



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

April 26, 2017

EA-16-150  
EA-15-214  
EN-51411

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

**SUBJECT: BWXT NUCLEAR OPERATIONS GROUP – NUCLEAR REGULATORY  
COMMISSION INTEGRATED INSPECTION REPORT 70-27/2017-002**

Dear Mr. Burch:

This letter refers to the inspections conducted from January 1 through March 31, 2017, at the BWXT Nuclear Operations Group, Inc. (NOG) 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 results were discussed with you and members of your staff at exit meetings held on January 26, 2017, and April 6, 2017.

During the inspections, 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 examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of these inspections, the NRC has determined that one Severity Level IV violation of NRC requirements occurred. This violation was identified as a result of an investigation conducted by the NRC Office of Investigations (OI) to determine if a BWXT NOG technician willfully violated approved procedure requirements regarding the handling of process material. In summary, based upon the documentation and testimony developed during the investigation, the NRC concluded that the technician willfully violated procedure requirements associated with the handling of process material. The consequences of the violation, absent of the willful aspect, was determined to be minor due to the fact that all licensed material remained in a secure location and was completely accounted for in accordance with 10 CFR 74 requirements. However, willful violations are a particular concern to the NRC. In this case, the technician was knowledgeable of the procedure requirements, yet chose to proceed contrary to procedural requirements. Based on the willful aspects, the NRC has concluded that this violation should be characterized at Severity Level IV in accordance with the NRC Enforcement

Policy. Because BWXT NOG identified and corrected the violation, and because the violation was not repetitive this violation is being treated as a non-cited violation (NCV), consistent with Section 2.3.2 of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Senior Resident Inspector at BWXT NOG facility.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390 of the NRC's "Rules of Practice and Procedure," 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), 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 you have any questions concerning these inspections, please contact me at 404-997-4555.

Sincerely,

*/RA/*

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

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

Enclosure:  
NRC Inspection Report 70-27/2017-002  
w/Attachment: Supplementary Information

cc: (See page 3)

cc:

Joseph G. Henry  
Chief Operating Officer  
BWXT Nuclear Operations Group, Inc.  
2016 Mount Athos Road  
Lynchburg, VA 24505

Christopher T. Terry, Manager  
Licensing and Safety Analysis  
BWXT Nuclear Operations Group, Inc.  
P.O. Box 785  
Lynchburg, VA 24505-0785

Steve Harrison, Director  
Division of Radiological Health  
Department of Health  
109 Governor Street, Room 730  
Richmond, VA 23219

SUBJECT: BWXT NUCLEAR OPERATIONS GROUP – NUCLEAR REGULATORY  
COMMISSION INTEGRATED INSPECTION REPORT 70-27/2017-002

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**U. S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket No: 70-27

License No: SNM-42

Report No: 70-27/2017-002

Licensee: BWX Technologies (BWXT)

Facility: Nuclear Operations Group, Inc. (NOG)

Location: Lynchburg, VA 24505

Dates: January 1 through March 31, 2017

Inspectors: C. Stancil, Senior Resident Inspector, RII/DFFI/PB2  
P. Glenn, Fuel Facility Inspector, RII/DFFI/PB2  
N. Peterka, Fuel Facility Inspector, RII/DFFI/PB1  
N. Pitoniak, Senior Fuel Facility Inspector, RII/DFFI/PB2  
M. Ruffin, Fuel Facility Inspector, RII/DFFI/PB2  
T. Sippel, Fuel Facility Inspector, RII/DFFI/SB  
R. Womack, Fuel Facility Inspector, RII/DFFI/SB

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

Enclosure

## **EXECUTIVE SUMMARY**

BWXT Nuclear Operations Group, Inc.  
NRC Integrated Inspection Report 70-27/2017-002  
January 1 – March 31, 2017

Inspections were conducted by the senior resident inspector and regional inspectors during normal and off-normal hours in safety operations, radiological controls, facility support, and other areas. The inspectors performed a selective examination of BWXT activities that were accomplished by direct observation of safety-significant activities and equipment, tours of the facility, interviews and discussions with BWXT personnel, and a review of facility records.

### **Safety Operations**

- There were no violations of NRC requirements identified related to Plant Operations and Safety System Walkdowns. (Paragraphs A.1, A.2, and A.6)
- There were no violations of NRC requirements identified related to the Fire Protection Program. (Paragraph A.3)
- There were no violations of NRC requirements identified related to the Nuclear Criticality Safety Program. (Paragraphs A.4 and A.5)

### **Radiological Controls**

- There were no violations of NRC requirements identified related to the Radiation Protection Program. (Paragraph B.1)

### **Facility Support**

- There were no violations of NRC requirements identified related to Post-Maintenance and Surveillance Testing Programs. (Paragraphs C.1 and C.2)
- There were no violations of NRC requirements identified related to items entered into the corrective action program. (Paragraph C.3)
- There were no violations of NRC requirements identified related to the Emergency Preparedness program. (Paragraphs C.4 and C.5)

### **Other Areas**

- One violation, Failure to Establish Adequate Management Measures Resulting in the Failure to Limit the Likelihood of Criticality to “Highly Unlikely,” was closed. (Paragraph D.1)
- One Severity Level IV Non-Cited Violation related to a deliberate procedural violation resulting in the mishandling of licensed material was opened and closed. (Paragraph D.2)

### **Attachment**

Supplementary Information

## 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 and Test Reactors (RTR) facility. The Uranium Recovery (UR) facility restarted from a scrubber shutdown maintenance period with all areas returning to routine operations.

