April 13, 2012

Mr. Joseph G. Henry
President
Nuclear Fuel Services, Inc.
P. O. Box 337, MS 123
Erwin, TN 37650

SUBJECT: INSPECTION REPORT NO. 70-143/2012-201

Dear Mr. Henry:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine, announced criticality safety inspection at your facility in Erwin, Tennessee, from March 26-29, 2012. The purpose of the inspection was to determine whether activities involving licensed materials were conducted safely and in accordance with NRC's requirements. Inspection observations were discussed with your management and staff throughout this inspection, and at the exit meeting which was held on March 29, 2012.

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. Based on the inspection, your activities involving nuclear criticality hazards were found to be conducted safely and in accordance with regulatory requirements.

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 Agencywide 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 at (301) 492-3209, or via email to Thomas.Marenchin@nrc.gov.

Sincerely,

/RA/

Thomas G. Hiltz, 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 70-143/2012-201

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Enclosure:
Inspection Report 70-143/2012-201

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

Docket No.:	70-143
License No.:	SNM-124
Report No.:	70-143/2012-201
Licensee:	Nuclear Fuel Services, Inc.
Location:	Erwin, TN
Inspection Dates:	March 26-29, 2012
Inspector:	Thomas Marenchin, Criticality Safety Inspector Timothy Sippel, Criticality Safety Inspector
Approved by:	Thomas G. Hiltz, 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. 70-143/2012-201

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine, announced nuclear criticality safety (NCS) inspection of the Nuclear Fuel Services, Inc., (NFS) facility, License Number SNM-124, in Erwin, Tennessee, from March 26-29, 2012. The inspection included an onsite review of the licensee programs involving the NCS program, NCS audits, internal NCS event review and follow-up, plant operations, and open items. The inspection focused on risk-significant fissile material processing activities, including the blended low-enriched uranium (BLEU) preparation 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 license's plant operations.

REPORT DETAILS

1.0 Plant Status

NFS, License Number SNM-124, produces uranium oxides from low-enriched uranium (LEU) liquid, conducts routine ammonia recovery process and liquid waste treatment at its Erwin, Tennessee site. During the inspection, NFS was performing routine fuel fabrication, and the commercial development line (CDL) area was shutdown.

2.0 Nuclear Criticality Safety Program (IP 88015, 88016)

a. Inspection Scope

The inspectors reviewed Nuclear Criticality Safety Evaluations (NCSEs) and other supporting calculations to determine that criticality safety of risk-significant operations was assured through engineered and human controls with adequate safety margin, and prepared and reviewed by qualified staff. The inspectors reviewed NCS procedures to confirm that the NCS program is being implemented according to the license. The inspectors reviewed selected aspects of the following documents:

- 54T-04-0043, "Validation of the SCALE-PC (Version 4.4a/27-Group) Computer Code Package for Uranium Systems Enriched in the U-235 Isotope (NFS Pentium IV 2400 MHz Personal Computer - Serial No. 702840 Running Windows XP Professional Operating System)," Revision 0, dated May 2004
- 54T-06-0010, "BLEU Complex Uranyl Nitrate Building," Revision 5, dated May 2006
- 54T-11-0002, "Nuclear Criticality Safety Evaluation for the High Security Storage Area in Building 311," Revision 8, January 2011
- 54T-11-0016, "Nuclear Criticality Safety Evaluation for the Dissolution of Uranium and High Enriched Uranium Storage Columns," Revision 16, dated September 2011
- 54T-11-0019, "Nuclear Criticality Safety Evaluation for Cart and Rack use in CDL," Revision 2, dated January 2012
- 54X-11-0007, "Nuclear Criticality Safety Evaluation for Areas 100/200 of the Production Fuel Facility," Revision 4
- 54X-11-0009, "Nuclear Criticality Safety Evaluation for Area C of the Uranium Recovery Facility," Revision 2, dated September 2011
- CEA-97-012, "Uranium Density in Uranium Peroxide Precipitate," dated January 16, 1997
- CFH:03:001, "Supplemental Calculations for the UNB," dated February 24, 2003
- ENG-EPS-A-005, "Engineering Practices and Standards," Revision 1, dated June 7, 2011
- KDB:01:001, "UNH Evaporation Calculation," dated December 3, 2001
- NFS-GH-055, "Conducting and Documenting Integrated Safety Analyses," Revision 6, dated May 25, 2007
- NFS-GH-056, "Management Measure Identification and Implementation," Revision 7, dated March 12, 2010
- NFS-GH-911, "Integrated Safety Analysis (ISA) Program," Revision 5, dated December 20, 2010

