[redacted]

July 3, 2007

EN-43389

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

SUBJECT: INSPECTION REPORT 70-27/2007-203

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, from June 4 - 8, 2007. The purpose of the inspection was to determine whether activities involving special nuclear material were conducted safely and in accordance with NRC regulatory requirements. An exit meeting was held at the conclusion of the inspection on June 8, 2007. Throughout the inspection, observations were discussed with your managers and staff.

The inspection, which is described in the enclosure, focused on the most hazardous activities and plant conditions; the most important controls relied on for safety and their analytical basis; and 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, and facility walkdowns to observe plant conditions and activities related to safety basis assumptions and NCS controls.

[redacted]

[redacted]

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

Sincerely,

/RA/

Margie Kotzalas, Acting Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

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

Enclosures: Inspection Report 70-27/2007-203

cc: L. Morrell
Licensing Officer
BWX Technologies

July 3, 2007

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Licensing Officer
BWX Technologies

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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.:	70-27/2007-203
Licensee:	BWX Technologies, Inc.
Location:	Lynchburg, VA
Inspection Dates:	June 4 - 8, 2007
Inspectors:	Dennis Morey, Senior Criticality Safety Inspector Blake Purnell, Criticality Safety Inspector
Approved by:	Margie Kotzalas, Acting Chief Technical Support Branch Division of Fuel Cycle Safety and Safeguards, NMSS

Enclosure

[redacted]

EXECUTIVE SUMMARY

BWX Technologies, Inc.
NRC Inspection Report 70-27/2007-203

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of the BWX Technologies (BWXT), Lynchburg, Virginia, facility from June 4 - 8, 2007. The inspection included an on-site review of the licensee NCS program, NCS-related inspections, audits and investigations, plant operations and open item review. The inspection focused on risk-significant [redacted] material processing activities including fuel fabrication and machining, the uranium recovery area, and the criticality warning system (CWS).

Results

- No safety concerns were identified regarding development, review or approval of NCS analysis or calculations or resulting NCS controls.
- A weakness was identified in the Integrated Safety Assessment (ISA), which did not correctly identify the items relied on for safety (IROFS) for specific accident sequences.
- No safety concerns were noted regarding NCS audits.
- No concerns were noted regarding CWS coverage at the Lynchburg Technology Center (LTC).
- With the exception of a concern noted previously regarding correct identification of an IROFS for a specific accident sequence, no safety concerns were noted regarding plant operations.

REPORT DETAILS

1.0 Summary of Plant Status

BWX Technologies (BWXT) manufactures high-enriched uranium (HEU) fuel, [redacted] at its facility near Lynchburg, VA. 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 operations was assured through engineered and human controls with adequate safety margin and preparation and review by qualified staff. The inspectors reviewed selected aspects of the following documents:

- NCSE-02, "Nuclear Criticality Safety & Quality Assurance Reviews," Rev. 33, dated July 15, 2006
- NCS-2007-112, "Level 2 NCS Evaluation for [redacted]," dated May 23, 2007
- NCS-2007-096, "Additional [redacted]," dated May 22, 2007
- NCS-2007-094, "Review of [redacted]," dated May 9, 2007
- NCS-2007-093, "[redacted]," dated May 10, 2007
- NCS-2007-080, "[redacted] Safety Basis," dated May 10, 2007
- NCS-2007-079, "[redacted]," dated April 19, 2007
- NCS-2007-050, "[redacted]," dated March 26, 2007

b. Observations and Findings

The inspectors reviewed NCS Approvals, 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 subcriticality 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. Nuclear criticality safety analyses and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits.

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 followed-up on recent NCS-related events including Event Number 43389 that occurred on May 24, 2007, and was reported to the NRC on May 25, 2007. The inspectors discussed the events with licensee staff and reviewed selected aspects of the following documents:

- NCS-2007-115, "Safety [redacted]," dated May 25, 2007
- NCS-2006-010, "[redacted] dated January 18, 2006
- NCS-2001-316, "NCS Evaluation for SER [Safety Evaluation Report] 01-130," dated October 26, 2001
- NCS-2001-139, "Additional Controls [redacted]," dated May 15, 2001
- NCS-2007-020, "Nuclear Criticality Safety [redacted]" dated February 8, 2007
- NCS-1993-109, "[redacted]," dated June 17, 1993
- NCS-1983-033, "[redacted]," dated August 8, 1983
- NCS-2002-187, "Comparison Calculations [redacted]," dated August 29, 2002
- NCS-2002-092, "[redacted]," dated April 11, 2002
- OP-0021001, "Operating Procedure for [redacted]," Revision 41, undated
- NCS-2007-076, "[redacted] Safety Basis Investigations," Revision 1, dated May 8, 2007
- NCS-2007-080, "[redacted] Safety Basis Investigation," dated May 10, 2007
- NCS-2007-059, "[redacted]," dated March 22, 2007

b. Observations and Findings

On May 24, 2007, an operator was using a crane to place a fixture holding [redacted] into an unfavorable geometry tank containing an acid solution. The licensee stated that after lining up the fixture inside the tank, the operator lowered the fixture into the solution. The licensee stated that one of the [redacted] drifted outside the base of the fixture, caught an edge inside the acid tank, and jarred the fixture causing [redacted] to fall out of the fixture and into the tank. The operator immediately opened the water rinse valve and initiated a manual dump of the acid solution. The event (EN-43389) was reported to the NRC within 24 hours.

