

September 7, 2012

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

SUBJECT: INSPECTION REPORT NO. 70-143/2012-203

Dear Mr. Henry:

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

J. Henry

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If you have any questions concerning this report, please contact Sheena Whaley at (301) 492-3200, or via email to Sheena.Whaley@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 70-143/2012-203

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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.: 70-143/2012-203
Licensee: Nuclear Fuel Services, Inc.
Location: Erwin, TN
Inspection Dates: August 6-9, 2012
Inspector: Thomas Marenchin, Criticality Safety Inspector
Sheena Whaley, 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. 70-143/2012-203

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 August 6-9, 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 licensee's plant operations.
- No concerns were identified regarding the licensee's criticality accident alarm system (CAAS) coverage of fissile material 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 inventory.

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:

- 15T-09-0038, "NFS Nuclear Criticality Safety Policy," Revision 2, dated April 17, 2009
- 21T-12-0562, "Integrated Safety Assessment (ISA) Risk Assessment Procedure," Revision 5, dated April 16, 2012
- 54T-11-0018, "Nuclear Criticality Safety Evaluation for Commercial Development Line (CDL) Tray Dissolution System," Revision 2, dated October 2011
- 54T-12-0011, "Nuclear Criticality Safety Evaluation for the 301 RFS Calciner Furnace," Revision 1, dated April 2012
- 54T-12-0023, "Nuclear Criticality Safety Evaluation for Uranium Recovery Solvent Extraction Areas G, H, and J," Revision 2, dated June 25, 2012
- 54T-12-0010, "Nuclear Criticality Safety Evaluation for CDL Building 301 Entrance Floor Area," Revision 1, dated March 29, 2012
- 54X-04-0050, "800-gallon Liquid Waste Discard Tanks," Revision 0, dated June 28, 2005
- 54X-10-0006, "Control Flowdowns and Field Verification for the 800-Gallon Liquid Waste Discard Tanks," Revision 2, dated June 2010
- 54X-12-0002, "Nuclear Criticality Safety Evaluation for Area A of the Uranium Recovery Facility," Revision 1, dated February 2012
- NFS-HS-A-16, "Safety Audits and Inspections," Revision 13, dated April 3, 2012
- NFS-HS-CL-15, "NCS Building 330 Waste Water Treatment Facility," Revision 19, dated December 1, 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:

- NCS-2012-01, "Sixth NCS Audit of the NCSEs for 300 Warehouse and 310 Warehouse," dated January 20, 2012
- NCS-2012-02, "NCS Audit of the NCSE for Area 1 of the U Recovery," dated February 13, 2012
- NCS-2012-03, "NCS Audit of the NCSE for Area 900 SNM Storage Racks, Second Audit," dated February 14, 2012
- NCS-2012-04, "NCS Audit of the NCSE for BPF Liquid Waste Discard System, Fourth Audit," dated February 14, 2012
- NCS-2012-05, "NCS Audit of the NCSE for the 300 Complex and 105 Laboratory Exhaust Ventilation Systems, Sixth Audit," dated 2012
- NCS-2012-06, "NCS Audit for the BPF Raffinate Solidification System," dated March 2, 2012
- NCS-2012-07, "NCS Audit of the NCSA for Nominal 6-Inch Borosilicate Glass Columns," dated April 9, 2012
- NCS-2012-08, "NCS Audit of the NCSE for the BPF U Metal Sampling and U Metal Shear System, Fifth Audit," dated April 20, 2012
- NCS-2012-09, "NCS Audit of the NCSA for Prevention of Inadvertent Backflow of U Solution From the U Recovery Process to Unfavorable Geometry Equipment in the Deionized Water Supply System, Sixth Audit," dated April 20, 2012
- NCS-2012-10, "NCS Audit of the NCSE for Area 900 –ENCLOS-7901 in Buildings 302,303, Second Audit," dated April 30, 2012
- NCS-2012-11, "NCS Audit of the NCSE for Area C of the URecovery Facility, Sixth Audit," dated May 10, 2012
- NCS-2012-12, "NCS Audit: Area B (Building 302 and 303) of the Production Fuel Facility, Sixth Audit," dated May 9, 2012
- NCS-2012-13, "NCS Audit of the NCSA for the Loading, Handling and Storage of 55-Gallon Drums with Low-Level Solid SNM Trash and the Storage of 55-Gallon Drums of Low-Level Solution in Buildings 302, 304, and 306, Sixth Audit," dated April 20, 2012
- NCS-2012-14, "NCS Audit of the NCSE for Areas 100/200 of the Production Fuel Facility, Revision 4, Fourth Audit," dated June 7, 2012