- NFS-HS-A-50, "Guidelines for Government Agency Notification," Revision 19, dated July 1, 2011
- NFS-HS-A-58, "Nuclear Criticality Safety Evaluations (NCSE)," Revision 5, 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-A-79, "Identification and Control of Items Relied on For Safety (IROFS) Procedure," Revision 8, dated October 7, 2011
- NFS-HS-A-93, "Nuclear Criticality Safety Posting Procedure," Revision 2, dated February 21, 2012
- NFS-HS-E-02, "Emergency Criticality Evacuation," Revision 37, dated March 11, 2011
- NFS-HS-E-04, "Fire Reporting and Response," Revision 32, dated October 25, 2010
- NFS-HS-E-13, "Emergency Take Cover," Revision 4, dated March 31, 2010
- NFS-HS-E-14, "CO_2 Evacuation Alarm Response and Responsibilities," Revision 10, dated March 11, 2011

b. Observations and Findings

The inspectors determined that, for those NCSEs reviewed, the NCSEs were: performed by qualified NCS engineers, independent reviews of the evaluations were completed by qualified NCS engineers, 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. The inspectors determined that the controls, limits, and postings were based on the NCSEs. The NCSEs and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits. The NCSEs used computer codes that were validated according to procedure. Other aspects of the NCS Program, such as the work request process, were also being implemented by procedure according to the license.

c. Conclusions

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

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

a. Inspection Scope

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

- 21T-11-2618, "NCS Audit of the NCSE for One Tube Cleaning Room of the Production Fuel Facility," dated November 15, 2011

- 21T-11-2759, “NCS Audit of the NCSE for Cart and Rack use in CDL,” dated November 17, 2011
- 21T-11-2765, “NCS Audit of NCSE for Hoke Tube Processing,” dated November 17, 2011
- 21T-11-2785, “NCS Audit of the NCSE for the HEPA Filtered,” dated December 6, 2011
- 21T-11-2791, “NCS Audit of the NCSE of the Waste Drum Storage and the Bechtel Jacobs Shipping Package Storage Areas on the West Side of Building 306 East,” dated December 6, 2011
- 21T-12-0238, “Sixth NCS Audit of the NCSE for the 300 Warehouse and 310 Warehouse,” dated January 26, 2012
- 21T-12-0413, “NCS Audit of the NCSE for Area I of Uranium Recovery,” dated February 15, 2012
- 21T-12-0432, “NCS Audit of the NCSE for BPF Liquid Waste Discard System,” dated February 15, 2012
- 21T-12-0434, “NCS Audit of the NCSE for the 300 Complex and 105 Laboratory Exhaust Ventilation System,” dated February 12, 2012
- 21T-12-0529, “NCS Audit of the NCSE for the BPF Raffinate Solidification System,” dated March 13, 2012

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 events that had occurred and immediate and long-term corrective actions. The inspectors reviewed selected aspects of the following documents:

- Corrective Action Report # 15185, dated April 7, 2011
- Corrective Action Report # 15186, dated April 7, 2011
- Corrective Action Report # 15187, dated April 7, 2011

- Corrective Action Report # 15188, dated April 7, 2011
- Corrective Action Report # 16421, dated November 2, 2011
- Corrective Action Report # 16647, dated December 7, 2011
- Corrective Action Report # 16798, dated January 10, 2012
- Corrective Action Report # 16803, dated January 10, 2012
- PIRCS [Problem Identification, Resolution, and Corrective System] # 32415, dated November 29, 2011
- PIRCS # 32450, dated December 2, 2011
- PIRCS # 32483, dated December 7, 2011
- PIRCS # 32549, dated December 12, 2011
- PIRCS # 32551, dated December 13, 2011
- PIRCS # 32720, dated January 2, 2012
- PIRCS # 32775, dated January 5, 2012
- PIRCS # 32785, dated January 6, 2012
- PIRCS # 32800, dated January 8, 2012
- PIRCS # 32970, dated January 20, 2012
- PIRCS # 33110, dated January 20, 2012
- PIRCS # 33368, dated February 16, 2012
- PIRCS # 33374, dated February 16, 2012
- PIRCS # 33436, dated February 21, 2012
- PIRCS # 33530, dated February 28, 2012
- PIRCS # 33534, dated February 28, 2012
- PIRCS # 33690, dated March 9, 2012
- PIRCS # 33763, dated March 15, 2012
- PIRCS # 33775, dated March 15, 2012
- PIRCS # 33880, dated March 26, 2012
- PIRCS # 33901, dated March 27, 2012

