July 6, 2011

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

SUBJECT: INSPECTION REPORT NO. 70-143/2011-203

Dear Mr. Henry:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your facility in Erwin, Tennessee, from June 6-9, 2011. 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 June 9, 2011.

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, at (301) 492-3209.

Sincerely,

/RA/

Margie Kotzalas, Acting 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 70-143/2011-203

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Sincerely,

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Enclosure:
Inspection Report 70-143/2011-203

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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.:	70-143/2011-203
Licensee:	Nuclear Fuel Services, Inc.
Location:	Erwin, TN
Inspection Dates:	June 6-9, 2011
Inspector:	Thomas Marenchin, Criticality Safety Inspector Tamara Powell, Criticality Safety Inspector
Approved by:	Margie Kotzalas, Acting 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. 70-143/2011-203

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of Nuclear Fuel Services, Inc. (NFS) License Number SNM-124, in Erwin, Tennessee, facility from June 6-9, 2011. 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.
- A minor violation was identified during review of the licensee's criticality alarm system.
- No safety concerns were identified regarding the license's plant operations.

REPORT DETAILS

1.0 Plant Status

NFS produces uranium oxides from low-enriched uranium (LEU) liquid, conducts a routine ammonia recovery process, and treats liquid waste at its Erwin, Tennessee site. During the inspection, NFS was performing routine fuel fabrication. Parts of the BPF were shutdown as was the Commercial Development Line area was shutdown.

2.0 Nuclear Criticality Safety Program (IP 88015, 88016)

a. Inspection Scope

The inspector reviewed Nuclear Criticality Safety Evaluations (NCSEs) to verify 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-03-02-17, "Area B (Building 302 and Building 303) of Production Fuel Facility," Revision 2, dated May 25, 2011
- NCS-07-01, "NCSE for the CDL ADU[ammonium diuranate] precipitation system and Calciner Furnace," Revision 1, dated March 2011
- NFS-HS-A-68, "ISA Risk Assessment," Revision 4, dated October 16, 2007
- NFS-HS-A-79, "Identification and Control of Items Relied on for Safety (IROFS) Procedures," Revision 7, dated November 19, 2010

b. Observations and Findings

The inspector verified 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 inspector verified 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:

- 21T-11-0269, “NCS Audit of the NCSE for Prevention of Inadvertent Solution Backflow from the Production Fuel Facility to Unfavorable Geometry Equipment of the Hydrogen and Argon Supply System,” Sixth Audit, dated March 31, 2011
- 21T-11-0270, “NCS Audit of the NCS Analysis for Uranium Recovery Solvent Extraction Areas G, H, and J,” Fifth Audit, dated March 31 2011
- 21T-11-0304, “NCS Audit of NCSE for Area 600,” Sixth Audit, dated April 13, 2011
- 21T-11-0306, “NCS Audit of the NCSE for the BLEU [Blended Low Enriched Uranium] Complex Uranyl Nitrate Building,” Fourth Audit, dated April 5, 2011
- 21T-11-0376, “NCS Audit of the NCSE for the Oxide Conversion Building Uranium Recovery Process,” Third Audit, dated April 7, 2011
- 21T-11-0466, “NCS Audit of the NCSE for Area E of the Uranium Recover Facility,” Fifth Audit, dated April 15, 2011
- 21T-11-0528, “NCS Audit of the NCSE for the 2-Liter (or smaller) Bottle to 2-Liter (or smaller) Bottle Pouring Station,” Revision 1, Fifth Audit, dated May 6, 2011
- 21T-11-0547, “Sixth NCS Audit of the NCSE for Rocket Storage in the Laboratory, “ dated May 11, 2011
- 21T-11-0561, “NCS Audit of the NCSE for Building 100 NDA Laboratory,” Sixth Audit, dated May 24, 2011

b. Observations and Findings

The inspector verified that the licensee NCS audits were conducted in accordance with written procedures. The inspector 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 inspector had no safety concerns regarding the identification, assignment and tracking of corrective actions.

c. Conclusions

No safety concerns were identified regarding the licensee NCS audits.

