers (FLMs), maintenance mechanics, radiation protection (RP) staff, and process engineering personnel regarding issues with plant equipment and to verify the status of the process operations.

The inspectors observed operations in progress in the UR, Filler, Machine Shop, and RTRT areas throughout the inspection period. The inspectors determined that the SNM processes and workstations in service at the time of walk-downs were operated in accordance with applicable procedures.

During the inspection period, the inspectors interviewed seven operators and two nuclear materials control (NMC) technicians and determined that each of the individuals demonstrated adequate knowledge of the nuclear criticality safety (NCS) posting requirements, and the SNM administrative and operations procedures associated with their assigned duties.

Safety System Walk-down (IP 88135.04)

The inspectors performed a walk-down of two safety-significant systems involved with the processing of SNM. As part of the walk-downs, inspectors reviewed the NCS postings associated with the Advanced Gas Reactor (AGR) fuel manufacturing process and those postings associated with the Container Storage Building (CSB). The inspectors verified that the existing configurations of the systems were correct and that IROFS were available and operable to perform their intended functions when needed to comply with the performance requirements of 10 CFR 70.61. The inspectors also verified that three IROFS controls for the AGR system and four in the CSB were properly implemented in the field. No conditions that degraded plant equipment, the availability, or operability of IROFS were identified.

To determine if plant equipment was installed correctly, the inspectors reviewed the relevant drawings, as well as Integrated Safety Analysis (ISA)/Safety Analysis Reports (SAR) 15.42 and 15.43 for the AGR process and the CSB. During the walk-downs, the inspectors verified some of the following as appropriate:

- Controls in place for potential criticality hazards;
- Process vessel and enclosure configurations maintained in accordance with Nuclear Criticality Safety Evaluations (NCSEs);
- Correct valve position and material condition;
- Electrical power availability;
- Adequate lighting in and around the workstations;
- Hangers and supports correctly installed and functional; and
- Lockout/Tag-Out program implementation.

b. Conclusion

No findings of significance were identified.

2. Nuclear Criticality Safety (IP 88135)

a. Inspection Scope and Observations

During daily tours of the Filler, UR, RTRT, and the general shop floor areas, the inspectors verified that NCS controls and postings were in place and available to perform their intended functions. The inspectors reviewed the field implementation of NCS-related administrative IROFS - one in the RTRT area, two in the shop floor area, and one in the UR area. During these observations, the inspectors noted that the IROFS were properly implemented and that operations personnel complied with NCS posting requirements in their work areas. The inspectors also reviewed the accuracy of one mass log tracking sheet in the RTRT area and one SNM mass log tracking sheet in the Filler area and verified that the mass log entries matched the as-found inventories of the corresponding workstations and areas.

b. Conclusion

No findings of significance were identified.

3. Fire Protection Quarterly (IP 88135.05)

a. Inspection Scope and Observations

During daily plant tours, the inspectors verified that transient combustibles were being adequately controlled and minimized in the Waste Operations areas of Bay 1 and Bays 4A through 5A. The inspectors conducted fire safety tours of these areas and reviewed the fire detection and suppression capabilities in those areas. No compliance or regulatory issues were noted with respect to fire protection equipment. The inspectors also verified that housekeeping in the areas reviewed was sufficient to minimize the risk of fire.

b. Conclusion

No findings of significance were identified.

4. Operational Safety (IP 88020)

a. Inspection Scope and Observations

The inspectors performed safety walk-downs and operational reviews of the most safety significant manufacturing areas that process SNM. The areas included Filler, Pickling Acid Treatment, the Retention Tank building (waste water receipt and sampling), and UR. The physical inspections included the use of approved procedures, operator training, operator techniques, working environmental controls, radiological safety protocols, chemical safety systems, and fire safety features. Additional focus included the use of programmable logic controllers (PLCs) to manage controls identified as IROFS. This was the first PLC-focused inspection and sets the stage for more in-depth inspections related to PLCs and individual controllers used for safety related controls. The overall focus was to determine how the PLCs achieved the functionality as defined in the ISA for achieving redundancy and diversity as required in 10 CFR 70.61. Inspectors reviewed shift turnover logs, discussed shift turnover information exchange practices, interviewed operators and FLMS, and process engineering staff regarding issues with plant equipment, and to verify the status of the process operations.

During the inspection period, the inspectors interviewed operators, front line managers, area managers, criticality and process engineers, and a NMC technician. It was determined that each of the individuals demonstrated adequate knowledge of the NCS posting requirements, the SNM administrative, and operations procedures associated with their assigned duties.

The inspectors verified that the existing configurations of the systems were correct and that IROFS were available and operable to perform their function when needed to comply with the performance requirements of 10 CFR 70.61.

The inspectors reviewed samples of the safety-significant controls and support systems related to the processes in the following areas: pickling, retention tank building, and recovery. The inspectors reviewed the controls associated with PLC managed safety controls designated as IROFS as documented in the Integrated Safety Analysis (ISA) or Safety Analysis Report (SAR) and verified their implementation in the field. During the walk-downs, the inspectors verified that the IROFS controls for the three areas were properly implemented by reviewing the system configuration in the field, and reviewing the NCS requirements of applicable NCS postings in the areas.

b. Conclusion

No findings of significance were identified.