#### **A. Safety Operations**

##### 1. Plant Operations (Inspection Procedures 88135 and 88135.02)

###### a. Inspection Scope and Observations

The inspectors performed routine tours of plant operating areas housing special nuclear material (SNM) and determined that equipment and systems were operated safely and in compliance with the license. Daily operational and shift turnover meetings were observed throughout the period to gain insights into process safety and operational issues. The inspectors reviewed selected BWXT-identified issues and corrective actions (CAs) for previously identified issues. These reviews focused on plant operations, safety-related equipment (valves, sensors, instrumentation, in-line monitors, and scales), and items relied on for safety (IROFS) to determine whether BWXT appropriately captured off-normal events and implemented effective CAs.

The routine tours included walkdowns of the RTR, filler, UR areas, and other manufacturing areas where SNM was being processed. During routine tours, the inspectors verified that operators, front-line managers, maintenance mechanics, radiation protection staff, and process engineering personnel were knowledgeable of their duties and attentive to any alarms or annunciators at their respective stations. The inspectors observed activities during normal and upset conditions for compliance with procedures and material station limits. The inspectors noted that safety controls, including IROFS, were in place, properly labeled, and functional to ensure proper control of SNM. The inspectors verified the adequacy of communications between supervisors and operators within the operating areas. The inspectors reviewed operator log sheets, operating procedures (OPs), maintenance records, and equipment and process changes to obtain information concerning operating trends and activities. The inspectors verified that BWXT actively pursued CAs for conditions requiring temporary modifications and compensatory measures.

The inspectors performed periodic tours of the outlying facility areas and determined that equipment and systems were operated safely and in compliance with the license. The inspectors focused on potential wind-borne missile hazards, potential fire hazards with combustible material storage and fire loading, hazardous chemical storage, the physical condition of bulk chemical storage tanks and piping, storage of compressed gas containers, and potential degradation of plant security features. In addition, the inspectors periodically toured or inspected BWXT's emergency response facilities to ensure the facilities were maintained in a readily available status.

The inspectors attended various BWXT meetings, including the Change Review Board, and met periodically with plant senior management and licensing personnel throughout the inspection period in order to determine the overall status of the plant. The inspectors evaluated the adequacy of BWXT's response to significant plant issues as well as their approach to solving various plant problems during these meetings.

b. Conclusion

No violations of more than minor significance were identified.

2. Safety System Walkdown (Inspection Procedure 88135.04)

a. Inspection Scope and Observations

The inspectors performed walkdowns of safety-significant systems involved with the processing of SNM. As part of the walkdowns, the inspectors verified as-built configurations matched approved plant drawings. The inspectors interviewed operators to confirm that plant personnel were familiar with the assumptions and controls associated with the IROFS systems and instrumentation for maintaining plant safety. The inspectors also verified that IROFS assumptions and controls were properly implemented in the field. The inspectors reviewed the related integrated safety analysis (ISA) to verify system abilities to perform functions were not affected by outstanding design issues, temporary modifications, operator workarounds, adverse conditions, or other system-related issues. The inspectors also verified that there were no conditions that degraded plant performance and the operability of IROFS, safety-related devices, or other support systems essential to safety system performance. The high-level dissolver system in UR and the wet end of the specialty fuel facility were specifically inspected.

To determine the correct system alignment, the inspectors reviewed procedures, drawings, related ISAs, and regulatory requirements such as Title 10 of the *Code of Federal Regulations* (10 CFR) 70.61, "Performance Requirements." During the walkdowns, the inspectors verified all or some of the following as appropriate:

- controls in place for potential criticality, chemical, radiological, and fire safety hazards
- process vessel configurations maintained in accordance with nuclear criticality safety evaluations (NCSEs)
- correct valve position and potential functional impacts such as leakage
- electrical power availability
- major system components correctly aligned, labeled, lubricated, cooled, and ventilated
- hangers and supports correctly installed and functional
- lockout/tag-out program appropriately implemented
- cabinets, cable trays, and conduits correctly installed and functional
- visible cabling in good material condition
- no interference of ancillary equipment or debris with system performance



b. Conclusion

No violations of more than minor significance were identified.

3. Fire Protection Quarterly (Inspection Procedure 88135.05)

a. Inspection Scope and Observations

During routine plant tours, the inspectors verified that transient combustibles were being adequately controlled and minimized in selected areas. Various fire barriers and doors were examined and found to be properly maintained and functional in accordance with site procedures. The inspectors reviewed active fire impairments in selected process areas and determined they were implemented per site procedure. The railyard storage building and container storage facility were specifically inspected.

The inspectors conducted fire safety tours and reviewed the fire detection and suppression capabilities in those areas, as applicable. The inspectors also reviewed relevant portions of the Pre-Fire Plan before and during the walkdowns to verify that key features identified on the Plan (e.g., sprinkler control valves) were in place in the field and that fire hazards that existed in the field were reflected in the Pre-Fire Plan. The inspectors also verified that housekeeping in the areas reviewed was sufficient to minimize the risk of fire. The inspectors reviewed the type of manual firefighting equipment that was provided to confirm that it was appropriate for the type of fire that could occur.

b. Conclusion

No violations of more than minor significance were identified.

