July 3, 2008

Mr. Roger P. Cochrane, General Manager
BWX Technologies, Inc.
P.O. Box 785
Lynchburg, VA 24505-0785

SUBJECT: INSPECTION REPORT NO. 70-0027/2008-203

Dear Mr. Cochrane:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced nuclear criticality safety (NCS) inspection at your facility in Lynchburg, Virginia, June 2 - 5, 2008. The purpose of the inspection was to determine whether activities involving special nuclear materials were conducted safely and in accordance with regulatory requirements. An exit meeting was held on June 5, 2008, during which time the inspection observations and findings were discussed with members of your staff.

The inspection, which is described in the enclosure, focused on: (1) the most hazardous activities and plant conditions; (2) the most important controls relied on for safety and their analytical basis; and (3) the principal management measures for ensuring controls are capable, available, and reliable to perform their functions relied on for safety. The inspection consisted of analytical basis review, selective review of related procedures and records, examinations of relevant NCS-related equipment, interviews with NCS engineers and plant personnel, review of recent criticality safety-related events, and facility walkdowns to observe plant conditions and activities related to safety basis assumptions and related NCS controls. Throughout this inspection, observations were discussed with your managers and staff.

In accordance with 10 CFR 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be made publicly available in the public electronic reading room of the NRC's Agency-Wide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/ADAMS.html.

If you have any questions concerning this report, please contact Dennis Morey, of my staff, at (301) 492-3112.

Sincerely,

/RA/

Patricia Silva, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS
Office of Nuclear Material Safety
and Safeguards

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

Enclosure: Inspection Report No. 70-0027/2008-203

cc: Barry Cole
Licensing Officer
BWX Technologies, Inc.

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cc: Barry Cole
Licensing Officer
BWX Technologies, Inc.

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

Docket No.:	70-27
License No.:	SNM-42
Report No.:	70-0027/2008-203
Licensee:	BWX Technologies, Inc.
Location:	Lynchburg, VA
Inspection Dates:	June 2 - 5, 2008
Inspectors:	Dennis Morey, Senior Criticality Safety Inspector Thomas Marenchin, Criticality Safety Inspector
Approved by:	Patricia Silva, Chief Technical Support Branch Division of Fuel Cycle Safety and Safeguards, NMSS

Enclosure

EXECUTIVE SUMMARY

BWX Technologies, Inc.
NRC Inspection Report 70-27/2008-203

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of the BWX Technologies Inc. (BWXT), Lynchburg, Virginia facility from June 2 through 5, 2008. The inspection included an on-site review of the licensee NCS program, NCS-related inspections, audits and investigations, NCS-related events, plant operations and open item review. The inspection focused on risk-significant fissile material processing activities including fuel fabrication and machining, the uranium recovery area, the Research Test Reactor and Target (RTRT) area, container storage areas, and the Lynchburg Technology Center.

Results

- No safety concerns were identified regarding development, review, or approval of NCS analysis or calculations or resulting NCS controls.

- No safety concerns were noted regarding licensee identified NCS-related events and tracking of resulting corrective actions.

- No safety concerns were noted regarding licensee internal audits and investigations or tracking and resolution of related corrective actions.

- No safety concerns were identified during plant walkdowns.

REPORT DETAILS

1.0 Summary of Plant Status

BWXT manufactures high-enriched uranium fuel, reactor core components and reactor cores at its facility near Lynchburg, Virginia. The licensee examines commercial reactor fuel at the Lynchburg Technology Center. During the inspection, the licensee conducted routine fuel manufacturing operations and maintenance activities in the fuel fabrication and uranium recovery areas.

2.0 Nuclear Criticality Safety Program (IP 88015 & IP 88016)

a. Inspection Scope

The inspectors reviewed NCS analyses to determine that criticality safety of risk-significant fissile material operations was assured through engineered and administrative controls with adequate safety margin including preparation and review by qualified staff. The inspectors reviewed selected aspects of the following documents:

Procedures

- OP-0061138, "Raschig Ring Installing, Removing, Replacing, and Washing Operation," Revision 25, dated March 31, 2008
- OP-0061265, "Control of Borosilicate Glass Raschig Rings," Revision 8, dated December 5, 2004