- NCS-2012-15, "NCS Audit of the NCSE for the Check Weighing Areas, Fourth Audit," dated June 14, 2012
- NCS-2012-16, "NCS Audit of the NCSA for Rocket Storage in Building 302, Revision 0, Fifth Audit," dated June 11, 2012
- NCS-2012-17, "NCS Audit of the NCSE for ENCLOS-4901 and -9901 of Area 900 of the Production Fuel Facility, Second Audit," dated June 14, 2012
- NCS-2012-08, "NCS Audit of the NCSA for Prevention of Inadvertent Solution Backflow From the Production Fuel Facility to Unfavorable Geometry Equipment of the Bulk Chemical Supply, Seventh Audit," dated July 16, 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. The inspectors 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. The inspectors noted that 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:

- Problem Identification, Resolution, and Corrective System (PIRCS) # 35698, dated August 2, 2012
- PIRCS # 35522, dated July 23, 2012
- PIRCS # 35521, dated July 23, 2012
- PIRCS # 35475, dated July 17, 2012
- PIRCS # 35359, dated July 10, 2012
- PIRCS # 35219, dated June 26, 2012
- PIRCS # 35192, dated June 23, 2012
- PIRCS # 35189, dated June 22, 2012
- PIRCS # 35158, dated June 21, 2012
- PIRCS # 35156, dated June 21, 2012
- PIRCS # 35120, dated June 19, 2012
- PIRCS # 35084, dated June 14, 2012
- PIRCS # 35040, dated June 12, 2012

- PIRCS # 34839, dated May 25, 2012
- PIRCS # 34742, dated May 18, 2012
- PIRCS # 34568, dated May 8, 2012
- PIRCS # 34489, dated May 4, 2012
- PIRCS # 34332, dated April 25, 2012

b. Observations and Findings

The inspectors reviewed selected licensee internally reported events that 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.

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. 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 Criticality Alarm System (IP 88017)

a. Inspection Scope

The inspectors reviewed documentation of criticality accident alarm detector coverage and interviewed engineering staff to determine the adequacy of the licensee's criticality alarm system. No changes had been made to the licensee's CAAS system since the previous inspection. The testing procedure was being revised to clarify how to perform the monthly tests.

b. Observations and Findings

The inspectors determined that the licensee had installed and maintained a system of criticality detectors that were capable of monitoring fissile material operations at the facility and reliably detecting the minimum accident of concern.

c. Conclusions

No concerns were identified regarding the licensee's CAAS coverage of fissile material operations.

7.0 Open Item Review

IFI 70-143/2011-202-02

This item concerns the commitment to complete 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 indicated that the remaining four NCSEs for Area A, B, C, and G, H, J, would be 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 determined that all of the NCSEs have been completed. This item is closed.

8.0 Exit Meeting

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

IFI 70-143/2011-202-02 Tracks the licensee's commitment to update NCSEs for Area A, B, C, and G, H, J by June 30, 2012.

Items Discussed

None

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**

NFS

J. Henry	NFS President
M. Elliott	Director, Quality, Safety & Safeguards
C. Reed	Operations Director
R. Daily	Engineering Director
J. Nagy	NFS Assurance Director
R. Shackelford	Manager, Nuclear Safety & Licensing
R. Droke	Senior Regulatory Advisor
J. Wheeler	Licensing and ISA Manager
M. Lee	Licensing Specialist
N. Brown	Manager, Nuclear Criticality Safety

NRC

T. Marenchin	Criticality Safety Inspector
S. Whaley	Criticality Safety Inspector
G. Smith	Senior Resident Inspector
M. Chitty	Resident Inspector

All attended the exit meeting on August 9, 2012

4.0 List of Acronyms and Abbreviations

BLEU	blended low-enriched uranium
BPF	BLEU preparation facility
EPB	Effluent Processing Building
HEU	high-enriched uranium
IP	inspection procedure
ISA	Integrated Safety Assessment
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