4. Nuclear Criticality Safety (Inspection Procedure 88135.02)

a. Inspection Scope and Observations

During daily production area tours, the inspectors verified that various criticality controls were in place, that personnel followed criticality station limit cards, and that containers were adequately controlled to minimize potential criticality hazards. The inspectors reviewed a number of criticality-related IROFS for operability. The inspectors noted that operators were knowledgeable of the requirements associated with IROFS. The inspectors performed the tours inside various process areas when restrictions on SNM movements were in effect.

As part of routine day-to-day activities on-site, the inspectors reviewed corrective action program (CAP) entries associated with criticality safety aspects. The inspectors evaluated BWXT's response to such entries and, if needed, had discussions with Nuclear Criticality Safety (NCS) engineers to determine safety significance and compliance with procedures.

b. Conclusion

No violations of more than minor significance were identified.

## 5. Nuclear Criticality Safety (Inspection Procedure 88015)

### a. Inspection Scope and Observations

The inspectors evaluated BWXT's NCS program to assure the safety of fissile material operations and compliance with the license and 10 CFR Part 70. The inspectors reviewed NCSEs which included NCS-2016-042, NCS-2016-076, NCS-2016-155, NCS-PA-21-00001, and those listed in Section 4 of the Attachment to determine whether properly reviewed and approved NCSEs were in place prior to conduct new or changed operations, and whether they were of sufficient detail and clarity to permit independent review as required. The inspectors also reviewed the selected NCSEs to determine whether calculations were performed within their validated area of applicability and consistent with the validation report. The inspectors verified that no changes to the validation report were made since the last NCS inspection. Additionally, the inspectors reviewed the selected NCSEs, associated assumptions, and calculations to verify that they were consistent with the commitments in the License Application (LA), including the consideration of the double contingency principle, assurance of subcriticality under normal and credible abnormal conditions with the use of BWXT's approved subcritical margin, technical practices and methodologies, and treatment of NCS parameters. NCSEs reviewed were selected based on factors that included risk-significance, whether or not they were new and/or revised, the use of new technology, and operating history.

The inspectors reviewed BWXT's "what if" analysis to determine whether the NCSEs reviewed systematically identified normal and credible abnormal conditions in accordance with the commitments and methodologies in the LA for the analysis of process upsets. This included the review of accident sequences and/or upsets that BWXT considered to be not credible to determine whether the bases for incredibility were consistent with the commitments, definitions, and methodologies in the LA and were documented in sufficient detail to permit an independent assessment of credibility. This review was conducted for the liquid waste system which includes various equipment including inline monitors, shutoff valves, and retention tanks. Additionally, the inspectors reviewed selected accident sequences, related to solution transfer and backflow in UR, that BWXT considered incredible to determine whether the bases for incredibility relied on any items which should be identified as formal NCS controls or IROFS.

The inspectors performed walkdowns of UR and Specialty Fuel Facility (SFF) to determine whether existing plant configuration and operations were covered by, and consistent with, the process description and safety basis in the selected NCSEs listed above. The inspectors reviewed process and system descriptions, specifications, and drawings (UPRR-10058 and UPRR-10060D) to verify that engineered controls established in the NCSEs were included. The engineered controls reviewed included safe geometry columns, air gaps, overflows, and other backflow prevention devices. The inspectors reviewed operating procedures (OP-1015720) and postings (15-18-013, 15-18-014, 15-18-015, and 15-18-016) to verify that selected administrative controls established in the NCSEs were included. The inspectors interviewed operators and engineers to verify that administrative actions established in the NCSEs were understood and implemented properly. The inspectors reviewed various administrative mass and moderator controls in UR and SFF, with a focus on those implemented using

a spreadsheet or mass log. The inspectors reviewed the ISA summary and supporting ISA documentation for these IROFS to determine whether the controls identified in the ISA were supported by technical basis in the NCSEs.

The inspectors conducted walkdowns of abandoned equipment and enclosures in the UR area to verify that BWXT evaluated and removed radiological material prior to declaring the systems out of service. The inspectors reviewed plant procedures to verify that BWXT had adequate procedures and controls in-place to suspend and restart fuel operations equipment from both short- and long-term system outages. Formal procedures related to permanent deactivation of equipment and updates to the ISA were also reviewed.

The inspectors reviewed records of the last two NCS quarterly audits (NCS-2016-107 and NCS-2017-001) and accompanied a NCS engineer on a weekly inspection of the central storage vault to determine whether NCS staff routinely inspects fissile material operations to ascertain that criticality requirements were being complied with. Additionally, the inspectors interviewed NCS staff and reviewed weekly inspection records to verify that the NCS function performed these weekly inspections and NCS audits as required by Section 5.1.3 of the LA.

The inspectors reviewed the applied management measures for selected NCS controls to determine whether the management measures were sufficient to ensure the availability and reliability of NCS controls. The management measures and NCS controls reviewed were selected from the NCSEs listed above and included cases where moderator was 'permitted as necessary,' the use of spreadsheets for tracking mass, and inspections for mass accumulation.