B. Radiological Controls1. Radiation Protection Quarterly (IP 88135.02)a. Inspection Scope and Observations

The inspectors toured the Filler and RTRT areas and verified that radiological signs and postings accurately reflected radiological conditions within the posted areas.

The inspectors observed plant personnel as they removed protective clothing at controlled area step-off pads. The inspectors also observed plant employees as they performed exit monitoring at the Filler and UR controlled area exits and verified that monitoring instructions were followed at the exit points.

The inspectors reviewed one radiological work procedure (RWP) concerning size reduction of pre-filters and High Efficiency Particulate Air (HEPA) filters that had been removed from the ventilation system that supports a furnace in the UR controlled area. Size reduction activities were conducted in a ventilated tent with respiratory protection and protective clothing requirements for personnel inside the tent. Support personnel outside the tent were not required to wear respiratory protection. On August 2, 2014, the breathing zone sample results for two of the workers were found to be above the action level of 50 millirem for internal exposure control. The workers were restricted from the area as a result and full bioassay kits were issued to these two workers in addition to one RP technician. Furthermore, urine bioassay samples were collected for three additional operators who supported the RWP activities. An investigation into the source of the airborne radioactivity found that the HEPA filter installed in the exhaust fan unit for the tent was not properly seated and secured inside the unit. As a result, a pathway for bypass of the filter media existed, which allowed airborne radioactive materials to be discharged from the containment tent into the adjoining areas. The licensee conducted a critique to review the event and identify corrective actions to prevent recurrence of this type of incident. The inspectors interviewed personnel involved with the RWP activity and reviewed Corrective Action (CA) system entry CA201401256. The inspectors noted from their interviews that the RWP and applicable plant procedures did not contain requirements for testing the filtration efficiency of the HEPA filter in a portable ventilation unit or proper installation of a HEPA filter. The inspectors also noted from their review that the licensee committed to developing procedural guidance for use and maintenance of the portable ventilation exhaust/HEPA filter unit as a corrective action to prevent a recurrence.

b. Conclusion

No findings of significance were identified.

C. Facility Support1. Post Maintenance Testing (IP 88135.19)a. Inspection Scope and Observations

The inspectors witnessed one post-maintenance test (PMT) per OP-0061242 and associated documentation. The test was conducted to verify that a repair to an actuator

associated with a valve in the UR In-line Monitor Number One system would perform its interlock function as designed upon receipt of a high level in a UR vessel. The test met the acceptance criteria and the valve functioned as designed. The inspectors also verified that PMT activities were conducted in accordance with applicable work order (WO) instructions or licensee procedural requirements for six (6) corrective maintenance WOs.

b. Conclusion

No findings of significance were identified.

2. Surveillance Testing (IP 88135.22)

a. Inspection Scope and Observations

The inspectors witnessed performance of an interlock check on a valve associated with the UR In-line Monitor Number Three system and the annular liquid effluent tanks per a preventive maintenance work order. The test was successful and all acceptance criteria were met for the test. The inspectors reviewed completed preventive maintenance work orders for six (6) surveillance tests of safety-related systems to verify that the tests were suitable to confirm the availability and reliability of any associated IROFS and licensee operating procedure requirements.

b. Conclusion

No findings of significance were identified.

3. Management Organization and Controls (IP 88135)

a. Inspection Scope and Observations

The inspector reviewed a sample of 47 items entered into the licensee's CA system during the inspection period to ensure that items pertinent to safety, security, and non-conforming conditions were identified, investigated as necessary, and tracked to closure. The inspector verified that the issues of high safety significance were properly identified and reviewed for apparent causes. The inspectors conducted a periodic review of licensee audits to determine their effectiveness and whether the licensee entered results into their CA system. The inspectors reviewed three (3) internal audits of safety discipline program areas for the inspection period. The internal audits reviewed were the licensee's independent assessments of ISA implementation for SAR 15.17 (256-1B), Radiation Protection Records Requirements (258-3I), and Emergency Preparedness Facilities and Equipment Readiness (259-4B).

The inspector noted that, for those issues requiring extent of condition/extent of cause reviews, the reviews were completed and documented in the applicable CAs. The inspector verified that appropriate CAs to prevent recurrence were identified in the CA system, and were reviewed and tracked to completion in accordance with the licensee's CA system implementing procedure, Quality Work Instruction (QWI) 14.1.1, "Preventive/Corrective Action System." For the audits reviewed the inspectors verified

that for Audit 259-4B that CA 201400144 was initiated to track completion of an audit finding to ensure that documentation of the quarterly alternate emergency operations center readiness inspection is recorded by the Industrial Health and Safety staff.

b. Conclusion

No findings of significance were identified.

