[redacted]

November 16, 2005

Mr. W. D. Nash, General Manager
BWX Technologies, Inc.
P.O. Box 785
Lynchburg, VA 24505-0785

SUBJECT: INSPECTION REPORT 70-27/2005-205

Dear Mr. Nash:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced nuclear criticality safety (NCS) inspection at your facility in Lynchburg, Virginia, from October 17 through October 21, 2005. 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 October 21, 2005. The inspection observations and findings were discussed with you and 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 function 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 related NCS controls. Throughout this inspection, observations were discussed with your managers and staff.

[redacted]

[redacted]

If you have any questions concerning this report, please contact Natreon Jordan, of my staff, at (301) 415-7648.

Sincerely,

/RA/ Frederick Burrows for

Melanie A. Galloway, Chief
Technical Support Group
Division of Fuel Cycle Safety
and Safeguards

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

Enclosure: Inspection Report 70-27/2005-205

cc: L. Morrell
Licensing Officer
BWX Technologies

If you have any questions concerning this report, please contact Natreon Jordan, of my staff, at (301) 415-7648.

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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.:	70-27/2005-205
Licensee:	BWX Technologies, Inc.
Location:	Lynchburg, VA
Inspection Dates:	October 17 - 21, 2005
Inspectors:	Lawrence Berg, Criticality Safety Inspector, NRC Headquarters Natreon J. Jordan, Criticality Safety Inspector, NRC Headquarters
Approved by:	Melanie A. Galloway, Chief Technical Support Group Division of Fuel Cycle Safety and Safeguards

Enclosure

[redacted]

[redacted]

EXECUTIVE SUMMARY

BWX Technologies, Inc.
NRC Inspection Report 70-27/2005-205

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 October 17 through 21, 2005. The inspection included an on-site review of the licensee programs dealing with the NCS program, inspections, audits, and investigations, and plant operations. The licensee programs were acceptably directed toward the protection of public health and safety and in compliance with NRC requirements. The inspection focused on risk-significant [redacted] material processing activities including fuel fabrication and machining, [redacted] areas, the Uranium Recovery Area, [redacted], and machining operations.

Results

- No safety concerns were noted during the inspection.
- Nuclear criticality safety analyses and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits. The NCS program as observed was adequate for maintaining acceptable levels of safety.
- NCS quarterly audits were adequate for maintaining acceptable levels of safety.
- Plant operations involving [redacted] materials were conducted safely and in accordance with written procedures.

[redacted]

REPORT DETAILS

1.0 NCS Program (88015)

a. Inspection Scope

The inspectors reviewed NCS analyses to determine that criticality safety of risk-significant operations was assured through engineered and human performance (controls) with adequate safety margin/certainty, preparation, and review by capable staff. The inspectors reviewed selected aspects of the following documents:

- NCS-2003-104, "NCS Analysis [redacted]: SER 03-035," dated August 7, 2003
- NCS-2005-211, "NCS Analysis [redacted]: SER 03-035 Phase 2 [redacted]," dated August 10, 2005
- NCS-2005-239, "NCS Analysis [redacted]Revision of SER 03-035 Phase 2 and 3 [redacted]" dated September 15, 2005
- NCS-2005-249, "Area of Applicability Demonstration [redacted]dated September 29, 2005
- NCS-2005-246, "NCS Analysis [redacted]: Revision of SER 03-035 Phase 2 [redacted]," dated September 21, 2005
- NCS-2005-009, "NCS Analysis Supporting All Phases of SER 04-060, [redacted]" dated February 8, 2005
- NCS-2005-238, "NCS Analysis Supporting Phase 1 of SER 05-035, [redacted]" dated September 9, 2005
- NCS-2005-267, "Nuclear Safety Release[redacted]SER 03-035 Phase 3," dated October 19, 2005

b. Observations and Findings

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, that subcriticality of the systems and operations was assured through appropriate limits on controlled parameters, and that double contingency was assured for each credible accident sequence leading to inadvertent criticality. The inspectors determined that NCS controls for equipment and processes assured the safety of the operations.

c. Conclusions

Nuclear criticality safety analyses and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits. The NCS program as observed was adequate for maintaining acceptable levels of safety.