The inspectors interviewed NCS staff and reviewed records to determine whether NCS staff reviewed new and/or revised fissile material operations and procedures, consistent with program procedures and at a level commensurate with their significance. The inspectors reviewed the selected NCSEs listed above to verify that they were performed in accordance with NCS program procedures and received appropriate independent review and approval. The inspectors interviewed the NCS manager and reviewed audit records to verify that the NCS quarterly audits were conducted at a frequency consistent with license requirements and examined trends in findings and reviewed past evaluations as required by Section 5.1.3 of the LA.

In accordance with the procedure for CAs, the inspectors reviewed six NCS-related CA entries, including CA entries to assess NRC reportability, to determine whether anomalous conditions were identified and entered into the CAP, whether they received the required level of investigation consistent with license commitments and procedures, whether they were prioritized on a schedule commensurate with their significance, and whether they were completed as required and addressed prevention of recurrence.

b. Conclusion

No violations of more than minor significance were identified.

6. Operational Safety (Inspection Procedures 88020)

a. Inspection Scope and Observations

The inspectors reviewed site requirements contained in the LA. The inspectors interviewed staff and reviewed records associated with the UR area. The UR area was preparing to restart following a prolonged shutdown to perform equipment modifications.

The inspectors observed four front-line managers and supervisor hands-on training and operation of the new UR area scrubber system per procedure OP-0061143, "Uranium Recovery Scrubber Operation," Revision (Rev.) 30. Training was conducted by the UR area engineer. Additionally, the inspectors performed walkdowns the new scrubber system during hands-on training activities. The inspectors also observed repair activities of a cracked scrubber system PVC flange. No leakage was identified following the repair activities.

The inspectors observed recovery furnace operations per procedure OP-0061556, "Furnace Operations," Rev. 16, following an extended maintenance period. The inspectors interviewed two technicians regarding modification upgrades of the furnace system resulting from a previous duct fire and reviewed mass logs associated with furnace operations.

The inspectors observed nitric acid tank high-level alarm IROFS maintenance and testing per work order (WO) 20213415.

The inspectors interviewed four recovery area operators regarding proficiency training associated with extended recovery area shutdown for the scrubber system upgrade. Additionally, the inspectors reviewed proficiency training records of 17 operators and documented on form E61-459, "Uranium Recovery Personnel Training Record," Rev. 40. The inspectors reviewed surveillance and test records for 74 IROFS required to support recovery area startup and operations.

The inspectors reviewed ISA scenario RSC1-4 per Safety Analysis Report (SAR) 15.5, "High-Level Dissolution Process in Uranium Recovery," Rev. 133, associated with process water in the UR area. The inspectors performed walkdowns of safety-related equipment associated with NCS-2016-096, "NCS Safety Analysis".

b. Conclusion

No violations of more than minor significance were identified.

**B. Radiological Controls**

1. Radiation Protection Quarterly (Inspection Procedure 88135)

a. Inspection Scope and Observations

The inspectors reviewed BWXT's Radiation Protection program to verify compliance with 10 CFR 20, "Standards for Protection Against Radiation," and LA requirements. The inspectors toured the controlled 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 observed plant personnel as they performed various tasks in different areas of the facility to verify that proper protective equipment was used to prevent contamination. The inspectors also observed plant employees as they performed exit monitoring at the controlled areas' exits to verify that monitoring instructions were followed at the exit point. The inspectors observed employees using the exit monitors in the controlled area exit to verify whether monitors were being used as required.

The inspectors verified the radiation work permits (RWPs) contained required work instructions, were posted in the work areas for employee review, and that workers signed the applicable RWP. The inspectors performed numerous partial reviews of special work permits (SWPs) during the inspection period in different operational areas, but conducted a more thorough review for the following SWPs and posted radiologically controlled areas:

- “Radiological boundary setup per OP-0061234, “Maintenance in UPRR” and WO 20213218, “14A Columns to Primary Feed Columns Prefab and Re-Installation of Kynar Piping”
- RWP-17-26, “Disconnect Main Tube from Furnace for Inspection during Inventory per OP-0061556, “Recovery Conversion Furnace Operation and Maintenance Plan 3926”

b. Conclusion

No violations of more than minor significance were identified.

**C. Facility Support**

1. Post-Maintenance Testing (Inspection Procedures 88135.19)

a. Inspection Scope and Observations

The inspectors witnessed and reviewed the post-maintenance tests (PMTs) listed below to verify that procedures and test activities confirmed safety systems and components (SSCs) operability and functional capability following the described maintenance. The inspectors reviewed BWXT's completed test procedures to ensure any of the SSC safety function(s) that may have been affected were adequately tested, that the acceptance criteria were consistent with information in the applicable licensing basis and/or design basis documents, and that the procedure had been properly reviewed and approved. The inspectors also witnessed and/or reviewed the test data to verify that test results adequately demonstrated restoration of the affected safety function. The inspectors verified that PMT activities were conducted in accordance with applicable WO instructions or licensee procedural requirements. Furthermore, the inspectors verified that problems associated with PMTs were identified and entered into BWXT's CAP.

- Change Requests (CHGs) 1040939 and 1041162, Cut and Cap High-Level Dissolver #2 and #3 Troughs 1-inch Process Drains

b. Conclusion

No violations of more than minor significance were identified.