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

a. Inspection Scope

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

- Corrective Action # 15185, “Revision to Area B NCSE,” dated February 1, 2011
- Corrective Action # 15186, “Revision to Area C NCSE,” dated February 1, 2011
- Corrective Action # 15187, “Revision to Area A NCSE,” dated February 1, 2011

- Corrective Action # 15188, “Revision to Area GH&J NCSE,” dated February 1, 2011
- Corrective Action # 15199, “Revision risk index sequence 4.1.14,” dated April 7, 2011
- PIRCS [Problem Identification, Resolution, and Corrective System] # 29453, “IROFS 301-Process,” dated April 9, 2011
- PIRCS # 29508, ”CK-29B26 was found to have failed,” dated April 12, 2011
- PIRCS # 30105, “Safety Related Equipment Problem,” dated May 27, 2011
- PIRCS # 30141, “Filter- A811 Leaking by,” dated May 31, 2011

b. Observations and Findings

The inspector reviewed selected licensee internally-reported events. The inspector observed that internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned. The inspector 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 inspector 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 inspector reviewed selected aspects of the following documents:

- NFS-HS-A-21, “Operation and Testing of the Criticality, Fire, and CO2 Alarm Systems,” Revision 2, dated April 1, 2010
- NFS-HS-B-34, “Performing Noise Level Surveys,” Revision 4, dated February 22, 2008
- Corrective Action Report #15522, dated May 27, 2011

b. Observations and Findings

The inspector reviewed selected licensee internally-reported events and discussed them with engineering staff involving the criticality alarm system, to determine whether appropriate corrective actions had been performed. An internal event, reported on May 5, 2011, concerned the inaudibility of the fire alarm in a restroom of the Building 100 office area. A corrective action entry was made the same day; however, approximately 3 weeks lapsed before a second corrective action was assigned to install an additional alarm speaker. The fire alarm and the criticality accident alarm share the same speakers, which indicate that the criticality alarm would also be inaudible. 10 CFR 70.24, states in part that a monitoring system will energize clearly audible alarm signals.

Sound level testing in the restroom of the Building 100 office area detected a sound level of approximately 1.1 dB above background. The inspector determined the inaudibility of the criticality alarm to be a violation of minor significance; therefore the issue is not subject to enforcement action in accordance with Section 2.2.2 of the Enforcement Policy. The licensee completed the installation of the additional speaker on June 13, 2011.

c. Conclusions

A minor violation was identified during a review of the licensee's criticality accident alarm system.

6.0 Plant Activities (IP 88015)

a. Inspection Scope

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

- Blended Low Enriched Uranium (BLEU) Preperation Facility
- BLEU
- Naval Fuel
- Solvent Extraction
- Commercial Development (CD) Line
- Laboratory
- Building 440
- Building 333

b. Observations and Findings

The inspector verified that controls identified in NCS analyses were installed or implemented and were adequate to assure safety. The inspector 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 inspector verified the adequacy of management measures for assuring the continued availability and reliability 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 70-143/2011-202-02

This item concerns the licensee's commitment to take corrective actions to correct the double counting of enabling events for accident sequence 4.1.12. On the previous inspection the inspector observed that for accident sequence 4.1.12, one of the enabling events to the sequence was also an IROFS failure credited for the same sequence. Combining an enabling event and an IROFS failure in an accident sequence is contrary to procedure NFS-HS-A-68. The inspector determined that there were other IROFS in place for the accident sequence and that the licensee still met the performance requirements with other IROFS credited in accident sequence 4.1.12.

During this inspection, the inspector reviewed the licensee's corrective actions for this PIRCS. The licensee had updated the accident sequence according to procedure NFS-HS-A-68. The inspector did not identify any safety concerns associated with the corrective action. The licensee is meeting the performance requirements with the updated accident sequence. This item is closed.

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 this 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 in PIRCS by the licensee under the following four identification numbers all dated April 7, 2011; 15185, 15186, 15187, and 15188. The inspector discussed with the licensee the progress on updating the NCSEs. The licensee stated that the NCSE for Area B had been completed and the other NCSEs are still being worked on. The licensee is still on target to have the work completed by June 30, 2012. This item remains open.

8.0 Exit Meeting

The inspector presented the inspection results to members of the licensee's management and staff during an exit meeting on June 9, 2011. 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

IFI 70-143/2011-202-01 Tracks the licensee's commitment to have both of the corrective actions with PIRCS 29424 finished by July 29, 2011.

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
IP 88017	Criticality Alarm Systems

3.0 Key Points of Contact

Nuclear Fuel Services, Inc.

N. Brown	Manager, Nuclear Criticality Safety
G. Darter	Director, Program Management
R. Droke	Senior Regulatory Advisor
D. Lee	Licensing
J. Lee	Manager, Security Operations
A. Rander	Manager, Security
C. Reed	Operations Director
R. Shackelford	Manager, Nuclear Safety & Licensing
J. Wheeler	Manager, Licensing and ISA
N. Willis	Manager, Security Compliance

NRC

T. Marenchin	Criticality Safety Inspector, NRC Headquarters
T. Powell	Criticality Safety Inspector, NRC Headquarters

All attended the exit meeting on June 9, 2011.

4.0 List of Acronyms and Abbreviations

ADU	ammonium diuranate
BLEU	blended low-enriched uranium
BPF	BLEU preparation facility
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
UNB	Uranyl Nitrate Building