b. Observations and Findings

The inspectors reviewed selected licensee internally reported events and related to criticality safety. The inspectors also interviewed licensee staff concerning some of these events and the tracking and trending of internal events. The inspectors observed that internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned. In many cases the licensee's policies result in 'a low threshold' of reportability for internal events. The licensee produces quarterly tracking and trending reports for internal events related to NCS that include the results of NCS Audits. 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 Plant Activities (IP 88015)

a. Inspection Scope

The inspectors performed plant walkdowns to review activities in progress, the storage of SNM, 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:

- 54T-11-0021, "CDL Sorting and Packing Stations," Revision 1, dated December 2011
- 54T-12-0001, "Control Flowdown and Field Verification for the Dissolution of Uranium and High Enriched Uranium Storage Columns," Revision 15, dated December 2011
- 54X-12-0001, "Control Flowdown and Field Verification for 100/200 in Building 302," Revision 4, dated December 12, 2011
- 54X-12-0003, "Control Flowdown and Field Verification for Area C Uranium Recovery in the FMF," Revision 4, dated December 12, 2011

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.

Some of the aspects that the inspectors selected for review and discussion with licensee staff during interviews were; the ventilation system, including the use of filters, and unfavorable geometry containers. The inspectors had no safety concerns regarding these aspects of the licensee's operations.

c. Conclusions

No safety concerns were identified regarding the licensee's plant operations during walkdowns.

6.0 Open Item Review

IFI 70-143/2011-202-02

This item concerns the commitment to provide a schedule during this NCS inspection for the completion of specific NCSEs that cover Reagents and Utilities. These are two general NCSEs that the licensee is working to split up into more specific analyses.

During a previous inspection the licensee gave a schedule to have the remaining four NCSEs for Area A, B, C, and GHJ, completed by June 30, 2012. The NCSEs are tracked by the licensee under Corrective Action report numbers: 15185, 15186, 15187, and 15188, all dated April 7, 2011. The inspector discussed with the licensee the progress on updating the NCSEs. The licensee stated that the NCSEs for Areas A, B, and C have been completed and the other NCSE is on target to be completed by June 30, 2012. This item remains open.

7.0 Exit Meeting

The inspectors presented the inspection results to members of the licensee's management and staff during an exit meeting on March 29, 2012. 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 70-143/2011-202-02 Tracks the licensee's commitment to update NCSEs for Area A, B, C, and GHJ by June 30, 2012.

2.0 Inspection Procedures Used

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

3.0 Key Points of Contact

NFS

A. Rander	Deputy Engineering Director
S. Barion	Emergency Planning
M. Moore	Manager, Environmental Protection & Industrial Safety
R. Shackelford	Manager, Nuclear Safety & Licensing
J. Nagy	NFS Assurance Director
J. Perkins	Acting Manager, Q&A
R. Droke	Senior Regulatory Advisor
N. Brown	Manager, Nuclear Criticality Safety
M. Elliott	Director, Safety & Security

NRC

T. Marenchin	Criticality Safety Inspector
T. Sippel	Criticality Safety Inspector

All attended the exit meeting on March 29, 2012

4.0 List of Acronyms and Abbreviations

ADU	ammonium diuranate
BLEU	blended low-enriched uranium
BPF	BLEU preparation facility
EPB	Effluent Processing Building
HEU	high-enriched uranium
IP	inspection procedure
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NFS	Nuclear Fuel Services, Inc. (licensee)
NUN	natural uranium nitrate
OCB	Oxide Conversion Building
PIRCS	Problem Identification, Resolution, and Corrective System
Q&A	Quality Assurance
SNM	Special Nuclear Material
UNB	Uranyl Nitrate Building