2. Surveillance Testing (Inspection Procedure 88135.22)

a. Inspection Scope and Observations

The inspectors witnessed portions of and/or reviewed completed test data for the following surveillance tests of risk-significant and/or safety-related systems to verify that the tests met the requirements of the ISA, commitments, and procedures. The inspectors confirmed the testing effectively demonstrated that the SSCs were operationally capable of performing their intended safety functions and fulfilled the intent of the associated safety-related equipment test requirement.

The inspectors discussed surveillance testing requirements with operators and maintenance personnel performing the associated tasks and determined that their procedural knowledge was adequate. The inspectors verified that any test equipment or standards used to conduct the test were within calibration. The inspectors determined that effective communications between personnel performing these tests were used to complete each activity.

- Maintenance Plan 3136, "Recovery Primary Organic Storage Columns 1, 2, and 3 High-Level Probe Test"
- Maintenance Plan 3927, "Semi-Annual Recovery Furnace Over Temp Interlock Checks"
- Maintenance Plan 118 and OP-1004612, "Ultrasonic Inspection Procedure for Annular Tanks and Cylindrical Columns, specifically the Recovery Organic Annular Tank"

b. Conclusion

No violations of more than minor significance were identified.

3. Corrective Action Program (Inspection Procedures 88135)

a. Inspection Scope and Observations

The inspectors reviewed a sample of items entered into BWXT's CAP during the inspection period to ensure that entries pertinent to safety, security, and non-conforming conditions were identified, investigated, and tracked to closure. The inspectors verified through interviews with BWXT staff and document reviews that issues of high-safety significance were identified and reviewed for apparent causes as required. The inspectors verified that, for those issues requiring extent-of-condition/ extent-of-cause reviews, the reviews were completed and documented in the applicable CA. The inspectors verified that CAs to prevent recurrence were identified in the CAP and were reviewed and tracked to completion in accordance with BWXT's CAP implementing procedure, Quality Work Instruction (QWI) 14.1.1, "Preventive/Corrective Action System," Rev. 33.

Furthermore, the inspectors conducted periodic reviews of BWXT audits and third-party reviews of safety-significant processes to determine their effectiveness and necessary entries into the CAP. Specifically the inspectors reviewed the following:

- Semi-Annual Effluent Monitoring Report dated February 21, 2017
- RP Audits, Inspections for the 4<sup>th</sup> Quarter 2016
- NCS Audit, NCS-2017-001, NCS Violation and Observation Summary 4<sup>th</sup> Quarter 2016

b. Conclusion

No violations of more than minor significance were identified.

4. Emergency Preparedness (Inspection Procedure 88135)

a. Inspection Scope and Observations

On February 15, 2017, the inspectors observed a security emergency director training session focused on using the emergency response flow chart with several simulated scenarios.

In addition, on March 21, 2017, the inspectors observed an emergency team exercise that simulated a heart attack in the Waste Treatment facility, fork lift accident, flammable liquid spill, metal fire, radiological spill, and a contaminated individual resulting in transportation to the local hospital. This drill was intended to identify any BWXT weaknesses and deficiencies in scenario classification and protective action recommendations in accordance with the BWXT Emergency Plan, Emergency Preparedness (EP) Manual, and licensee conformance with other applicable emergency plan implementing procedures. The inspectors reviewed the documented post-exercise critique to compare any inspector-observed weaknesses with those identified by BWXT in order to verify whether BWXT staff were properly identifying EP-related issues and entering them into the CAP, as appropriate.

b. Conclusion

No violations of more than minor significance were identified.

5. Emergency Preparedness (Inspection Procedures 88050)

a. Inspection Scope and Observations

The inspectors reviewed multiple EP procedures listed in the Attachment in order to verify that changes made to EP procedures were in compliance with the Emergency Plan. The inspectors discussed BWXT's emergency call list and verified that the list was current. The inspectors also observed the implementation of procedures for inventorying emergency response vehicles and a Commonwealth of Virginia ambulance inspection to verify that procedures were usable for onsite staff.

The inspectors reviewed training records and interviewed BWXT staff, including senior management and a radiation control technician, regarding EP training. The inspectors verified that BWXT provided training for their personnel and that the training material was consistent with the performance objectives required in the Emergency Plan.

The inspectors reviewed written agreements with off-site agencies and verified that the organizations required by the Emergency Plan had up-to-date agreements. The inspectors toured Lynchburg General Hospital and Concord Volunteer Fire Department and interviewed the Campbell County sheriff and the Campbell County public safety director. The inspectors verified that off-site organizations maintained an understanding of written agreements with BWXT. During interviews, the inspectors verified that BWXT invited all off-site organizations for training as required by the Emergency Plan and that BWXT performed a communication check with off-site organizations as required by the Emergency Plan.

The inspectors toured the emergency operation center and the off-site emergency operation center to verify that the areas were readily assessable, maintained the appropriate amount of functional communication equipment, and contained up-to-date and accessible EP procedures.

The inspectors reviewed documentation of past events captured in BWXT's CAP since the last EP inspection, which required the implementation of the Emergency Plan. The inspectors also reviewed the most recent audit of the EP program that any problems or deficiencies associated with the Emergency Plan or implementing procedures were corrected. The inspectors reviewed the self-assessments generated since the last inspection and verified that a system was in place for tracking and resolving self-assessment findings.

b. Conclusion

No violations of more than minor significance were identified.