[redacted]

The inspectors noted that the accident sequence was analyzed in the ISA and two IROFS were credited. IROFS 1 was an automated valve that would dump the acid solution from the tank if the [redacted] were left in the tank for more than [redacted]. IROFS 2 was the fixture limiting the number of [redacted]. The inspectors determined that IROFS 2 should not have been credited for this event since it does not prevent a critical mass from entering the solution. The inspectors also noted another accident sequence in the ISA for the acid tank operations that did not appropriately credit the IROFS. Additional IROFS for acid tank operation were listed in the ISA that were not credited as preventing either of these accident sequences. The inspectors discussed these observations with the NCS staff, and the NCS staff stated that it should have credited the operator following the operating procedure (IROFS 3) for both accident sequences discussed. The inspectors determined that IROFS 3 was an appropriate control for both accident sequences. The inspectors noted that the operator followed procedure throughout the event. The inspectors did not identify any immediate safety concern related to the event.

The licensee determined that requiring operators to positively secure [redacted] to the fixture would be part of corrective actions for the event The licensee committed to revise the ISA to correctly identify the IROFS for the acid tank operations. The licensee's corrective actions for this event and revision of the ISA will be tracked as **Inspector Follow-up Item (IFI) 70-27/2007-203-01**.

The inspectors noted that the licensee's NCS analyses are fragmented in that hundreds of NCS analyses, reviews, and calculations are created and issued as individual documents to create the safety basis. This fragmentation makes it difficult for licensee staff to identify which controls are actually being relied to prevent accident sequences and correctly describe those controls in the ISA. The inspectors noted that the licensee has broader analysis documented in some process areas such as uranium recovery but no overall effort is planned to consolidate NCS analysis by plant or process areas such as those areas defined by the licensee audit program. The inspectors note that, without some consolidation of the NCS analyses, issues will continue to arise related to describing IROFS in the ISA and appropriately crediting the IROFS for accident sequences. The inspectors did not identify any immediate safety concern regarding the fragmented NCS analyses.

c. Conclusions

A weakness was identified in the ISA, which did not correctly identify the IROFS for specific accident sequences.

[redacted]

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 reviewed selected aspects of the following document:

- NCS-2007-089, "NCS Violations & Observation Summary—1st Quarter 2007," dated May 30, 2007

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.

c. Conclusions

No safety concerns were noted regarding NCS audits.

5.0 Criticality Warning System (IP 88017)

a. Inspection Scope

The inspectors reviewed licensee evaluation of criticality warning system (CWS) coverage for the Lynchburg Technology Center (LTC). The inspectors reviewed selected aspects of the following documents:

- NCS-2004-202, "New Range for Criticality Detector Coverage," dated July 27, 2004
- NCS-2004-204, "[redacted]," dated July 28, 2004
- NCS-2004-278, "NCS Analysis for Modification [redacted] Criticality Detectors: SER 05-007 Phase 1," dated February 8, 2005

b. Observations and Findings

During a walkdown of the LTC, the inspectors noted the placement of the criticality monitors for the facility. The inspectors noted that the monitors were placed on the [redacted] as described in NCS-2004-278. The inspectors did not observe anything that would challenge the detector placement limits stated in NCS-2004-202. The inspectors did not identify any safety concerns regarding CWS coverage at the LTC.

c. Conclusions

No concerns were noted regarding CWS coverage at the LTC.

6.0 Plant Operations (IP 88015)

a. Inspection Scope

The inspectors performed plant walkdowns to review activities in progress and to determine whether risk-significant [redacted] material operations were being conducted safely and in accordance with regulatory requirements. The inspectors verified the adequacy of management measures for assuring the continued availability, reliability, and capability of safety-significant controls relied upon by the licensee for controlling criticality risks to acceptable levels.

b. Observations and Findings

The inspectors performed walkdowns of the acid tank area, the shop floors, the [redacted]. The inspectors verified that controls identified in NCS analyses were installed or implemented and were adequate to ensure safety. The inspectors observed that NCS engineers were knowledgeable in assigned process operations and appeared to have frequent interactions with operators associated with those operations.

c. Conclusions

With the exception of a concern noted previously regarding correct identification of an IROFS for a specific accident sequence, no safety concerns were noted regarding plant operations.