4. Plant Modifications (IP 88070)

a. Inspection Scope and Observations

The inspectors reviewed risk significant plant modifications from the licensee's 2013 Integrated Safety Analysis and Configuration Management Review. Specifically, the inspectors evaluated the associated IROFS for high and intermediate consequence accident sequences related to the selected modifications. The inspectors interviewed the Licensing and Safety Analysis staff responsible for these plant modifications to verify the licensee had established an effective configuration management system to evaluate, implement, and track permanent plant modifications which could affect safety.

The inspectors reviewed the licensee's change request (CR) documentation, safety evaluation reports (SERs), and change packages regarding the modification of the target cabinets for the storage of uranium-molybdenum coupons; two scrap component carts for fuel transport; and the installation of a rupture disc for the Vertical Tube Furnace. The inspectors conducted field walk downs of the modifications to validate the as-found plant configurations were in agreement with the change package documentation and to evaluate the material condition of the IROFS. In addition, the inspectors reviewed updates and changes to the SAR and procedures that were affected by the modifications.

The inspectors reviewed plant modification design packages for accuracy and adherence to the licensee's configuration management process. The inspectors verified the applicable post maintenance installation and testing requirements were adequately identified and performed prior to implementation of plant modifications. The inspectors determined that completed modifications were adequately reviewed using the configuration management process prior to placing the affected equipment into service. The inspectors verified that the licensee addressed the impacts of modifications to the SAR / ISA and related safety program information.

The inspectors reviewed the licensee's corrective actions program to verify that issues relating to the preparation and installation of permanent plant modifications were entered into the corrective action program and that the corrective actions were adequate to prevent recurrence of issues.

b. Conclusion

No findings of significance were identified.

5. Emergency Preparedness (IP 88050)

a. Inspection Scope and Observations

The inspectors interviewed staff and reviewed records and determined that any changes made to the Emergency Plan or within the facility had been properly coordinated within the Emergency Preparedness program. The inspectors reviewed procedures with significant revisions since the last emergency preparedness inspection and determined that the changes were in compliance with the Emergency Plan. The inspectors reviewed the licensee emergency call list and verified that the list was current.

The inspectors reviewed Emergency Team training records and interviewed licensee staff regarding emergency preparedness training in the past year. The inspectors determined that the training requirements were in compliance with the Emergency Plan. The inspectors verified that the licensee provided training for their personnel and testing of emergency equipment as required by the Emergency Plan. The individuals responsible for utilizing the emergency equipment were qualified. The inspectors verified that the licensee provided training to hypothetical emergency situations which were effective and consistent with the frequency and performance objectives required in the Emergency Plan.

The inspectors reviewed the written agreements with the off-site agencies and verified that the organizations, required by the Emergency Plan, had up-to-date agreements. The inspectors interviewed representatives of the Campbell County Sheriff's Department and Campbell County Department of Public Safety and determined that they maintained an adequate understanding of the written agreements. The inspectors interviewed off-site personnel and reviewed records and verified that the licensee invited the off-site agencies for training as required by the Emergency Plan and determined that the training given was appropriate. The inspectors reviewed records and verified that the licensee performed communication checks with the off-site organizations at a quarterly frequency as required by the Emergency Plan.

The inspectors observed the storage of emergency equipment in the Emergency Operations Center and Site Fire Station and verified that the inventory levels were maintained as required by the Emergency Plan. The inspectors performed a check of selective items of emergency response equipment and verified required maintenance and testing were conducted at the required frequency. The inspectors toured the Emergency Operation Center and verified that the areas were readily accessible and maintained the appropriate amount of communication equipment. The inspectors reviewed the accountability procedure and verified that accountability meeting points were accessible.

The inspectors reviewed documentation of past events, since the last Emergency Preparedness inspection, which required the implementation of the Emergency Plan. The inspectors verified that any problems or deficiencies associated with the Emergency Plan were corrected. The inspectors reviewed the self assessments generated since the last inspection and verified that licensee utilized the Commitment Tracking System for adequately tracking and resolving self assessment findings.

b. Conclusion

No findings of significance were identified.

D. **Nuclear Criticality Safety**

1. Headquarters Nuclear Criticality Safety Program (IP 88015) and Nuclear Criticality Safety Evaluations and Analyses (IP 88016)

a. Inspection Scope and Observations

The inspectors reviewed the licensee's nuclear criticality safety (NCS) Program. This consisted of reviewing new and revised analyses, audits, plant activities, and event follow-up. The inspection consisted of reviews of selected portions of NCS-related documents, interviews with licensee management and staff, and field observation of audits and operations. The inspectors reviewed selected NCS Approvals, NCSEs, and supporting calculations for new, changed, and other selected operations. For the analyses reviewed, the inspectors determined that the NCSEs were performed and independently reviewed by qualified NCS engineers, and that the analyses provided for subcriticality of the systems and operations through appropriate limits on controlled parameters, and double contingency was assured for each credible accident sequence leading to inadvertent criticality that was selected for review.