**D. Other Areas**

Follow-Up on Previously Identified Issues

1. (CLOSED) Violation (VIO) 70-27/2015-009-01: Failure to Establish Adequate Management Measures Resulting in the Failure to Limit the Likelihood of Criticality to "Highly Unlikely"

This event was first reported to the NRC in Event Notification (EN) 51411 and discussed in NRC Integrated Inspection Reports 70-27/2015-008 and 70-27/2015-009 (EA-15-214). It involved the failure to provide adequate management measures, specifically training, to operators in the SFF to ensure that an administrative IROFS limiting internal moderation remained available and reliable. The operators involved did not understand that they were required to adhere to limits for both U-235 mass and internal moderation, which resulted in a failure to control internal moderation.

In following up on this violation, the inspectors reviewed documents including NCS-2016-042, NCS-2016-076, NCS-2016-155, postings, CAs, and interviewed operators, engineers, and managers. Specifically, the inspectors reviewed how BWXT had



reanalyzed most SFF gloveboxes with dual mass-moderator controls and imposed new control schemes that eliminated the need to control both mass and moderator. The inspectors walked these gloveboxes down with BWXT engineers, interviewed operators, and reviewed the postings in the field to verify that the controls were being implemented in accordance with the new NCS requirements. The inspectors also observed operators use electronic mass tracking spreadsheets; these configuration controlled spreadsheets contain built-in error-checking logic that would alert the operators if an action (e.g., addition of mass) would exceed a limit.

The inspectors reviewed BWXT's process for ensuring readiness to restart a system that had been shut down for more than six months. The site performed a scrubber modification in the UR area that required an extended period of suspended operations. The inspectors reviewed operator proficiency training records and system walkdowns performed by operators and reviewed and discussed with supervisors. The inspectors observed hands-on equipment training conducted with recovery area front line managers and the recovery scrubber system engineer prior to equipment startup and operation per procedure OP-0061143, "Uranium Recovery Scrubber Operation," Rev. 30. The inspectors performed system walkdowns of the new scrubber system modification and interviewed operators and maintenance personnel regarding changes to system operations. The inspectors reviewed test and surveillance records associated with safety-related equipment required for restart.

This item is considered closed.

2. (OPEN and CLOSED) Non-Cited Violation (NCV) 2017-002-01: "Willful Violation of Approved Procedures Resulting in the Mishandling of Licensed Material"

The NRC staff completed a review of the mishandling of licensed material that occurred in March 2015. BWXT identified that processed licensed material was missing from its expected location. The licensee performed an investigation and identified that an operator deliberately deviated from approved procedures by introducing non-SNM materials into the process and inadvertently exchanged the container lids/labels between the licensed material and non-SNM material resulting in the incorrect storage and tracking of SNM materials upon completion of processing activities.

Safety Condition S-1 of NRC License SNM-42 authorizes the use of nuclear material in accordance with Chapters 1 through 11 of the LA.

Section 11.4 of the LA requires, in part, that activities at B&W NOG involving licensed material shall be performed in accordance with written and approved procedures.

Contrary to the above, on March 2, 2015, activities at BWXT involving licensed material were not performed in accordance with written approved procedures. Specifically, a technician willfully violated procedure OP-1041242, "Pharmacy Operations," Rev. 2, Section 5.4.13 by introducing a bulk container of non-SNM material into the process. An error in the handling of this material subsequently affected the handling and storage of licensed material.

The consequences of the violation, absent of the willful aspect, was determined to be minor based on screening per Inspection Manual Chapter 0616, "Fuel Cycle Safety and Safeguards Inspection Reports" and the NRC Enforcement Policy due to the fact that all

licensed material remained in a secure location and was completely accounted for in accordance with 10 CFR 74 requirements. However, willful violations are a particular concern to the NRC. In this case, the technician was knowledgeable of the procedure requirements, yet chose to proceed contrary to procedural requirements. Based on the willful aspects, the NRC has concluded that this violation should be characterized at Severity Level IV in accordance with the NRC Enforcement Policy. Based upon the willful nature of the violation and specifically meeting the requirements of Sections 2.3.2.a.4 and 2.3.2.b of the Enforcement Policy, this violation is dispositioned as a NCV 2017-002-01 (EA-16-150). The basis for the disposition is due to the violation being licensee identified, isolated to the acts of a non-supervisor employee without management knowledge or involvement, not due to a lack of management oversight, completion of CAs to prevent recurrence, licensee initiative in identifying the root cause, and being non-repetitive as a result of an inadequate CA.

**E. Exit Meeting**

On January 26 and April 6, 2017, the inspectors presented the inspection results to Mr. J. Burch and members of the BWXT staff. No dissenting comments were received from BWXT. Proprietary information was discussed, but not included in the report.

