May 7, 2010

Mr. Dave Amerine
President
Nuclear Fuel Services, Inc.
P.O. Box 337, MS 123
Erwin, TN 37650

SUBJECT: INSPECTION REPORT NO. 70-143/2010-202

Dear Mr. Amerine:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your facility in Erwin, Tennessee, from April 5- 9, 2010. The purpose of the inspection was to determine whether activities involving licensed materials were conducted safely and in accordance with NRC requirements. Inspection observations were discussed with your management and staff throughout this inspection and at the exit meeting which was held on April 9, 2010.

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 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 nuclear criticality safety (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.

In accordance with Title 10 of the Code of Federal Regulations 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be available in the public electronic reading room of the NRC's Agency-Wide Documents 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 Thomas Marenchin, of my staff, at (301) 492-3209.

Sincerely,

/RA/
Patricia A. Silva, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-143
License No.: SNM-124

Enclosure: Inspection Report 70-143/2010-202

If you have any questions concerning this report, please contact Thomas Marenchin, of my staff, at (301) 492-3209.

Sincerely,

/RA/
Patricia A. Silva, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-143
License No.: SNM-124

Enclosure: Inspection Report 70-143/2010-202

DISTRIBUTION:
FCSS r/f CPayne, RII MCrespo, RII KMcCallie, RII
KRamsey, FMB

ML101120982

INDICATE IN BOX: "E"=COPY W/ATT/ENCL; "C"=COPY W/O ATT/ENCL; "N"=NO COPY				
OFFICE	FCSS/TSB	FCSS/TSB	FCSS/TSB	FCSS/TSB
NAME	TMarenchin	CFisher	PJenifer	PSilva
DATE	4/23/10	4/27/10	4/28/10	5/07/10

OFFICIAL RECORD COPY

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

Docket No.:	70-143
License No.:	SNM-124
Report No.:	70-143/2010-202
Licensee:	Nuclear Fuel Services, Inc. (NFS)
Location:	Erwin, Tennessee
Inspection Dates:	April 5–9, 2010
Inspector:	Thomas Marenchin, Criticality Safety Inspector Christian Fisher, Criticality Safety Inspector
Approved by:	Patricia A. Silva, Chief Technical Support Branch Division of Fuel Cycle Safety and Safeguards Office of Nuclear Material Safety and Safeguards

Enclosure

EXECUTIVE SUMMARY

Nuclear Fuel Services, Inc.
NRC Inspection Report No. 70-143/2010-202

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of NFS License Number SNM-124, in Erwin, Tennessee, facility from April 5-9, 2010. The inspection included an on-site review of the licensee programs involving the NCS program, NCS audits, internal NCS event review and follow-up, criticality alarm system, plant operations, and open items. The inspection focused on risk-significant fissile material processing activities including the blended low-enriched uranium processing facility (BPF), and high-enriched uranium (HEU) fuel fabrication.

Results

- No safety concerns were identified regarding implementation of the NCS program.
- No safety concerns were identified regarding the licensee's NCS audits.
- No safety concerns were identified regarding the licensee's internal NCS event review and follow-up.
- No safety concerns were identified regarding the licensee's criticality alarm system.
- No safety concerns were identified regarding the licensee's plant operations.

REPORT DETAILS

1.0 Plant Status

NFS (License Number SNM-124) produces uranium oxides from low-enriched uranium liquid, HEU fuel fabrication, conducts routine ammonia recovery process, downblending, uranium recovery, remediation, and decommissioning operations, and liquid waste treatment at its Erwin, Tennessee site. During the inspection, NFS was performing limited aspects of fuel fabrication, the BPF was shutdown, and the CD Line area was shutdown.

2.0 Nuclear Criticality Safety Program (IP 88015, 88016)

a. Inspection Scope

The inspector reviewed Nuclear Criticality Safety Evaluations (NCSE) 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 inspector reviewed selected aspects of the following documents:

- NCS-07-01, "Nuclear Criticality Safety Evaluation for the Dissolution of Uranium and High Enriched Uranium Storage Columns," Revision 14, dated January 14, 2010
- NCS-08, "Nuclear Criticality Safety Analysis of the ES-3100 Shipping Package," Revision 1, dated April 1, 2010
- NCS-03-02-16, "Nuclear Criticality Safety Analysis for Area A of the Uranium Recovery," Revision 0, dated August 13,1999
- NCS-03-02-18, "Nuclear Criticality Safety Analysis for Area C of the Uranium Recovery Facility," Revision 1, dated August 13,1999
- NCS-03-02-14, "Nuclear Criticality Safety Analysis for Prevention of Inadvertent Solution Backflow from the PFF to Unfavorable Geometry Equipment of the Bulk Chemical Supply," Revision 1, dated April 28, 1999
- NCS-03-01, "Nuclear Criticality Safety Evaluation of the Check Weighing Areas," Revision 1, dated February 5, 2010
- NCS-03-04-01, "Nuclear Criticality Safety Evaluation Packaging of Finished and Semi-Finished Fuel Samples," Revision 0, dated December 14, 1999
- NCS-07-10, "NCSE for the BPF U-Aluminum Dissolution," Revision 12, dated April 6, 2010
- NFS-GH-913, "Nuclear Criticality Safety Program," Revision 2, dated February 27, 2004
- NFS-HS-A-58, "Nuclear Criticality Safety Evaluations," Revision 11, dated March 27, 2009
- NFS-HS-A-62, "Implementation of Nuclear Criticality Safety Evaluations," Revision 5, dated September 16, 2009
- NFS-HS-A-68, "ISA Risk Assessment Procedure," Revision 4, dated October 26, 2007
- NFS-HS-CL-10-10, "Nuclear Criticality Safety Building 302, 304, 306 – General Stations," Revision 22, dated December 19, 2008
- NFS-HS-CL-16-01, "Nuclear Criticality Safety 105/302/303 Laboratory Sample Receiving," Revision 10, dated July 16, 2007

b. Observations and Findings

The inspectors determined that NCSEs 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. NCS 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 the NCS program.

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

a. Inspection Scope

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

- NCS-2010-01, "Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Analysis for Area C of the Uranium Recovery Facility," 5th Audit, dated January 12, 2010
- NCS-2010-02, "Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Evaluation for the BPF Uranium Metal Sampling and the Uranium Shear System," 4th Audit, dated January 12, 2010
- NCS-2010-03, "Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Analysis for the Loading, Handling and Storage of 55 Gallon Drums with Low-Level Solid SNM Trans and the Storage of 55 Gallon Drums of Low-Level Solution," 5th Audit, dated January 12, 2010
- NCS-2010-04, "Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Analysis for Normal 6-Inch Borosilicate Glass Columns," 5th Audit, dated February 8, 2010
- NCS-2010-05, "Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Evaluation for hardened Access Control Point," 3rd Audit, dated February 10, 2010
- NCS-2010-06, "Nuclear Criticality Safety Audit: Area B (Building 302 and Building 303) of the Production Fuel Facility," 5th Audit, dated February 15, 2010
- NFS-HS-A-16, "Safety Audits and Inspections," Revision 11, dated June 9, 2009

b. Observations and Findings

The inspectors observed that the licensee's 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 the adequacy of control implementation; reviewed plant operations for compliance with license requirements, procedures, and postings; and examined equipment and operations to determine that past evaluations remained adequate. Any deficiencies identified within

NCSEs and operating procedures were appropriately captured in the licensee corrective action program and resolved in a timely manner. The inspectors had no safety concerns regarding the identification, assignment and tracking of corrective actions.

c. Conclusions

No safety concerns were identified regarding the licensee's NCS audits.

4.0 Nuclear Criticality Safety Event Review and Follow-up (IP 88015)

a. Inspection Scope

The inspectors reviewed the licensee's response to internally-reported events. The inspectors reviewed the progress of investigations and interviewed licensee staff regarding immediate and long-term corrective actions. The inspectors reviewed selected aspects of the following documents:

- PIRCS [Problem Identification, Resolution, and Corrective System] #23221, dated December 11, 2009
- PIRCS #22451, dated December 11, 2009
- PIRCS #22781, dated January 12, 2010
- PIRCS #22782, dated January 12, 2010
- PIRCS #22789, dated January 12, 2010
- PIRCS #23051, dated January 26, 2010
- PIRCS #23052, dated January 26, 2010
- PIRCS #23096, dated January 29, 2010
- PIRCS #23220, dated February 5, 2010
- PIRCS #23221, dated February 5, 2010
- PIRCS #23354, dated February 17, 2010
- PIRCS #23434, dated February 23, 2010
- PIRCS #23221, dated February 5, 2010

b. Observations and Findings

The inspectors reviewed selected licensee internally-reported events. The inspectors observed that internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned. The inspectors had no safety concerns regarding licensee reporting, investigation, and correction of internal NCS related events.

c. Conclusions

No safety concerns were identified during a review of recent licensee investigation of internal events.

5.0 Criticality Alarm Systems (IP 88017)

a. Inspection Scope

The inspectors reviewed documentation of criticality accident alarm detector coverage, interviewed engineering staff, and performed facility walkdowns to determine the adequacy of the licensee criticality alarm system. The inspectors reviewed selected aspects of the following documents:

- PIRCS #22569, dated December 13, 2009
- PIRCS #22640, dated December 14, 2009
- PIRCS #23310, dated February 12, 2010
- PIRCS #23389, dated February 30, 2010
- 21T-10-0274, SYS-50-16-02, NFS-H-A-21, "Operation and Testing of Criticality, Fire and CO_2 Alarm System," Revision 29, dated April 1, 2010.

b. Observations and Findings

The inspectors reviewed selected licensee internally-reported events and discussed them with the engineering staff that dealt with the criticality alarm system. This was done to ensure that appropriate corrective actions had taken place. The inspectors also performed facility walkdowns to observe the detector readout in Building 105, and to observe several detectors in the facility.

c. Conclusions

No safety concerns were identified during a review of the licensee's criticality accident alarm system.

