December 21, 2011

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

SUBJECT: INSPECTION REPORT NO. 70-143/2011-205

Dear Mr. Henry:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your facility in Erwin, Tennessee, from November 28 - December 2, 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 December 2, 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.

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 Tamara D. Powell, at (301) 492-3211.

Sincerely,
/RA/

Thomas 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 70-143/2011-205

If you have any questions concerning this report, please contact Tamara D. Powell, at (301) 492-3211.

Sincerely,
/RA/

Thomas 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 70-143/2011-205

DISTRIBUTION:
FCSS r/f FEhrhardt, RII JPelchat, RII KMcCallie, RII
KRamsey, FMB

ML113500457

INDICATE IN BOX: "E"=COPY W/ATT/ENCL; "C"=COPY W/O ATT/ENCL; "N"=NO COPY			
OFFICE	FCSS/TSB	FCSS/TSB	FCSS/TSB
NAME	TPowell	PJenifer	THiltz
DATE	12/19 /11	12/20 /11	12/21/11

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.:	70-143/2011-205
Licensee:	Nuclear Fuel Services, Inc.
Location:	Erwin, Tennessee
Inspection Dates:	November 28 – December 2, 2011
Inspector:	Tamara D. Powell, Criticality Safety Inspector
Approved by:	Thomas 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. 70-143/2011-205

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 November 28 – December 2, 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 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 during review of the licensee's criticality alarm system.
- No safety concerns were identified regarding the licensee's plant operations.

REPORT DETAILS

1.0 Plant Status

NFS produces uranium oxides from low-enriched uranium 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.

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:

- 21T-09-0215, "Nuclear Criticality Safety Design Considerations," Revision 2, dated April 10, 2009
- 54T-10-0032, "Nuclear Criticality Safety Evaluation [NCSE] for BPF Liquid Waste Discard System," Revision 6, dated November 2010
- 54T-10-0033, "NCSE for Waste Water Treatment Facility [WWTF] Caustic Receipt Tank-26," Revision 1, dated November 2010
- 54X-07-0022, "NCSE for Area 800 of the Production Fuel Facility," Revision 8, dated November 28, 2011
- 54X-11-0011, "NCSE for Area B (Building 302 and Building 303) of Production Fuel Facility," Revision 3, dated October 27, 2011
- 54X-04-0045, "NCSE for ENCLOS-8901 in Area 900 of the Production Fuel Facility," Revision 0, dated December 13, 2004
- 54X-10-0007, "NCSE for ENCLOS-5901 in Area 900 of the Production Fuel Facility," Revision 3, dated September 9, 2010
- 54X-10-0008, "Control Flowdown and Field Verification for ENCLOS-5901 in Area 900 of the Production Fuel Facility, Revision 3, of NCSE issued on 9/1/10," Revision 0, dated September 7, 2010
- Drawing Number 306-F0013-D, dated June 5, 2001
- Drawing Number 306-F0014-D, dated July 17, 2001
- Drawing Number 306-F0015-D, dated June 6, 2001
- Drawing Number 306-F0016-D, dated April 18, 2001
- NFS-GH-913, "Nuclear Criticality Safety [NCS] Program," Revision 2, dated February 27, 2004
- NFS-HS-A-58, "Nuclear Criticality Safety Evaluations [NCSE]," 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 [Integrated Safety Analysis] 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-CL-04, "Nuclear Criticality Safety Configuration Control Requirements," Revision 4, dated November 11, 2011
- NFS-SS-003, "Stabilization of 333 BPF Caustic," Revision 0, dated March 28, 2007
- SOP 299, "Waste Water Treatment Facility," Revision 16, dated June 3, 2011
- SOP 401, "Area 800," Revision 15, dated August 24, 2011

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-11-0164, "NCS Audit of the CDL [Commercial Development Line] Interaction Analysis, First Audit," dated August 24, 2011
- 21T-11-0611, "NCS Audit of the NCSE for Area 800, Sixth Audit," dated June 13, 2011
- 21T-11-0631, "NCS Audit of the NCSE for WWTF Caustic Receipt Tank-26, Second Audit," dated June 20, 2011
- 21T-11-0645, "NCS Audit of the NCSE for the OCB [Oxide Conversion Building] Oxide Blending System, Third Audit," dated June 24, 2011
- 21T-11-0648, "NCS Audit of the NCSE for the 110B and 131 Labs, Sixth Audit," dated July 14, 2011
- 21T-11-0730, "Third NCS Audit of the NCSE for the OCB Portable HEPA filter Unit," dated July 27, 2011
- 21T-11-0749, "NCS Audit of the Nuclear Criticality Safety Stude for Six Inch Diameter Glass Column Leaks, Sixth Audit," dated August 15, 2011
- 21T-11-0761, "NCS Audit of the NCSE for the CDL Process Ventilation System, First Audit," dated August 9, 2011
- 21T-11-0765, "NCS Audit of the NCSE for the CDL Sorting and Packaging Station, First Audit," dated August 9, 2011
- 21T-11-0766, "NCS Audit of the NCSE for Sublimation Station Number 3, the Heel