NCS Evaluations

- NCSE-02, "Nuclear Criticality Safety Analyses and Quality Assurance Reviews," Revision 35, dated May 29, 2008
- NCS-2007-232, "NCS Analysis for Tertiary Evaporator Steam Supply Interlock with Densitometer," dated October 9, 2007
- NCS-2008-027, "NCS Safety Analysis for the Close out of N-24780, 'SAR [Safety Analysis Report] 15.39 Process Development Lab,'" dated March 20, 2008
- NCS-2008-033, "Raschig Ring Vacuum Cleaner Solution Height Test," dated March 6, 2008
- NCS-2008-035, "Nuclear Safety Release for Addition Column 12-4: CR-1027923," dated March 10, 2008
- NCS-2008-037, "Raschig Ring Free Vacuum Cleaner Safety Basis," dated April 28, 2008
- NCS-2008-039, "Close out of N-24780, 'SAR 15.28 Metallographic Laboratories,'" dated March 12, 2008
- NCS-2008-040, "NCS Analysis for SER [Safety Evaluation Report] 08-009 Phase 1 through 6," dated March 14, 2008
- NCS-2008-043, "Nuclear Criticality Safety Release for Tertiary Evaporator Steam Supply Interlock with Densitometer," dated March 13, 2008
- NCS-2008-048, "Review of Drum Count Prior to Raschig Ring Wash," dated March 28, 2008

- NCS-2008-064, “New ROL [Routine Operating Limit] for Redesigned High Level Dissolver,” dated April 25, 2008
- NCS-2008-65, “Nuclear Safety Release for Re-evaluation of the SFR Forming Station,” dated May 7, 2008
- NCS-2008-067, “NCS Safety Analysis for the Close out of N-24780, ‘SAR 15.32 Pharmacy and Fuel Reclamation Operations,’” dated April 30, 2008
- NCS-2008-068, “Nuclear Safety Release of SER 08-009, Phase 2, Pre-Operational,” dated may 1, 2008
- NCS-2008-071, “Enhancement of Raschig Ring Safety Basis,” dated May 9, 2008
- NCS-2008-075, “Enhancement of Raschig Ring Vessel Safety Basis,” dated May 12, 2008
- NCS-2008-080, “High Level Trough Column Dissolver Column Shift,” dated May 20, 2008
- NCS-2008-084, “RTRT Oil in Dry Glovebox HEPA Filter,” dated May 21, 2008
- NCS-2008-086, “Bay 7 Cantilever Racks Analysis,” dated May 22, 2008

b. Observations and Findings

The inspectors reviewed NCS approvals (NCSA), NCS evaluations (NCSE), and supporting calculations for new, changed, and other selected operations. Within the selected aspects reviewed, the inspectors determined that the analyses were performed by qualified NCS engineers, that independent reviews of the evaluations were completed by qualified NCS engineers, and that the analyses provided for sub-criticality of the systems and operations. The inspectors observed that the analyses contained appropriate limits on controlled parameters for each credible accident sequence leading to inadvertent criticality. The inspectors determined that NCSAs, NCSEs and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits.

The inspectors noted that licensee NCSAs, NCSEs, and supporting documents are all individual documents with unique numbers issued in order of preparation. NCS document numbers do not, for example, give any indication of the relationship of one document to another so that it can be difficult even for experienced licensee staff to identify all documents supporting a specific analytical conclusion. Licensee NCS documents are not revised, rather, if a change is to be documented, a new NCS document is prepared. The inspectors noted that some NCS documents prepared recently have tended to be more comprehensive (i.e., less reliant on referencing documents which, in turn, reference other documents). The inspectors also noted that licensee management is reviewing proposals by NCS staff to make NCS documentation more comprehensive. The inspectors did not identify any immediate safety concern related to incorrect analytical assumptions or conclusions in NCS documents reviewed.

c. Conclusions

No safety concerns were identified regarding development, review, or approval of NCS analysis or calculations or resulting NCS controls.

3.0 Nuclear Criticality Safety Event Review and Follow-Up (IP 88015 & IP 88016)

a. Inspection Scope

The inspectors reviewed licensee actions to investigate and correct deficiencies related to internally reported events. The inspectors reviewed selected aspects of the following documents:

- NCS-2008-082, "30-Day Report to the General manager for BWX_2027009," dated May 21, 2008
- NCS-2008-085, "30-Day Report to the General manager for BWX_2027264," dated May 22, 2008
- BWX 2025519, "Raschig Ring Vacuum Cleaner Suction Investigation," dated March 11, 2008
- BWX 2025417, "Raschig Ring Vacuum Cleaner Level Problem Investigation," dated March 6, 2008
- RWP 08-0031, "Raschig Ring Vacuum Cleaner use for Floor Only," Revision 00, dated May 14, 2008

b. Observations and Findings

The inspectors reviewed the progress of investigations and interviewed licensee staff regarding immediate and long-term corrective actions. The inspectors determined that licensee internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned.

c. Conclusions

No safety concerns were noted regarding licensee identified NCS-related events and tracking of resulting corrective actions.