## SUPPLEMENTARY INFORMATION

### 1. KEY POINTS OF CONTACT

#### Licensee Personnel

<u>Name</u>	<u>Title</u>
J. Burch	Vice President and General Manager
J. Calvert	Environmental, Safety, Health & Security Program Manager
D. Faidley	Manager, Nuclear Criticality Safety
A. Rander	Security Manager
C. Reed	Operations Manager
L. Ragland	Unit Manager, Uranium Processing Operations
H. Shaffer	Engineering Manager
D. Spangler	Section Manager, Nuclear Safety and Licensing
C. Terry	Unit Manager, Licensing and Safety Analysis
D. Ward	Department Manager, Environmental, Safety, Health, and Safeguards

### 2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

#### Closed

70-27/2015-009-01	VIO	Failure to Establish Adequate Management Measures Resulting in the Failure to Limit the Likelihood of Criticality to "Highly Unlikely" (Paragraph D.1)
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#### Opened/Closed

70-27/2017-002-01	NCV	Willful Violation of Approved Procedures Resulting in the Mishandling of Licensed Material (Paragraph D.2)
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### 3. INSPECTION PROCEDURES USED

88015	Nuclear Criticality Safety
88020	Operational Safety
88050	Emergency Preparedness
88135	Resident Inspection Program For Category I Fuel Cycle Facilities
88135.02	Plant Status
88135.04	ISA Implementation
88135.05	Fire Protection Quarterly
88135.19	Post-Maintenance Testing
88135.22	Surveillance Testing

#### 4. **DOCUMENTS REVIEWED**

##### Drawings:

CRF-265D, Flow Diagram SFF System, Rev. 5  
 REC-2007-002D, Complexing Columns Piping and Instrumentation Drawing (P&ID),  
 Rev. 3  
 UPRR-30118E, Trough Dissolver P&ID, Rev. 0  
 UPRR-30138B, Rev. 0

##### Records:

Audit 259-4D, Emergency Preparedness (Training, Drills, and Exercises) dated  
 December 2016  
 BWXT NCS Inspection Records:  
 Week of October 31, 2016, dated November 3, 2016  
 Week of November 7, 2016, dated November 12, 2016  
 Week of December 5, 2016, dated December 7, 2016  
 Week of December 9, 2016, dated January 12, 2017  
 Week of December 19, 2016, dated December 21, 2016  
 CHG-1040939-00, Trough Dissolver #2 Process Drain Modification  
 E-61-001, Uranium Tech-B Qualification Records, Rev. 15 (various personnel)  
 E-61-459, Uranium Recovery Personnel Training Record, Rev. 40  
 GEST Employee Safety Training, Rev. 0  
 N-105, Safety Evaluation Report (SER) Release Record QWI 5.1.7 Phase 1  
 (SER 14-032), Rev. 8  
 N-105, SER Release Record QWI 5.1.7 Phase 2 (SER 14-032), Rev. 8  
 NCS Training – 2016 Annual Refresher dated July 22, 2016  
 NCS-2010-142, NCS Analysis for SER10-29 Phase 1, Trough Pass-Through Box Safety  
 Analysis and System Modifications  
 NCS-2016-042, NCS Safety Analysis for SER 16-015 Phase 01 – Re-Analysis of SFF  
 Dry Gloveboxes dated September 1, 2016  
 NCS-2016-076, NCS Analysis to Revise Mass/Moderator Limits for Workstations  
 250/300 per SER 16-15 Phase 03 dated September 29, 2016  
 NCS-2016-104, NCS Safety Analysis Supporting SER 16-026 Phase 01, “Place WS 145  
 Out of Service” dated October 13, 2016  
 NCS-2016-107, NCS Violation and Observation Summary – 3<sup>rd</sup> Quarter 2016 dated  
 October 24, 2106  
 NCS-2016-155, NCS Safety Analysis SFF Glovebox Posting Revision (CHG-00001954)  
 dated December 15, 2016  
 NCS-2017-001, NCS Violation and Observation Summary – 4<sup>th</sup> Quarter 2016 dated  
 January 18, 2017  
 NCS-PA-17-00001, Nuclear Criticality Safety Evaluation of SFF Systems, Rev. 1  
 NCS-PA-21-00001, Nuclear Criticality Safety Evaluation of Low-Level Radioactive  
 Waste Processes, Rev. 0  
 NCS-TR-00021, Retention Tank Data and Analysis, January 2008 – April 2015, Rev. 0,  
 dated November 26, 2016  
 Pre-Fire Plan Information, Sheet 38, dated June 21, 2011  
 Pre-Fire Plan Information, Sheet 52, dated September 2008  
 SAP M.P. 118, UT of Recovery Annulus Waste Tanks  
 SAP M.P. 627, Test of HLD Oxide Glovebox WO 20207786  
 SAP M.P. 992, Bypass Column High-Level WO 20210275

SAP M.P. 1086, Previous Maintenance Checklist WO 20207268  
 SAP M.P. 1467, HF Day Tank High Level Probes WO 20208971  
 SAP M.P. 1716, HF Leak Detection WO 20208491  
 SAP M.P. 1717, HF Overflow Tank WO 20208033  
 SAP M.P. 1807, Nitric Acid Day Tank High Level WO 20208034  
 SAP M.P. 2895, Low-Level Dissolver 2-Inch Column Probe WO 20208121  
 SAP M.P. 3140, Primary Organic Feed WO 20206980  
 SAP M.P. 3927, Recovery Furnace Over Temperature Interlock Checks  
 WO 20213218  
 WO 20213415  
 WO 20214469  
 WO 20214470  
 WO 20214471

Procedures:

EPR-01-10, Issuance of News Media Statements, Rev. 8  
 EPR-02-06, Emergency Communication Plan, Rev. 10  
 EPR-03-05, Management of Fire Water System, Rev. 7  
 EPR-03-07, Response to Severe Weather, Rev. 19  
 EPR-06-01, Emergency Organization, Rev. 15  
 EPR-06-03, Emergency Management Training, Rev 12  
 EPR-06-04, Emergency Drills, Rev. 18  
 EPR-06-08, Emergency Response Training, Rev. 10  
 HS-ET-003, Attachment 2, Inventory of Squad Truck, Rev. 17  
 HS-ET-003, Attachment 3, Inventory of Engine, Rev. 14  
 HS-ET-003, Attachment 4, Inventory of Equipment Radiological Control Van and  
 Command Vehicle, Rev. 10  
 HS-ET-003, Attachment 5, Inventory of Engine, Rev. 14  
 NCSE-03, NCS Audits and Inspections, Rev. 28  
 NCSE-07, Qualification and Training Requirements for a Nuclear Criticality Safety  
 Engineer, Rev. 10  
 RWP 17-0007, Consolidate 1-Gallon Can Samples, Rev. 0  
 OP-0000272, Liquid Handling at the Retention Tank Inline Monitor System, Rev. 8  
 OP-0061101, High Level Tray Dissolver Operations, Rev. 56  
 OP-0061110, Cyclone and All Purpose Pump Station Operations, Rev. 16  
 OP-0061115, Operating Procedure for Primary Extraction System, Rev. 44  
 OP-0061121, Primary Evaporator System, Rev. 27  
 OP-0061122, Secondary Evaporator System, Rev. 16  
 OP-0061123, Contractor Evaporator System, Rev. 25  
 OP-0061124, Evaporator #6 Operation, Rev. 14  
 OP-0061127, Raffinate/Waste Collection System Operation, Rev. 16  
 OP-0061128, Identification of Process Scrap and Waste Material, Rev. 18  
 OP-0061129, Drum Dryer Collection of Uranyl Nitrate Crystals, Rev. 51  
 OP-0061134, Preparation of Chemical Reagents for Uranium Recovery, Rev. 33  
 OP-0061143, Uranium Recovery Scrubber Operation System Walkdown, Rev. 30  
 OP-0061144, Low-Level Storage Column Operation, Rev. 21  
 OP-0061150, Inspection and Cleaning of Recovery Ducts, Rev. 27  
 OP-0061161, Training of Uranium Processing Operators, Rev. 10  
 OP-0061167, Spill and Leak Handling Emergency, Rev. 32  
 OP-0061169, Housekeeping and Decontamination in Uranium Recovery Facility,  
 Rev. 10

OP-0061214, LLD Accountability Weigh Column Operation, Rev. 27  
 OP-0061232, Preparation for SNM Inventory in Uranium Recovery, Rev. 16  
 OP-0061234, Maintenance in UPRR, Rev. 52  
 OP-0061247, Main Recovery Accountability Weigh Column Operations, Rev. 30  
 OP-0061556, Recovery Conversion Furnace Operation, Rev. 16  
 OP-1004612, Ultrasonic Inspection Procedure for Annular Tanks and Cylindrical Columns  
 OP-1015720, Coating in the Centorr Furnace for Advanced Gas Reactor Program, Rev. 39  
 QWI 2.1.17, Suspending and Restarting Fuel Operations, Rev. 01  
 QWI 5.1.12, Change Management and Attachment 4, Rev. 31  
 QWI 9.1.6, Control of Processes, Special Processes, and Tests, Rev. 02  
 QWI 9.1.7, Maintenance and Safety Related Controls Testing Program, Rev 10  
 QWI 9.1.21, Industrial Engineering Maintenance, Facilities Engineering, and Construction Work Requests, Rev. 06  
 QWI 14.1.1, Preventive/Corrective Action System, Rev. 33  
 QWI 14.1.4, Reporting Unusual Events Rev. 12  
 QWI 14.1.10, Safety Evaluation of Unusual Incidents, Rev. 16

Other Documents:

Posting 15-18-013, Rev. 1  
 Posting 15-18-014, Rev. 1  
 Posting 15-18-015, Rev. 1  
 Posting 15-18-016, Rev. 1  
 Quality Systems Manual, Rev. 12  
 SAP 10007121  
 SAP 10007122  
 SAP 10007123  
 SAR 15.5, High-Level Dissolution Process in Uranium Recovery, Rev. 133  
 SAR 15.7, General Purpose Reclamation Area Processes in Uranium Recovery, Rev. 48  
 SAR 15.25, Furnace Process Recovery Operation, Rev. 37  
 UPRR-10058, Rev. 0, dated July 21, 2016  
 UPRR-10060D, Rev. 0, dated August 18, 2016

Corrective Actions:

2015-424, 2016-13, 2016-105, 2016-336, 2016-365, 2016-508, 2016-1184, 2016-1408, 2016-1490, 2016-1539, 2016-1573, 2016-1681, 2017-59, 2017-71, 2017-77, 2017-80, 2017-90, 2017-128, 2017-145, 2017-167, 2017-169, 2017-265, 2017-309, 2017-316, 2017-318, 2017-324, 2017-388, 2017-447, 2017-462