2.0 Inspections, Audits, and Investigations (88015)

a. Inspection Scope

The inspectors reviewed results of the most recent NCS quarterly audits to assure that appropriate issues were identified and resolved. The inspectors reviewed selected aspects of the following documents:

- NCS-2005-194, "NCS Finding & Observation Summary - 2nd Quarter 2005," dated July 28, 2005
- NCS-2005-268, "NCS Finding & Observation Summary - 3rd Quarter 2005," dated October 10, 2005 (draft)
- NCS-2005-258, "Thirty Day Report to the General Manager," dated October 10, 2005

b. Observations and Findings

The inspectors observed that the licensee NCS audits were conducted in accordance with written procedures. The inspectors noted that the audits were performed by NCS engineers who: (1) reviewed open NCS issues from previous audits; (2) reviewed the adequacy of control implementation; (3) reviewed plant operations for compliance with license requirements, procedures, and postings; and (4) examined equipment and operations to determine that past evaluations remained adequate. No safety concerns were noted.

c. Conclusions

NCS quarterly audits were adequate for maintaining acceptable levels of safety.

3.0 Plant Operations (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. The inspectors performed walkdowns of fuel fabrication and machining, [redacted] areas, Uranium Recovery Area, [redacted] process areas, and machining areas. The inspectors reviewed selected aspects of the following documents prior to performing the walkdowns:

- NCS-2003-104, "NCS Analysis [redacted]: SER 03-035," dated August 7, 2003

- NCS-2005-211, "NCS Analysis [redacted] SER 03-035 Phase 2 [redacted]," dated August 10, 2005
- NCS-2005-239, "NCS Analysis [redacted]: Revision of SER 03-035 Phase 2 and 3 [redacted]" dated September 15, 2005
- NCS-2005-246, "NCS Analysis [redacted]: Revision of SER 03-035 Phase 2 [redacted]" dated September 21, 2005
- NCS-2005-009, "NCS Analysis Supporting All Phases of SER 04-060, [redacted]" dated February 8, 2005
- NCS-2005-238, "NCS Analysis Supporting Phase 1 of SER 05-035, [redacted]" dated September 9, 2005
- NCS-2005-267, "Nuclear Safety Release [redacted] SER 03-035 Phase 3," dated October 19, 2005

b. Observations and Findings

The inspectors verified that controls identified in NCS analyses were installed or implemented and were adequate to assure safety. The cognizant NCS engineers were knowledgeable and had good interfaces with operators on the process floors. No safety issues were identified during the walkdowns.

c. Conclusions

Plant operations involving [redacted] materials were conducted safely and in accordance with written procedures.

4.0 Open Item Review

VIO 70-27/2005-203-01

This item concerned the licensee's failure to document in nuclear criticality safety analyses that risk of criticality was identified and minimized in process ventilation systems other than in the Uranium Recovery Area. During inspection 70-27/2005-203, the inspectors had determined that the licensee could not demonstrate with existing documentation that it had analyzed the dry process ventilation systems and minimized the risk of [redacted] material accumulation. During this inspection, the inspectors reviewed the status of the licensee's corrective actions, including documentation of the criticality safety basis of balance of plant ventilation systems. The inspectors noted that the licensee had drafted a criticality safety evaluation to cover the balance of plant areas. The inspectors discussed the draft with the licensee, and determined that the approach taken by the licensee was reasonable. As committed to by the licensee in its August 29, 2005, response to the violation, the final evaluation will be completed by December 31, 2005. This item remains open.

IFI 70-27/2005-203-02

This item tracked the licensee's reevaluation of access restrictions on future external NCS auditors. During inspection 70-27/2005-203, the inspectors had observed that the

external auditor had been excluded from one area of the plant where criticality safety controls were used to mitigate risk of inadvertent criticality. During this inspection, the inspectors noted that the licensee had annotated the external audit file to include a note to ensure adequate planning time for arranging future external auditor [redacted] where criticality risks exist. The inspectors discussed the licensee's expectations for future audits and determined that the selection of plant areas for review by the external auditors would not be [redacted]. This item is closed.