4.0 Nuclear Criticality Safety Inspections, Audits, and Investigations (IP 88015)

a. Inspection Scope

The inspectors reviewed results of the most recent NCS quarterly audit to assure that appropriate issues were identified and resolved. The inspectors accompanied a licensee NCS engineer on a scheduled NCS audit. The inspectors reviewed selected aspects of the following documents:

- NCS Finding CA-2027264, "Horizontal Recirculation Column," dated May 19, 2008
- NCS Finding CA-2027009, Organic Solvent Hydrogen Density," dated May 9, 2008
- NCS-2008-079, "NCS Violation and Observation Summary - 1st Quarter 2008," dated June 2, 2008

b. Observations and Findings

The inspectors determined that the licensee NCS audits were conducted in accordance with written procedures. 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 control implementation; reviewed plant operations for compliance with license requirements, procedures, and postings; examined equipment and operations to determine that past evaluations remained adequate; and analyzed non-compliances for potential trends.

The inspectors accompanied a licensee NCS engineer on a scheduled audit of container storage areas. The inspectors noted that the audit was planned and conducted around specific NCS-related IROFS for fissile material storage. No safety concerns were identified during the audit.

c. Conclusions

No safety concerns were noted regarding licensee internal audits and investigations or tracking and resolution of related corrective actions.

5.0 Plant Operations (IP 88015)

a. Inspection Scope

The inspectors performed plant walkdowns to review activities in progress and to determine whether risk-significant fissile material operations were being conducted safely and in accordance with regulatory requirements. The inspectors interviewed operations staff and NCS engineers both before and during walkdowns. The inspectors reviewed selected aspects of the following documents prior to performing the walkdowns:

- NCS-2007-232, “NCS Analysis for Tertiary Evaporator Steam Supply Interlock with Densitometer,” dated October 9, 2007
- NCS-2008-027, “NCS Safety Analysis for the Close out of N-24780, ‘SAR 15.39 Process Development Lab,’” dated March 20, 2008

b. Observations and Findings

The inspectors performed walkdowns in the shop areas, the uranium recovery area, the Research Test Reactor and Target (RTRT) area, container storage areas, and the Lynchburg Technology Center. The inspectors verified that controls identified in NCS analyses were installed or implemented and were adequate to ensure safety. The inspectors observed that licensee NCS engineers were knowledgeable regarding assigned process areas and made frequent contact with production counterparts in the facility.

c. Conclusions

No safety concerns were identified during plant walkdowns.

6.0 Open Item Review

VIO 70-27/2007-06-01

This item concerned the licensee failure to perform an NCS analysis to safely control the transport of HEU solution-filled RRVCs, one of which was dropped during transfer operations. The dropped RRVC was wrapped in two 55-gallon plastic bags for contamination control based on direction from an RP technician. The inner 55-gallon bag retained the Raschig rings and the outer 55-gallon bag retained approximately 16.8 liters of low concentration High Enriched Uranium (HEU) solution (without the Raschig rings). Approximately 4 liters of solution spilled to the ground and 2.3 liters of solution remained in the RRVC. Because the licensee had not anticipated that SNM-bearing solution in an RRVC could become separated from the Raschig rings (other than to spill to the floor in a favorable geometry slab), the event was reported, in Event Notification 43528, as an unanalyzed condition in accordance with 10 CFR Part 70, Appendix A, paragraph (b)(1). Following the event, the licensee halted transfer of RRVCs pending an investigation.

During the current inspection, the inspectors noted that the licensee had committed to the following corrective actions:

1. Evaluate preferential separation of Raschig rings in a covered vessel and implement safety controls.
2. Audit specific areas (IROFS) to identify other unanalyzed conditions.
3. Install lifting devices on RRVCs.
4. Revise the operational procedure for SNM transfers to include the RRVCs.
5. Implement controls to prevent the transfer of RRVCs.
6. Distribute a lessons-learned report on the event to operations management.
7. Develop a reliable procedure to ensure that RRVCs are empty prior to transfer.
8. Revise the powered industrial truck training to incorporate a requirement to notify supervision prior to transporting items of unusual configuration.

The inspectors determined that all corrective actions had been completed except for Item #2 which the licensee refers to as the plant-wide IROFS implementation review and Item #3, installation of lifting devices. Installation of lifting devices on RRVCs was cancelled with NRC approval because of the licensee plan to eliminate the RRVCs. Because the IROFS implementation review is a major project and is being separately tracked, the inspectors determined that **VIO 70-27/2007-06-01** need no longer be tracked. This item is closed.