6.0 Plant Activities (IP 88015)

a. Inspection Scope

The inspectors performed plant walkdowns of the BPF, fuel fabrication, solvent extraction, CD Line, the Laboratory, Building 105, 333, and 440 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:

- NFS-HS-CL-10-10, "Nuclear Criticality Safety Building 302, 304, 306 – General Stations," Revision 22, dated December 19, 2008
- NFS-HS-CL-16-01, "Nuclear Criticality Safety 105/302/303 Laboratory Sample Receiving," Revision 10, dated July 16, 2007

b. Observations and Findings

The inspectors verified that controls identified in NCS analyses were installed or implemented and were adequate to ensure safety. The inspectors also verified that

safety was maintained for observed facility operations. The cognizant NCS engineers were knowledgeable and interacted regularly with operators on the process floors. 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.

c. Conclusions

No safety concerns were identified during plant walkdowns.

7.0 Open Item Review

IFI 70-143/2009-207-01

This item concerns the licensee's demonstration of applicability of, and compliance with the License Application, Section 4.2.1.9. During a pervious inspection the inspectors observed, in their review of the revised BPF U-Aluminum Dissolution NCSE, that the licensee stated it was no longer required to perform inspections of borosilicate glass columns in this area, allowing the columns to be reclassified as configuration controlled equipment (CCE) rather than safety-related equipment. The inspectors reviewed the memorandum that justified this, dated February 6, 2009. The BPF processes still place reliance on the borosilicate glass, but no longer require an annual inspection of the glass thickness based on examinations of inspection data taken from 2006 to 2009, consisting of 220 tests with 3520 individual glass thickness measurements (taken at many different axial and radial locations along and around each column). The inspectors reviewed this data and the licensee's evaluation thereof, and concluded that the data did adequately demonstrate there was no measurable thinning of the glass over this time, justifying their reclassification as CCE.

The inspectors determined that the stated specifications for the borosilicate glass (i.e., in the U-Aluminum Dissolution NCSE) include NCS limits on the B_2O_3 content and ^{10}B enrichment, as well as the glass thickness. Therefore, it appears that reliance is being placed on both the inner diameter and the material properties of the glass columns, even if only partial credit for boron is needed to demonstrate subcriticality, which would mean that this section of the application does apply. The inspectors determined, however, that the failure to do inspections has at most minor safety significance, because of the large margin inherent in facility calculations, and because the licensee's inspection data convincingly demonstrate the lack of any measurable thinning of the glass over time. In fact, there is no foreseeable credible mechanism that could reduce the glass thickness by the 50% required to exceed the upper subcritical limit. Therefore, there is no safety concern with the discontinuation of glass column inspections (as long as current chemical conditions in this area are maintained). The licensee has committed that it would complete its evaluation of the applicability of the License Application, Section 4.2.1.9, and justifies how it is meeting the license requirements, by June 30, 2010.

During this inspection the inspectors discussed with the licensee's staff the progress of the evaluation on the applicability of the License Application, Section 4.2.1.9, and justification of how it is meeting the license requirements for the U-Aluminum Dissolution NCSE. The licensee's staff indicated that they were continuing to work on the evaluation and were still planning to meet the commitment of completing the evaluation by June 30, 2010. This item remains open.

8.0 Exit Meeting

The inspectors presented the inspection results to members of the licensee's management and staff during an exit meeting on April 9, 2010. 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

None

Items Discussed

IFI 70-143/2009-207-01 Tracks the Licensee's demonstration of applicability of, and compliance with License Application Section 4.2.1.9.

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 Key Points of Contact

Nuclear Fuel Services, Inc.

M. Elliott	Director, Safety & Security
D. Gardner	Licensing
N. Kenner	Director, Human Performance & Learning
T. Lindstrom	Vice President, Operations
R. Maurer	Engineer, NCS
M. Moore	Senior Regulatory Adviser
J. Nagy	CNSO
J. Perkins	Acting Manager, Q&A
S. Sanders	Training Manager
R. Shackelford	Manager, Nuclear Safety & Licensing
M. Teoten	Senior Manager, Radiological Control

NRC

C. Fisher	Criticality Safety Inspector, NRC Headquarters
T. Marenchin	Criticality Safety Inspector, NRC Headquarters

All attended the exit meeting on April 9, 2010.

4.0 List of Acronyms and Abbreviations

BPF	blended low-enriched uranium preparation facility
CCE	configuration controlled equipment
HEU	high-enriched uranium
IP	inspection procedure
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NFS	Nuclear Fuel Services, Inc. (licensee)
PIRCS	Problem Identification, Resolution, and Corrective System
Q&A	Quality Assurance
SNM	Special Nuclear Material