August 10, 2009

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

SUBJECT: INSPECTION REPORT NO. 70-143/2009-205

Dear Mr. Kudsin:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your facility in Erwin, Tennessee, from July 13-17, 2009. 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 July 17, 2009.

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 10 CFR 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 <u>http://www.nrc.gov/reading-rm/adams.html</u>.

D. Kudsin

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If you have any questions concerning this report, please contact Dennis Morey, of my staff, at (301) 492-3112.

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 70-143/2009-205

D. Kudsin

If you have any questions concerning this report, please contact Dennis Morey, of my staff, at (301) 492-3112.

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 70-143/2009-205

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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.:	70-143/2009-205
Licensee:	Nuclear Fuel Services, Inc.
Location:	Erwin, TN
Inspection Dates:	July 13-17, 2009
Inspectors:	Dennis Morey, Senior Criticality Safety Inspector Christopher Tripp, 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

EXECUTIVE SUMMARY

Nuclear Fuel Services, Inc. NRC Inspection Report No. 70-143/2009-205

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of the Nuclear Fuel Services, Inc. (NFS), Erwin, Tennessee, facility from July 13-17, 2009. The inspection included review of the NCS program; administrative and operating procedures; inspections, audits, and investigations; plant activities; event review and follow-up; the criticality alarm system; and open items. The inspection focused on the fuels manufacturing area, uranium recovery, the wastewater treatment facility (WWTF), and the blended low-enriched uranium (BLEU) Preparation Facility (BPF).

Results

- No safety concerns were noted regarding the NCS program.
- No safety concerns were noted regarding licensee NCS inspections, audits, and investigations.
- No safety concerns were noted regarding the licensee's maintenance and testing of its criticality alarm system.
- No safety concerns were noted regarding plant operations.

REPORT DETAILS

1.0 Plant Status

NFS conducts high-enriched uranium fuel fabrication, downblending, uranium recovery, waste processing, remediation, and decommissioning operations at its Erwin, Tennessee site. During the inspection, the facility was operating normally, with the exception of the CD Line (which is awaiting approval).

2.0 Nuclear Criticality Safety Program (IP 88015, 88016)

a. Inspection Scope

The inspectors reviewed Nuclear Criticality Safety Evaluations (NCSEs) 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 inspectors reviewed selected aspects of the following documents:

Criticality Analyses

- 54T-09-0017, "Nuclear Criticality Safety Evaluation for the Blended Low-Enriched Uranium Preparation Facility Solvent Extraction," Rev. 10, dated April 9, 2009
- 54T-09-0010, "Nuclear Criticality Safety Analysis for the BPF Process Ventilation System," Rev. 5, dated February 2, 2009
- 54T-09-0032, "Nuclear Criticality Safety Evaluation for Waste Water Treatment Facility [WWTF]," Rev. 4, dated May 29, 2009
- 54T-08-0035, "NCSE for the High Security Storage area in Building 311," Revision 7, dated June 23, 2008
- 53T-09-0022, "FINAL REPORT: Processing of Fluoride Bearing Solutions in Glass SX Columns," dated April 4, 2009

Procedures **Procedures**

- NFS-HS-A-58, "Nuclear Criticality Safety Evaluations (NCSE)" Rev. 11, dated March 27, 2009
- NFS-HS-A-16, "Safety Audits and Inspections," Revision 11, dated June 19, 2009
- 21T-08-0326, "Nuclear Criticality Safety Evaluation/Analysis Writers Guide," Rev. 8, dated June 6, 2008

b. Observations and Findings

The inspectors reviewed NCSEs that had been revised since the previous inspection, and determined that they complied with applicable procedures and regulations. The inspectors reviewed new sequences involving the transfer of solution with high fluoride concentration to solvent extraction in NCSE 54T-09-0017, which were added on account of the CD Line. The inspectors determined that controls were adequate to meet double contingency. The risk-indexing stated that these events were highly unlikely based, in

part, on large margin. The licensee explained that the limiting fluoride concentration was significantly below what would be needed to prevent significant corrosion of the solvent extraction columns. This was shown in the corrosion study (53T-09-0022), in which glass samples were exposed to various fluoride concentrations and the corrosion rate measured. The exact surveillance rate has not been determined, but the inspectors determined that there was adequate protection against these sequences.

c. <u>Conclusions</u>

No safety concerns were noted regarding the NCS program.

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

a. Inspection Scope

The inspectors reviewed 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-2009-10, "NCS Audit of the OCB Oxide Blending System", Second Audit
- NCS-2009-11, "Second NCS Audit of NCSE for OCB Uranium Recovery Process"
- NCS-2009-12, "NCS Audit of NCSE for Prevention of Inadvertent Solution Backflow from the Production Fuel Facility to Unfavorable Geometry Equipment of the Hydrogen & Argon Supply System"
- HS-A-16, "Safety Audits and Inspections," Rev.11, June 19, 2009

b. Observations and Findings

The inspectors reviewed audits that had been completed since the last inspection along with the procedure for conducting audits and inspections. Several NCS Engineers were interviewed on how they conduct audit and they appeared to be following there procedures for conducting audits and following up on any corrective actions that are a result of there audits.

c. <u>Conclusions</u>

No safety concerns were noted regarding licensee NCS inspections, audits, and investigations.