URI 70-27/2008-202-01

During the previous inspection the inspectors observed in NCS-2007-262, “Level 3 Nuclear Criticality Safety Analysis Supporting Consolidation of Waste and Scrap Container Rack NCS Postings,” that the analytical basis for the analysis was found in previously completed analyses of the system which were referenced. Because the justification of the controls were found in the references, it was difficult to determine if the basis for the controls and justification to change the limit on one of the controls was adequate. The inspectors also observed in NCS-2008-011, “NCS Analysis for New ROLs for the Re-design High Level Dissolver (Zirc Dissolver),” that the analysis did not

contain all information required by the licensee administrative procedure for performing Nuclear Criticality Safety Analyses.

During the current inspection, the inspectors noted that NCS-2007-262 complied with the requirements in NCSE-02, Nuclear Criticality Safety and Quality Assurance Reviews which is the procedure governing content of the NCSA. The inspectors also reviewed additional analyses to determine if any similar documentation weakness could be identified. Licensee staff indicated that the technical basis for evaluations was difficult to follow due to the fact that the actual analytical conclusions were often times found in numerous references. The inspectors observed that other analyses reviewed complied with the requirements in NCSE-02. No other safety concerns were noted. This item is closed.

URI 70-27/2008-202-04

During a previous inspection, the inspectors asked for verification of the number of Raschig ring vacuum cleaners (RRVCs) in use in the BWXT Lynchburg facility. Near the end of that inspection, the licensee responded that one of the RRVCs in the RTRT area could not be located and was thought to have been destroyed. Because RTRT procedures required daily checks of RRVC raschig ring levels, the inspectors asked whether the missing vacuum had been checked daily as required. The licensee could not immediately verify how the daily checks had been accomplished.

During the current inspection, licensee staff stated that the missing RRCV had been marked as out of service during daily inspections. The inspectors determined that licensee staff had routinely marked the missing vacuum as out of service on daily RRVC inspection forms. The licensee stated that the missing vacuum cleaner had been removed from the facility and scrapped many years before. The inspectors determined that the missing RRVC was out of service and that licensee RTRT operators, by indicating out of service on the daily checks, were in compliance with the RRVC level verification procedure as written. The licensee has since clarified the procedure by removing the missing RRVC from the check sheet. No other safety concerns were noted. This item is closed.

7.0 Exit Meeting

The inspectors presented the inspection scope and results to members of the licensee's management and staff during an exit meeting on June 5, 2008. The licensee acknowledged and understood the findings as presented.

SUPPLEMENTARY INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Items Opened

None.

Items Closed

VIO 70-27/2007-06-01	Failure to Perform an NCS Analysis to Safely Control the Transport of HEU Solution-filled Raschig Ring Vacuum Cleaners
URI 70-27/2008-202-01	Adequacy of description of the analytical basis for controls in criticality analysis
URI 70-27/2008-202-04	Adequacy of level verification procedure for RTRT area RRVCs

2.0 Inspection Procedures Used

IP 88015	Nuclear Criticality Safety Program
IP 88016	Nuclear Criticality Safety Evaluations and Analyses

3.0 Partial List of Persons Contacted

BWXT

R. Cochrane	Manager, BWXT NPD-Lynchburg
D. Ward	Manager, ESH&S
S. Nagley	Manager, UPRR
D. Miller	Manager, Recovery and Downblend
B. Burch	Manager, Operations
J. Creasey	Manager, Uranium Processing
D. Faidley	Manager, Nuclear Criticality Safety
B. Cole	Manager, Licensing and Safety Analysis
C. Yates	Manager, Nuclear Safety & Licensing
K. Kirby	Engineer, Licensing and Inspection

NRC

T. Marenchin	Criticality Safety Inspector, NRC Headquarters
D. Morey	Senior Criticality Safety Inspector, NRC Headquarters
O. Lopez	Senior Resident Inspector, NRC Region II
C. Cramer	Fuel Facility Inspector, NRC Region II

Attachment

4.0 List of Acronyms

APV	Apparent Violation
BWXT	BWX Technologies, Inc. (Licensee)
IP	inspection procedure
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NRC	U.S. Nuclear Regulatory Commission
ROL	Routine Operating Limit
RRVCs	Raschig ring filled vacuum cleaners
RTRT	Research Test Reactor and Target
SAR	Safety Analysis Report
SER	Safety Evaluation Report
URI	Unresolved Item