7.0 Open Item Review

IFI 70-27/2006-204-03

This item tracks the licensee's commitment to revise [redacted] drain procedures, replace the condensate [redacted] and complete corrective actions. During a previous inspection, the inspectors observed that the [redacted] connected to the ventilation ductwork of the [redacted] was so discolored that it was not possible to see the presence of liquid inside it. The inspectors determined that the condition of the [redacted] rendered observation of the level (or even presence) of the condensate impossible. The licensee stated that it would (1) replace the [redacted] with one that clearly allows operators to view the level of condensate, and (2) update the operating procedure. The licensee stated during a previous inspection that the [redacted] had been replaced, but due to the nature of the process it rapidly discolored. The licensee had also identified [redacted] that perform a similar function. During this inspection, the inspectors determined that the licensee has updated the operating procedure for all [redacted] so that a visual inspection is no longer relied upon. This item is closed.

IFI 70-27/2007-202-01

This item tracks the licensee's commitment to revise the ISA and ISA Summary to correctly identify the IROFS limiting the height of [redacted] storage chest. During a previous inspection, the inspectors noted that the IROFS was identified as passive engineered IROFS in the ISA and as an administrative IROFS in NCS analysis. During this inspection, the inspectors determined that the licensee had performed an NCS evaluation (NCS-2007-112) for the accident sequence and made the appropriate revisions to the ISA and ISA Summary. This item is closed.

VIO 70-27/2007-202-02

This item tracks the failure to implement a passive engineered (PE) control on a storage [redacted] that limited a specified parameter in the NCSE. During a previous inspection, the inspectors noted that a storage [redacted] in the [redacted] had less than the required spacing between the [redacted]. The [redacted] design feature to limit spacing between [redacted] was listed as a PE IROFS in the ISA and the limit was used as an assumption in the NCSE for the [redacted] At the time the violation was discovered, the licensee took immediate corrective actions [redacted] to meet the required spacing limits. This event and similar non-compliances were attributed, in part, to the pre-operational NCS release process that was in effect until 1995 that was less rigorous than the current process. The licensee committed in its response to the Notice of Violation (NOV) on April 12, 2007 to the following:

1. All PEs that do not have a specifically documented NCS release or are not controlled by an ongoing release process will have a field verification performed and a new NCS release documented.

2. For PEs with an NCS release dated prior to 1997 listed in the Safety Analysis Report (SAR), the NCS release will be reviewed to determine if the release documents a line-by-line verification of the physical requirements. If not, a field-verification will be performed and a new NCS release documented.

The licensee stated that it will complete these actions by October 31, 2007, and the inspectors verified that this was entered into its corrective action program. This item is closed.

8.0 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 8, 2007. The licensee acknowledged and understood the findings as presented.

[redacted]

SUPPLEMENTARY INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Items Opened

IFI 70-27/2007-203-01	Tracks the licensee's corrective actions for the dropping of [redacted] SNM [redacted] into an acid tank, including a commitment to revise the ISA to correctly identify the IROFS for the acid tank.

Items Closed

IFI 70-27/2006-204-03	Tracks the licensee's commitment to revise [redacted] drain procedures, replace the condensate [redacted], and complete corrective actions.
IFI 70-27/2007-202-01	Tracks the licensee's commitment to revise the ISA and ISA Summary to correctly identify the IROFS limiting the height of [redacted] storage chest.
VIO 70-27/2007-202-02	Failure to implement a passive engineered control on a storage [redacted] that limited a specified parameter in the NCSE.

2.0 Inspection Procedures Used

IP 88015	Nuclear Criticality Safety Program
IP 88016	Nuclear Criticality Safety Evaluations and Analyses
IP 88017	Criticality Alarm Systems

3.0 Partial List of Persons Contacted

BWXT

D. Faidley	Nuclear Criticality Safety
L. Wetzel	Nuclear Criticality Safety
J. Dougherty	Licensing
S. Schilthelm	Manager, Safety and Licensing
J. Creasey	Department Manager Uranium Processing
J. Burch	Department Manager Operations

NRC

D. Morey	Senior Criticality Safety Inspector, NRC HQ
B. Purnell	Criticality Safety Inspector, NRC HQ
G. Wertz	Senior Resident Inspector, NRC Region II

Attachment

[redacted]

[redacted]

4.0 List of Acronyms

BWXT	BWX Technologies, Inc. (Licensee)
CWS	criticality warning system
HEU	high-enriched uranium
[redacted]	[redacted]
IFI	inspector follow-up item
IP	inspection procedure
IROFS	item relied on for safety
ISA	integrated safety analysis
LEU	low-enriched uranium
LTC	Lynchburg Technology Center
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NOV	Notice of Violation
PE	passive engineered
[redacted]	[redacted]
SAR	Safety Analysis Report
SCA	Safety Concern Analysis
SER	Safety Evaluation Report
SNM	Special Nuclear Material
[redacted]	[redacted]
VIO	violation

[redacted]