4.0 Criticality Alarm System (IP 888017)

a. Inspection Scope

The inspectors reviewed recent events involving failure of the criticality alarm system (CAS) uninterruptible power supply (UPS), and procedures for taking criticality alarms out of service and returning them to service, to verify compliance with the regulations. The inspectors reviewed selected aspects of the following documents:

 21T-09-656, "Operation and testing of the BLEU Complex Criticality Alarm System," Revision 4, July 9, 2009

b. Observations and Findings

Problem Identification, Reporting, and Corrective Action System (PIRCS) 19649 concerned activation of the criticality alarm due to failure of the UPS system. During response to this incident, the licensee gave the signal for personnel to return to the area while the CAS remained on generator power. During the subsequent switch back to main power, a power glitch caused a second alarm to sound. Following return of the UPS to service, continuing hardware faults led the licensee to issue PIRCS 19663. The corrective actions associated with this incident included adding additional test requirements to the preventive maintenance procedure used by the vendor. The inspectors reviewed the licensee's response to these events, including its corrective actions (the change to the procedure had not yet been implemented), and determined that they appeared appropriate. The inspectors determined that during the time when the CAS alarm amplifiers were turned off, a stop movement order was in effect, and that this was done in compliance with procedure NFS-HS-A-21, "Operation and Testing of the Criticality, Fire, and CO_2 Alarm Systems," Rev. 28, dated June 2009.

The inspectors attended a meetings of the PIRCS Steering Committee in which the UPS failures were discussed. No criticality concerns were discussed at this meeting. The inspectors also discussed the events with plant personnel and reviewed a sample work order for preventive maintenance used by the vendor. The inspectors did not identify any concerns regarding the licensee's response to recent events involving the UPS, including stop movement and recovery activities, was adequate.

The inspectors reviewed procedure NFS-HS-A-21 and determined that this procedure contained detailed testing and calibration requirements, and reviewed the latest semiannual alarm calibration and functional test (Work Order 0000106533, dated July 3, 2009). This semi-annual surveillance was conducted in accordance with the procedure and verified the response for each on-site alarm cluster.

c. Conclusions

No safety concerns were noted regarding the licensee's maintenance and testing of its criticality alarm system.

5.0 Plant Activities (IP 88015)

a. Inspection Scope

The inspectors performed plant walkdowns 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 reviewed selected aspects of the following documents prior to performing the walkdowns:

 NFS-HS-CL-27, "NCS Buildings 520/530 OCB/EPB," Revision 9, dated January 5, 2009

b. Observations and Findings

The inspectors performed walkdowns in the fuel production areas, BPF, the waste water treatment facility, and the AREVA Erwin oxide conversion facility. The inspectors interviewed operations staff and NCS engineers both before and during walkdowns. The inspectors noted that observed NCS controls were effectively implemented and that observed operations were being performed in accordance with written procedures. The inspectors did not identify any safety concerns during plant walkdowns.

c. Conclusions

No safety concerns were noted regarding plant operations.

6.0 Open Item Review

IFI 70-143/2008-208-01

This item tracked the licensee's corrective actions to justify the basis for independence when crediting repeated failures of a single items relied on for safety (IROFS), as part of its double contingency discussion in NCSEs. During a previous inspection, the inspectors had reviewed the criteria for independence in Attachment III to NFS procedure NFS-HS-A-68, "ISA Risk Assessment Procedure," Rev. 4, dated October 26, 2007, and a new requirement in procedure NFS-HS-A-58, "Nuclear Criticality Safety Evaluations," Rev. 11, dated March 27, 2009, to justify and document the basis for independence, and found them adequate. The inspectors had left the item open pending review to verify correct implementation of these requirements. During the current inspection, the inspectors reviewed the NCSEs revised since the new version of NFS-HS-A-58 took effect. One NCSE, 54T-09-0032, "Nuclear Criticality Safety Evaluation for Waste Water Treatment Facility," Rev. 4, dated May 2009, had accident sequences crediting repeated failures of the same IROFS. The inspectors noted that the NCSE Table 4-1, entitled "Risk Index Assignment," specifically indicated where controls were credited more than once in the same sequence. The inspectors reviewed the three sequences and determined that the licensee did include additional justification for why the repeated failures were independent. In one case, it would require a large number of failures before criticality would be possible. In all three cases, the licensee stated that the failures would occur on different days and most likely be different individuals. The licensee explained that the wastewater tanks take at least several shifts to fill and empty, and that there are several operators on each shift. (The controls involve draining the tanks and performing a visual or nondestructive assay inspection before a new batch can be introduced.) In addition, each sequence would still meet the highly unlikely requirement without crediting multiple failures, so the repeated failures were just defense-in-depth. After discussion with the licensee, the inspectors concluded in each case the sequence met the criteria for independence specified in Attachment III to NFS-HS-A-68. This item is closed.