The inspectors verified that controls identified in select NCS analyses were installed or implemented and adequately ensured safety. The inspectors conducted walk-downs in the pharmacy, element areas, RTRT, the vault, the receipt area, and the 'monster carts' with NCS engineers, the NCS manager, and operations engineers. During the walk-downs the inspectors interviewed NCS engineers and operations staff and observed operators performing activities with SNM. All observed operations were conducted in accordance with postings and procedures.

The inspectors observed that the licensee's NCS audit of the UR Annular Tanks was conducted in accordance with the latest revision of procedure NCSE-03. The inspectors noted that the audits were performed by NCS engineers who reviewed open NCS issues from previous audits; reviewed new violations that occurred during the audit quarter; reviewed the adequacy of NCS control implementation; reviewed plant operations for compliance with license requirements, procedures, and postings; examined equipment and operations to determine that past evaluations remained adequate; identified NCS-related non-compliances; and analyzed non-compliances for potential trends.

During review of an analysis performed to establish the UR Annular Tanks criticality safety controls (NCS-2012-097), inspectors noted that parameter studies showed the tank walls interacted more as a reflector rather than a poison such that thicker walls would result in a system that was more reactive than thinner walls. This was also noted in the text of the analysis with the determination that a limit was needed for the maximum wall thickness. However, no limit for the maximum wall thickness was established as a control. The licensee's engineers explained that the parameter studies looked at a relatively small model with mirror boundaries such that no neutrons escaped the system being evaluated. When the modeled equipment was placed into a much

larger model so that a more realistic situation could be evaluated, additional design adjustments were made causing tank reflection to have less impact so that the maximum thickness of the tank walls was not controlled in the resulting design.

Also missing from the Annular Tanks analysis was an overflow upset condition whereby fissile solution would be present to the brim of the open topped tanks while overflow would be present as a film on the inside/outside of the tanks and under the tank. This was determined to be of negligible significance because the fissile material was conservatively modeled as thicker than actually built (the annulus of the tank was modeled at 1.75 and 1.5 inches thickness as opposed to the thickness it was built to, 1.25 inches) and impacts of reflection and interspersed moderation were evaluated which the inspectors determined would bound the analysis of an overflow condition.

The inspectors reviewed selected licensee internal events. This included a lightning induced activation of the criticality detection and alarm system, a wedged component event in a storage array, and use of an unsafe geometry vessel to collect a spill in an unencapsulated uranium area. The inspectors determined that the licensee adequately evaluated these events for reportability to the NRC. The inspectors observed that internal events were investigated in accordance with QWI 14.1.1 and appropriate corrective actions were assigned and tracked.

Regarding the lightning induced activation of the site's criticality accident alarm system which occurred on June 11, 2014, the licensee had the failed high voltage power supply components, which led to the alarm activation, evaluated by the manufacturer. The manufacturer communicated both verbally and via email to the licensee with contradictory information that the damage appeared both somewhat random (i.e., not on a series of components associated with a specific circuit) and also that the malfunction appeared associated with supply side and detector circuits. Because the failed components were reported to be physically located near where the lightning struck, the licensee considered that it was possible that the failure was due to an electromagnetic pulse associated with the lightning as opposed to direct voltage spikes induced on any specific circuit. All wiring to the system is contained in galvanized conduit which is grounded making it more resistant to lightning damage. The licensee noted that the standards for a criticality alarm system, to which their system was designed and tested, addressed the radiation fields likely to be encountered in the event of a criticality but not necessarily the electromagnetic fields which are present in a lightning strike nor those which may occur because of a criticality. The licensee is awaiting a final report from the manufacturer and has been informally communicating with other industry representatives, who employ the vendor's criticality accident alarm system, to keep them aware of the investigation findings.

The inspectors reviewed an event from August 15, 2014, in which spilled coolant in the RTRT radiological controlled area was temporarily collected in an unfavorable geometry 5-gallon pail. The inspectors walked down the furnace that suffered the coolant leak and interviewed licensee NCS engineers and operations engineers and reviewed associated documentation. The leak occurred below a new furnace when a valve failed open while the furnace coolant reservoir was being filled. The spill occurred in part because of the significant static head pressure that resulted from placing the coolant reservoir on the roof, a clean area, to minimize work performed and equipment installed in a radiologically controlled area. However, the pressure relief valves were sized by the furnace manufacturer assuming the coolant reservoir was physically located beside the