Removal Station, and the NaF [sodium fluoride]/Alumina Traps, First Audit," dated August 10, 2011

- 21T-11-0768, "NCS Audit of the NCSE for the CDL Column Dissolution System Audit, First Audit," dated August 10, 2011
- 21T-11-0801, "Sixth NCS Audit of the 105/302/303 Laboratory," dated August 19, 2011
- 21T-11-0888, "NCS Audit of the NCSE for Area LA, Fourth Audit," dated August 19, 2011
- 21T-11-0889, "NCS Audit of the NCS Limits and Risk Indexing for BPF Prototype and Four reactor System, First Audit," dated August 19, 2011
- 21T-11-0969, "NCS Audit of the NCSE for the 311 High Security Storage Area, Third Audit," dated August 19, 2011
- 21T-11-1111, "NCS Audit of the 306 West Storage Rack Evaluation, Fourth Audit," dated August 24, 2011
- 21T-11-1449, "NCS Audit of the NCSE for the CDL ADU [ammonium diurante] Precipitation System and Calciner Furnace, First Audit," dated September 2, 2011
- 21T-11-2087, "NCS Audit of the NCSE for Area 700 of the Production Fuel Facility, Sixth audit," dated October 6, 2011
- 21T-11-2237, "NCS Audit of the NCSE for the CDL Liquid Waste Discards System, First Audit," dated October 17, 2011
- 21T-11-2256, "NCS Audit of the NCSE for CDL Building 301 Entrance Floor Area, First Audit," dated October 24, 2011
- 21T-11-2618, "NCS Audit of the NCSE for the Tube Cleaning Room of the Production Fuel Facility, Sixth Audit," dated November 15, 2011
- 21T-11-2759, "NCS Audit of the NCSE for Cart and Rack Use in CDL, First Audit," dated November 17, 2011
- 21T-11-2765, "NCS Audit of the NCSE for Hoke Tube Processing, First Audit," dated November 17, 2011
- 21T-06-1956, "Nuclear Criticality Safety Audit Writer's Guide," Revision 2, dated November 27, 2006
- NFS-HS-A-16, "Safety Audits and Inspections," Revision 12, dated March 28, 2011
- PIRCS [Problem Identification, Resolution, and Corrective System] #30809, dated July 26, 2011
- PIRCS #31135, dated August 19, 2011
- PIRCS #31120, dated August 17, 2011
- PIRCS #31122, dated August 18, 2011
- PIRCS #31123, dated August 18, 2011
- PIRCS #31124, dated August 18, 2011
- PIRCS #31125, dated August 18, 2011
- PIRCS #31898, dated October 19, 2011
- PIRCS #32233, dated November 14, 2011

b. Observations and Findings

The inspector verified that the licensee's 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's 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's 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:

- NFS-GH-65, "Problem Identification," revision 6, dated January 21, 2011
- NFS-GH-922, "The NFS Problem Identification Resolution and Correction System," Revision 11, dated January 21, 2011
- PIRCS #29931, dated May 6, 2011
- PIRCS # 30556, dated July 6, 2011
- PIRCS # 30654, dated July 14, 2011
- PIRCS #30700, dated July 18, 2011
- PIRCS #30772, dated July 23, 2011
- PIRCS #30850, dated July 28, 2011
- PIRCS #30977, dated August 8, 2011
- PIRCS #32013 dated October 28, 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.

b. Observations and Findings

The inspector reviewed the licensee's criticality alarm detector placement to determine that the system remained in accordance with license requirements. The inspector observed the locations of all criticality alarm detectors during plant walkdowns.

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 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 Preparation Facility
- Naval Fuel
- Solvent Extraction
- CDL
- Building 440
- Building 333
- WWTF

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 commitment to provide a schedule for the completion of specific NCSEs that cover Reagents and Utilities. The licensee had been working to split these two general NCSEs into more specific analyses. During the 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 in PIRCS by the licensee under the following four identification numbers all dated April 7, 2011; 15185, 15186, 15187, and 15188. During this inspection, the inspector discussed the progress on updating the NCSEs with the licensee. The licensee stated that the NCSE for Area B had been completed and implemented, however work on the remaining NCSEs was ongoing. 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 December 2, 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

None

Items Discussed

IFI 70-143/2011-202-02 Tracks the licensee's commitment to update NCSEs for Areas 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
R. Droke	Senior Regulatory Advisor
J. Henry	President
D. Lee	Licensing
C. Reed	Operations Director
R. Shackelford	Manager, Nuclear Safety & Licensing
J. Wheeler	Manager, Licensing and ISA

NRC

T. Powell	Criticality Safety Inspector, NRC Headquarters

All attended the exit meeting on December 2, 2011.

4.0 List of Acronyms and Abbreviations

ADU	ammonium diuranate
BPF	BLEU preparation facility
CDL	Commercial Development Line
IP	inspection procedure
ISA	integrated safety analysis
NaF	sodium flouride
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NFS	Nuclear Fuel Services, Inc. (licensee)
PIRCS	Problem Identification, Resolution, and Corrective System
SNM	Special Nuclear Material
WWTF	Waste Water Treatment Facility