IFI 70-143/2009-202-01

This item tracked the licensee's submission of an amendment request to clarify the license requirements regarding modeling of reflection. During a previous inspection, an Unresolved Item (URI 70-143/2007-207-01) had been closed based on the licensee's commitment to submit an amendment request. However, IFI 70-143/2009-202-01 was subsequently opened because the licensee withdrew its amendment request. During the current inspection, NFS provided the inspectors with a revision to the section of the license renewal application dealing with reflection control, submitted on June 30, 2009. The inspectors discussed the revised language with the licensee and determined that it appeared to be an accurate representation of the licensee's current technical practices. The adequacy of the proposed revision will be reviewed in the license renewal process. The licensee stated that it still intends to submit an amendment request so that the issue can be resolved sooner than completion of license renewal, and therefore the IFI will remain open until submission of the amendment request. This item remains open.

IFI 70-143/2009-203-01

During a previous inspection, the inspectors noted that the AREVA Erwin oxide conversion facility CAS operation and testing procedure requires that the alarm panel be observed at times when the horns are switched out of automatic. During the previous inspection, licensee staff explained that the objective of the panel monitoring was to note if the CAS went into alarm and switch the horns back to automatic in order to cause a facility evacuation. During the previous inspection, the inspectors observed that an alarm condition would be indicated by a red light on the panel and that the procedure did not describe how an alarm condition would manifest itself or how the observer could cause an alarm signal. The licensee committed to revise the CAS operation and testing procedure to describe manual alarm activation. During the current inspection, the inspectors observed that the licensee had revised the CAS operation and testing procedure to inform operators that local alarms are received at the panel when the horns are switched off and that the procedure includes direction to operators on identification of criticality events. **This item is closed**.

7.0 Exit Meeting

The inspectors presented the inspection results to members of the licensee's management and staff during an exit meeting on July 17, 2009. 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 70-143/2008-208-01	Tracks the licensee's corrective actions to justify the basis for independence when crediting repeated failures of a single IROFS as part of double contingency discussion in NCSEs		
IFI 70-143/2009-203-01	Tracks revision of the licensee's CAS operation and testing procedure description of manual alarm activation.		

Items Discussed

IFI 70-143/2009-202-01 Tracks the licensee's submission of an amendment request to clarify the license requirements regarding modeling of reflection.

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 List of Acronyms and Abbreviations

- BLEU Blended Low-Enriched Uranium
- BPF BLEU Preparation Facility
- CAS Criticality Alarm System
- CD Line Commercial Development Line
- IFI Inspection Follow-up Item
- IROFS Item Relied on For Safety
- NCS Nuclear Criticality Safety
- NCSE Nuclear Criticality Safety Evaluation
- PIRCS Problem Identification, Reporting, and Corrective Action System
- UPS Uninterruptible Power Supply
- WWTF Wastewater Treatment Facility

Attachment

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4.0 Key Points of Contact

Nuclear Fuel Services, Inc.

*G. Athon	Director AT/Principal Scientist
*N. Brown	Nuclear Safety Engineer
*T. Coates	Facilities Emergency Manager
*R. Dailey	Engineering Director
*R. Droke	Licensing Director
M. Eakin	Nuclear Safety Engineer
S. Gizzie	Nuclear Safety Engineer
*D. Hopson	BLEU Complex Safety Manager
*N. Kenner	Director, Human Performance and Learning
*N. Kerns	Security Compliance Manager
*R. King	Legal Manager
*D. Kudsin	President
*J. Lee	Security Operations Manager
*T. Lewis	MC&A Specialist
*N. Marchioni	ECP Manager
R. Maurer	Nuclear Safety Engineer
*M. Moore	Director Safety and Regulatory
*R. Shackleford	NCS Manager
*M. Shope	QA Manager
*S. Skiles	Nuclear Safety Engineer
*K. Weir	Security Director
*J. Wheeler	Licensing and ISA Manager

<u>NRC</u>

*S. Burris	Senior Resident Inspector, NRC Region II
*G. Smith	Resident Inspector, NRC Region II
*D. Morey	Senior Criticality Safety Inspector, NRC Headquarters
*C. Tripp	Criticality Safety Inspector, NRC Headquarters
*C. Fisher	Criticality Safety Inspector, NRC Headquarters
*O. Smith	Security Inspector, NRC Region II
*M. Thomas	Senior Fuel Facility Inspector, NRC Region II

<u>KAPL</u>

*T. Finan KAPL Resident

*Attended the exit meeting on July 17, 2009.