furnace, which would result in a lower static head pressure from the reservoir. During coolant reservoir filling, the pressure relief valve then stayed open due to blockage by debris and about 130 liters of coolant was spilled onto the floor. The inspectors noted that the furnace design package did not consider the effect of static head pressure from locating the coolant reservoir on the roof. Personnel in the vicinity of the furnace noticed the spill and took action to contain it and prevent it from overflowing into the adjacent clean area. Initially personnel used safe geometry 2.5 liter containers to collect the coolant in accordance with procedures. However, the size of the spill resulted in insufficient 2.5 liter bottles being available and, hence, a nearby 5-gallon pail was temporarily used to collect the spill by emptying the contents of a safe geometry container into the pail two times. After collecting approximately 5 liters, licensee personnel ceased using the 5-gallon pail and completed the spill clean-up with favorable geometry 2.5 liter containers. The five (5) liters of coolant collected is less than the smallest single parameter volume limit for Uranium-235 solutions in American Nuclear Society (ANS)-8.1 Table 1. As a result, a volume of five (5) liters could not have been critical even for the worst case. The inspectors noted that collecting spills in unfavorable geometry containers without approval from the licensee's NCS staff was not in accordance with the requirements of the licensee's NCS procedure, NCS-09, "Leaks, Spills and Floor Scrubbing" for clean-up of leaks in areas where unencapsulated SNM is processed. However this was new coolant, and, as a result, it was not contaminated and no SNM was involved. Also, no fissile solutions of SNM are handled in this area, no unencapsulated SNM was being handled when the spill occurred, and no IROFS were lost in the event. Unfavorable geometry containers such as a 5-gallon pail are allowed in the area because other controls (e.g., mass limits) are imposed to prevent a criticality. In response to the event, the licensee initiated CA201401360 to prevent similar events in the future and issued a site-wide SAFETY Brief to inform personnel of the event and remind them of the proper procedure for handling spills in areas where unencapsulated SNM is handled.

b. Conclusion

No findings of significance were identified.

E. Other Areas

1. Follow-up on Previously Identified Issues

- a. (CLOSED) Unresolved Item (URI) 70-27/2011-005-04 Failure to Conduct an Analysis of the Potential for an Explosion and Chemical Exposure in the Chemical Treatment Area, and Identify the Need for IROFS to Minimize the Consequences of an Event in the Chemical Treatment Area and Surrounding Areas with Licensed Material

The inspectors reviewed the corrective actions taken in response to the URI, the associated safety analysis reports and supporting calculations, associated operating procedures, and determined that the ventilation system, necessary to comply with their Commonwealth of Virginia Department of Environmental Quality permit requirements, was analyzed for a hydrogen explosion in the chemical treatment area. This item is closed.

- b. (CLOSED) Violation (VIO) 70-27/2012-004-01 Failure to Adhere to a Nuclear Criticality Safety Spacing Requirement in the Uranium Recovery Area

The inspectors reviewed the corrective actions taken in response to the violation and observed the spacing devices in the field. This item is closed.

- c. (CLOSED) URI 70-27/2012-004-03 Procedure Revisions Not Performed in accordance with Requirements

The inspectors reviewed the corrective actions taken in response to the URI, including the packages selected for the permanent plant modifications inspection and observed that steps had been taken to ensure that the initiators of projects or change requests were not approving their own packages. This item is closed.

2. Event Follow-up

- a. (RETRACTED/CLOSED) EN 50425: "Unanalyzed Condition Related to Potential Material Transfer Cart Tipping"

Event Notification 50425 was reported to the NRC as a 24-hour event notification under 10 CFR Appendix A (b)(1) reporting criteria for an unanalyzed condition which could result in the licensee failing to meet the performance requirements of 10 CFR 70.61(d). The condition involved the Safe Geometry Storage and Transportation carts used to transfer uranium scrap between buildings and a postulated unanalyzed accident sequence involving the carts tipping over and uranium accumulating in an unfavorable geometry potentially leading to a criticality accident. Following discovery of the unanalyzed condition, the licensee tagged and locked the carts in question out of service and entered the issue into the corrective action program. Following analysis of the unanalyzed condition, the licensee determined that the accident scenario was not considered a credible event and retracted the event notification. During the initial review of the event at the time of reporting, the inspectors did not identify any issues with the licensee's response to the event. This item is considered closed.

F. Exit Meeting

On July 10, September 11, and October 3, 2014, the inspectors presented the inspection results to B.J. Burch and members of the staff. No dissenting comments were received from the licensee. Proprietary information was discussed but not included in the report.

SUPPLEMENTARY INFORMATION

1. KEY POINTS OF CONTACT

<u>Name</u>	<u>Title</u>
B.J. Burch	Vice President and General Manager
K. Conway	Unit Manager, Radiation Protection
M. Edstrom	Fire Protection Engineer
T. England	Unit Manager, Licensing and Safety Analysis
D. Faidley	Unit Manager, Nuclear Criticality Safety
J. Grassano	Security Manager
K. Kirby	Licensing Engineer
D. Miller	Unit Manager, Uranium Processing and Research Reactors
W. Ogden	Unit Manager, Nuclear Materials Control
L. Ragland	Engineer, Uranium Processing and Research Reactors
B. Stratton	Front Line Manager, Radiation Protection
D. Ward	Dept. Manager, Environmental, Safety Health and Safeguards
C. Yates	Section Manager Uranium Processing and Research Reactors

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

70-27/2011-005-04	URI	Failure to Conduct an Analysis of the Potential for an Explosion and Chemical Exposure in the Chemical Treatment Area, and Identify the Need for IROFS to Minimize the Consequences of an Event in the Chemical Treatment Area and Surrounding Areas with Licensed Material (Paragraph E.1)
70-27/2012-004-01	VIO	Failure to Adhere to a Nuclear Criticality Safety Spacing Requirement in the Uranium Recovery Area (Paragraph E.1)
70-27/2012-004-03	URI	Procedure Revisions Not Performed in accordance with Requirements (Paragraph E.1)