IFI 70-27/2005-202-03

This item tracked review of non-benchmark quality validation cases to determine and analyze experimental uncertainties. During inspection 70-27/2005-202, the inspectors had noted that several of the cases with the highest and lowest k_{eff} values consisted of poorly described configurations for which experimental uncertainties were not readily available. In response to the inspectors' questions, the licensee stated that establishing the pedigree of validation cases, including use of poorly described configurations and the uncertainties associated with them was in progress at the time of the inspection. During the current inspection, the licensee indicated that the review would be complete by March 15, 2006. This item remains open.

IFI 70-27/2005-202-04

This item tracked examination of individual subsets of data to determine localized bias trends (including reason for low k_{eff} values). During inspection 70-27/2005-202, the inspectors had noted an unusually large spread in the calculated k_{eff} values, ranging from [redacted] which was approximately the same magnitude as the margin of subcriticality. During the current inspection, the inspectors reviewed the results from the licensee's examination of individual subsets of data. The licensee determined (NCS-2005-249, "Area of Applicability Demonstration for [redacted]," dated September 29, 2005) separate k_{eff} limits for each of the [redacted] benchmark sets, each geometry type, and each enrichment range [redacted] The licensee also determined separate k_{eff} limits for [redacted] different groups of benchmarks, [redacted]. The licensee concluded that its non-parametric method for determining the upper safety limit (USL) (based on the lowest calculated k_{eff}) was sufficient to bound any localized bias effects for [redacted] the subsets. The inspectors noted that the USLs obtained from two of the subsets appeared to be lower than the USL obtained from the entire data set. The inspectors discussed the documented justification with the licensee and determined that further NRC review of the data was necessary to evaluate whether the conclusions were statistically acceptable. In addition, the staff notes that the purpose of examining the subsets of data included determining the reason for large positive and negative bias values. Because the licensee is still evaluating this issue as part of its response to IFI 70-27/2005-202-03, and because more NRC review is needed to evaluate the report's conclusions, this item remains open.

5.0 Exit Meeting

The inspectors presented the inspection scope and results to members of the licensee's management and staff during an exit meeting on October 21, 2005. The licensee acknowledged and understood the findings as presented.

[redacted]

SUPPLEMENTARY INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Opened

None

Closed

IFI 70-27/2005-203-02	Tracks the reevaluation [redacted] on the external NCS auditor.

Discussed

VIO 70-27/2005-203-01	Reviewing non-benchmark quality validation cases; determining and analyzing experimental uncertainties.
IFI 70-27/2005-202-03	Reviewing non-benchmark quality validation cases; determining and analyzing experimental uncertainties.
IFI 70-27/2005-202-04	Examining individual subsets of data to determine localized bias trends (including reason for low k_{eff} values).

2.0 Inspection Procedures Used

IP 88015	Headquarters Nuclear Criticality Safety Program

Attachment

[redacted]

3.0 Partial List of Persons Contacted

BWXT

* W. Nash	General Manager
* L. Duncan	Manager, Nuclear Criticality Safety
* L. Morrell	Manager, Licensing
S. Schilthelm	Manager, Safety and Licensing
D. Ward	Manager, Environment, Safety, Health, and Safeguards
*R. Cochrane	Manager, Operations
L. Wetzel	NCS Engineer

NRC

*L. Berg	Criticality Safety Inspector
*N. Jordan	Criticality Safety Inspector
*G. Wertz	Senior Resident Inspector

*Participated in the exit meeting on October 21, 2005.

4.0 List of Acronyms

BWXT	BWX Technologies, Inc.
IFI	inspector follow-up item
IP	inspection procedure
LEU	low-enriched uranium
NCS	nuclear criticality safety
NRC	U.S. Nuclear Regulatory Commission
ROA	range of applicability (also referred to as area of applicability)
SCALE	standardized computer analyses for licensing evaluation
SNM	special nuclear material
VIO	violation