3. LIST OF INSPECTION PROCEDURES USED

88015	Nuclear Criticality Safety Program
88016	Nuclear Criticality Safety Evaluations and Analysis
88020	Operational Safety
88050	Emergency Preparedness
88070	Plant Modifications
88135	Resident Inspection Program For Category I Fuel Cycle Facilities
88135.02	Resident Inspection Program Plant Status Activities
88135.04	ISA Implementation
88135.05	Fire Protection
88135.17	Permanent Plant Modifications

88135.19 Post Maintenance Testing
 88135.22 Surveillance Testing

4. **DOCUMENTS REVIEWED**

Records:

Audit Number 259-4D, Emergency Preparedness (Training, Drills, and Exercises), June 2014
 Communications Check/Call back – May 2014
 Communications Check/Call back – June 2014
 Communications Check/Call back – July 2014
 Communications Check/Call back – August 2014
 CR 1038679, “Revised the Safety Basis for the Target Storage Cabinets”
 CR 1039789, “Rupture Disc for the Vertical Tube Furnace”
 CR 1039957, “In-line monitors for Raffinate and Retention Tanks”
 Emergency Preparedness Procedure Review database
 Emergency Center Incident Logs for drill on March 5, 2014
 EPR-06-03-01, EP Training/Drill Attendance Sheet, Rev. 2, dated August 4, 2008 for training on March 5, 2014
 EPR-06-04-01, Emergency Drill Critique, Rev 3., dated May 15, 2012 for the drill on March 5, 2014
 EPR-06-04-02, Emergency Drill Training, Rev. 2, dated May 15, 2012 for drill on March 5, 2014
 EPR-06-04-03, Emergency Drill Authorization and Review, Rev. 0, for May 28, 2014 drill
 EPR-06-05-01, EOC Readiness Checklist, Rev. 2 for May 2014
 EPR-06-05-01, EOC Readiness Checklist, Rev. 2 for June 2014
 EPR-06-05-01, EOC Readiness Checklist, Rev 2 for July 2014
 EPR-06-05-01, EOC Readiness Checklist, Rev. 2 for August 2014
 EP-06-05-04, Monthly/Quarterly Check of Emergency Pagers, Rev. 0 for May 2014
 EP-06-05-04, Monthly/Quarterly Check of Emergency Pagers, Rev. 0 for June 2014
 EP-06-05-04, Monthly/Quarterly Check of Emergency Pagers, Rev. 0 for July 2014
 EP-06-05-04, Monthly/Quarterly Check of Emergency Pagers, Rev. 0 for August 2014
 May 2014 Recall Record Update
 Quarterly Communications Check – 2nd Qtr 2014
 HS-2012-030, Industrial Health and Safety Technical Work Record 2012 Mutual Aid Agreements Letters, dated February 13, 2012
 HS-2014-017, EOC Inspections 2014
 HS-2014-030, Emergency Team for 1st Qtr drill
 HS-2014-084, 2014 Evacuation, Annual Evacuation Drill for June 26, 2014
 HS-2014-085, Second Quarter E Team Drill 2014, dated May 28, 2014
 HS-ET-001 Att 4, Emergency Team Initial Team Training, Revision (Rev.) 1
 HS-ET-004 Attachment 5, Live Fire Medical Evaluation, Rev. 2
 Model 2241 Radiation Detector Calibration Records
 Model PIC-613 Radiation Detector Calibration Records
 Mutual Aid Agreement with Lynchburg General Hospital, dated February 15, 2012
 Mutual Aid Agreement with Concord Volunteer Fire Department, dated March 1, 2012
 Mutual Aid Agreement with Concord Rescue Squad, dated February 20, 2012
 Mutual Aid Agreement with Campbell County Public Safety Office, dated March 5, 2012
 Mutual Aid Agreement with Campbell County Sheriff’s Office, dated February 14, 2012
 RP-07-103 Form 1, Sounding of the Building Evacuation System, Rev. 0 for drill on January 22, 2014

RP-07-028 Form 3, Sounding of the Evacuation Alarm System, Rev. 29 for drill on January 22, 2014
 RP-07-103 Form 1, Sounding of the Building Evacuation System, Rev. 1 for drill on April 23, 2014
 RWP 14-0040, Radiological Work Permit 14-040
 SAR 15.18, SFF Dry-End Processing SFF Operation.
 SAR 15.21, Low Level Radioactive Waste Processes
 SAR 15.23, RTRT Fuel Component Manufacturing
 SAR 15.42, Container Storage Facility
 SAR 15.43, AGR
 SER 13-033, "Place posting for the Scrap Component Cart
 SER 03-058, "Vertical Tube Furnace Rupture Disc modification"
 SER 14-009, "Modification of the Target Storage Cabinets for U-Moly and LEU coupons storage"

Procedures:

Emergency Plan, Rev. 26, dated October 30, 2013
 EP-906, Functional Testing For Waste Operations Dynamic U235 Inventory and Supercompactor Batch System
 EPR-01-01, Emergency Plant Evacuation, Rev. 18, dated June 15, 2012
 EPR-01-02, Activation of the Emergency Organization by an Unannounced Sounding of the Emergency Team Assembly Alarm, Rev. 9, February 1, 2014
 EPR-01-03, Activation of the Emergency Organization After an Unannounced Howler Sounding, Rev. 11, July 15, 2014
 EPR-01-05, Emergency Response to James River Flooding, Rev. 3, dated February 15, 2009
 EPR-01-07, Personnel Accounting During Power Outages, Rev. 3, dated June 30, 2009
 EPR-01-08, Off-site Gov't Agency Response, Rev. 3, dated April 15, 2011
 EPR-01-11, Response to security Incidents, Rev. 4, dated February 15, 2014
 EPR-01-12, Emergency Evacuation Plan, Rev. 9, dated July 15, 2013
 EPR-02-04, Notification of Off-site Agencies During an Emergency, Rev. 31, dated June 15, 2011
 EPR-02-04-01, Report of Emergency Worksheet, Rev. 2, dated July 15, 2008
 EPR-02-04-04, Off-site Notifications Courtesy Notifications, Rev. 15, dated October 15, 2013
 EPR-03-26, Emergency Personnel Assembly, Rev. 4, dated February 25, 2014
 EPR-06-01, Emergency Organization, Rev. 13, dated September 30, 2013
 EPR-06-02, Mt. Athos Site Emergency Plan Distribution, Rev. 13, dated January 30, 2013
 EPR-06-03, Emergency Management Training, Rev. 11, dated May 15, 2013
 EPR-06-04, Emergency Drills, Rev. 16, dated May 15, 2012
 EPR-06-05, Inspection of Emergency Operations Center, Rev. 26, dated April 15, 2014
 EPR-06-06, Annual Emergency Plan Review, Rev. 7, dated May 15, 2013
 EPR-06-07, Plant Evacuation Drill, Rev. 5, dated May 15, 2013
 EPR-06-08, Emergency Response Training, Rev. 8, dated October 15, 2012
 OP-1016020, "AGR Coating Furnace Scrubber Operation and Maintenance," Rev. 10
 OP-0061137, "General Purpose Area A/B," Rev.40
 OP-1001944, "Furnace Testing for RTRT General Shop Area," Rev.7
 Quality Work Instruction 5.1.12, Change Management, Rev. 26
 Quality Work Instruction 14.1.1, Preventive/Corrective Action System, Rev. 26
 Quality Work Instruction 17.1.2, Internal Quality Audits, Rev. 17
 NCSE-03, Nuclear Criticality Safety Audits and Inspections, Rev. 26,

NCS-03, Spacing Control, Rev. 7
 NCS-09, Leaks, Spills, and Floor Scrubbing, Rev. 4.

Corrective Action (CA) Reports Review:

CA201400144, CA201400420, CA201401028, CA201401035, CA201401041,
 CA201401057, CA201401074, CA201401087, CA201401107, CA201401109,
 CA201401111, CA201401126, CA201401137, CA201401138, CA201401141,
 CA201401142, CA201401146, CA201401171, CA201401172, CA201401174,
 CA201401183, CA201401207, CA201401220, CA201401221, CA201401235,
 CA201401240, CA201401250, CA201401256, CA201401277, CA201401288,
 CA201401294, CA201401317, CA201401339, CA201401340, CA201401358,
 CA201401360, CA201401409, CA201401415, CA201401421, CA201401423,
 CA201401446, CA201401464, CA201401477, CA201401491, CA201401497,
 CA201401505, CA201401515, CA201401523, CA201401540, CA201401543
 CA200902092, CA200902093, CA201003178, CA 201202010, CA 201202844,
 CA201202122, CA201202746, CA201203408, CA201301264, CA201301297,
 CA201301299, CA201301359, CA201302367, COM-46105, COM-46108,
 COM-46107, COM-39933, COM-39936, COM-36601, COM-42829

Commitment Tracking System Entries Written as a Result of the Inspection:

COM-49491, Documents Emergency Team Training record tracking process not formalized via an established procedure, dated September 11, 2014

Work Orders:

NPDM 20165708, NPDM 20165749, NPDM 20165872, NPDM 20166374, NPDM 20166427,
 NPDM 20166790, NPDM 20168782, NPDP 20162205, NPDP 20162230, NPDP 20162686,
 NPDP 20163821, NPDP 20165945, NPDP 20166745, NPDP 20167609

Other Documents:

Annular Tank Modification to Stainless Steel,"" dated June 20, 2012
 Audit 256-1B, ISA implementation for SAR 15.17
 Audit 258-3I, Radiation Protection Records Requirements
 Audit 259-4B, Emergency Preparedness Facilities and Equipment Readiness
 B&W Letter 14-099, Semi-Annual Effluent Monitoring Report
 E61-107, Rev. 2, CR# 103-0000-00, Inline Monitor Supervisors Parameters Setup Record,
 Inline detector 2M2/2
 N420 #16804, HF Delivery System, Automated System Test Plan (test plan for HF day tank)
 N420 # 16908, PLC Battery Check, thermocouple system check
 NCS Posting, NCS-15-42-001
 NCS Posting, NCS-15-42-002
 NCS Posting, NCS-15-43-003
 NCS-2010-207
 NCS-2010-239
 NCS-2011-042
 NCS-1994-035
 NCS-1994-153
 NCS-2007-156
 NCS-2006-168
 NCS-2014-097, "NCS Analysis for Phase 02, 03, 04, & 05 of SER 11-042, "Stationary
 NCS-1990-059, "Nuclear Criticality Safety of RTRFE 'Two Foot Spacing' Racks and
 Subsequent Operating Limits for Posting," dated March 31, 1990

- NCS-1993-183, "Fabricate Rhode Island Fuel Elements (RTRFE)," dated February 10, 1993
- NCS-2011-066, "NCS Analysis per SER-10-030, SER-10-032, SER-10-042, and SER-10-053, Removal of Raschig Rings from Uranium Recovery Operations," dated April 14, 2011
- NCS-2012-003, "NCS Safety Analysis for SER 11-042, Phase 1, 'Stainless Annular Tank Modification to Stainless Steel,' SER 10-005, Phase 1, 'Contactor Inline Filter Enclosure Relocation,' and SER 12-007, Phase 1, 'Stainless Steel and Kynar Filter Housing Modification in Recovery'," dated March 6, 2012
- NCS-2012-097, "NCS Analysis for Phases 02, 03, 04, and 05 of SER 11-042, Stationary Annular Tanks Modification to Stainless Steel (U)," dated June 20, 2012
- NCS-2012-199, "Nuclear Criticality Safety Release Supporting SER 11-042 Annular Tanks 1, 2, and 4, 'Stationary annular Tank Modification to Stainless Steel (U)'," dated November 19, 2012
- NCS-2014-079, "NCS Safety Analysis for Project Area C per SER 14-007," dated May 28, 2014
- NCS-2014-065, "NCS Safety Analysis for UMo Coupon Storage in Target Storage Cabinets per SER 14-009," dated June 5, 2014
- NCS-2014-082, "NCS Justification Analysis Supporting SER 14-008 Phase 1 Automated Dispenser," dated May 7, 2014
- NCS-2014-086, "Safety Concern Analysis for Improper Storage of a Rhode Island Plate in a Single Storage Location – CA-201400878," dated May 27, 2014
- NCS-2014-087, "NCS Safety Analysis to Revise SAR 15.23 and Scenarios Addressing Commitments COM-46415, 40748, and COM-45267 per CR-1042675," dated June 25, 2014
- NCS-2014-088, "NCS Justification Analysis for New Bay 16 Mezzanine – Relocate Storage Racks from Bay 14 to Bay 16 per SER 14-012 Phase 1," dated June 5, 2014
- NCS-2014-093, "Nuclear Criticality Safety Release Supporting UMo Coupon Storage in Target Storage Cabinets per SER 14-009 Phase 1," dated June 24, 2014
- NCS-2014-099, "NCS Violation and Observation Summary – 2nd Quarter 2014," dated July 22, 2014
- NCS-2014-103, "NCS Safety Evaluation to Approve the New Universal Element Transport Cart per SER 14-025 Phase 01," dated August 20, 2014
- NCS-2014-110, "Safety Concern Analysis for a Dropped S9G PA in Bay 7A High Rise (CA-201401285)," dated August 11, 2014
- NCS-2014-111, "NCS Safety Analysis to Revise Waste Treatment Scenarios per Commitment com-42829," dated August 22, 2014
- NCS-2014-113, "Safety Concern Analysis for Anti-Freeze Spill in RTR Unencapsulated Area (CA-201401360)," dated August 15, 2014
- SAFETY Brief, "Nuclear Criticality Safety Requirements for Responding to a Spill or Leak," dated August 18, 2014
- NCS-2014-115, "Interspersed Moderation, What is Credible?," dated August 22, 2014
- NCS-2014-117, "NCS Safety Analysis for Temporary NCS Posting to Anodize A1G PreAssembly per CR-1043203 (U)," dated September 3, 2014
- NCS-2014-122, "Revised Safety Concern Analysis for Potential Monster Cart Container Spill Accident Scenario (CA201401491)," dated September 18, 2014
- PLC IROFS Annual Functional Test, Recovery Side Report, WT Dynamic U235 Inventory, Retention Tank Building, dated January 14, 2014
- SFF/Recovery/RTR/Chem lab Quarterly Safety and Housekeeping Audit, dated January 2014
- SFF/Recovery/RTR/Chem lab Quarterly Safety and Housekeeping Audit, dated April 2014
- SFF/Recovery/RTR/Chem lab Quarterly Safety and Housekeeping Audit, dated July 2014