

[REDACTED]

November 16, 2006

Mr. Dwight B. Ferguson, President
and CEO
Nuclear Fuel Services, Inc.
P.O. Box 337, MS 123
Erwin, TN 37650

SUBJECT: INSPECTION REPORT NO. 70-143/2006-207

Dear Mr. Ferguson:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your facility in Erwin, Tennessee, from October 23 through 27, 2006. The purpose of the inspection was to determine whether activities involving licensed materials were conducted safely and in accordance with NRC requirements. An exit meeting was held on October 27, 2006. The inspection observations and findings were discussed with members of your staff.

The inspection, which is described in the enclosure, focused on: (1) the most hazardous activities and plant conditions; (2) the most important controls relied on for safety and their analytical basis; and (3) the principal management measures for ensuring controls are capable, available, and reliable to perform their function 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. Based on the inspection, your activities involving nuclear criticality hazards were found to be conducted safely and in accordance with regulatory requirements.

[REDACTED]

[REDACTED]

[REDACTED]

D. Ferguson

- 2 -

If you have any questions concerning this report, please contact Harry Felsher, of my staff, at (301) 415-5521.

Sincerely,

/RA/

Melanie A. Galloway, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket No.: 70-143

Enclosure: Inspection Report No. 70-143/2006-207

[REDACTED]



D. Ferguson

- 2 -

If you have any questions concerning this report, please contact Harry Felsher, of my staff, at (301) 415-5521.

Sincerely,

/RA/

Melanie A. Galloway, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket No.: 70-143

Enclosure: Inspection Report No. 70-143/2006-207

DISTRIBUTION:

FCSS r/f DDayres, RII ASheppard, RII SBurris, RII KRamsey
GMorrell

ML063130188

OFC	FCSS	FCSS	FCSS	FCSS
NAME	BPurnell	HFelsher	RWray	MGalloway
DATE	11/ 09 /06	11/ 09 /06	11/ 10 /06	11/ 16 /06

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.: 70-143/2006-207

Licensee: Nuclear Fuel Services, Inc.

Location: Erwin, TN

Inspection Dates: October 23–27, 2006

Inspectors: Harry D. Felsher, Criticality Safety Inspector
Blake A. Purnell, Criticality Safety Reviewer

Approved: Melanie A. Galloway, Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

ENCLOSURE

**Nuclear Fuel Services, Inc.
NRC Inspection Report 70-143/2006-207**

EXECUTIVE SUMMARY

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 October 23 through 27, 2006. The inspection focused on risk-significant plant operations. The inspection included an on-site review of the NCS program, plant operations, NCS audits, NCS event review and follow-up, NCS training and qualification, and open items.

Results

- The NCS program was adequate for maintaining acceptable levels of safety.
- Plant operations involving [REDACTED] materials were conducted safely and in accordance with written procedures.
- A weakness was identified in the NCS audit program, which did not require that all recommended corrective actions listed in the audit be entered into the Problem Identification, Resolution, and Correction System (PIRCS). The licensee's NCS audit procedure will be revised to require all corrective actions to be entered into PIRCS.
- No safety concerns were identified relating to licensee event review and followup.
- The licensee training and qualification management system ensures that general workers, operators, and NCS staff complete appropriate NCS training prior to performing risk-significant NCS tasks.

REPORT DETAILS

1.0 Plant Status

Nuclear Fuel Services, Inc. (NFS) conducts [REDACTED], downblending, uranium recovery, waste processing, and decommissioning operations at its Erwin, Tennessee site. During the inspection, NFS was performing routine fuel fabrication and maintenance operations and was conducting an inventory of uranium in the fuel fabrication areas. The blended low-enriched uranium (BLEU) preparation facility (BPF) was starting to operate for the first time since March 2006, when operations were shut down due to an event in the BPF [REDACTED] process.

2.0 Nuclear Criticality Safety Program (88015, 88016)

a. Inspection Scope

The inspectors reviewed revised nuclear criticality safety evaluations (NCSEs) to determine whether criticality safety of risk-significant operations was ensured through engineered and administrative controls with adequate safety margin, including preparation and review by qualified staff. The inspectors interviewed NCS management and NCS engineers regarding the implementation of the NCS program. The inspectors accompanied NCS engineers on walkdowns of NCS controls in selected plant areas. The inspectors reviewed selected aspects of the following documents:

- "NCS Design Considerations," Revision 0, dated June 9, 2006
- "NFS NCS Policy," Revision 1, dated August 3, 2001
- "Safety-Related Equipment Control Program," Revision 13, dated May 15, 2006
- "Evaluation and Implementation of Internally Authorized Changes," Revision 9, dated April 24, 2006
- "Conducting and Documenting ISAs [Integrated Safety Analyses]," Revision 5, dated January 30, 2004
- "Management Measures Identification and Implementation for IROFS [items relied on for safety]," Revision 3, dated August 2, 2004
- "NCS Program," Revision 2, dated February 27, 2006
- "NCS Evaluations," Revision 10, dated February 17, 2006
- "ISA Change Control," Revision 8, dated October 11, 2006
- "Implementation of NCS Evaluations," Revision 4, dated April 4, 2006
- "Completing the Safety and Regulatory Review Routing Form," Revision 4, dated October 13, 2005
- "NCSE for Wastewater Treatment Facility," Revision 1, dated February 2006
- "Control Flowdown and Field Verification for NCSE for Wastewater Treatment Facility," Revision 1, dated February 2006
- "NCSE for BPF [REDACTED]," Revision 5, dated July 2006
- "Control Flowdown and Field Verification for NCSE for BPF [REDACTED]," Revision 3, dated September 2006

- "NCSE [REDACTED] Facility," Revision 7
- "NCSE for BPF Liquid Waste Discard System," Revision 2, dated June 2006
- "Control Flowdown and Field Verification Checklist for BPF Liquid Waste Discard," dated June 2006
- "NCSE [REDACTED]," Revision 9, dated July 2006
- "NCSE [REDACTED] Facility," Revision 2

b. Observations and Findings

The inspectors determined that NCSEs were performed by qualified NCS engineers, that independent reviews were completed for the NCSEs by other qualified NCS engineers, that subcriticality of the systems and operations was ensured through appropriate limits on controlled parameters, that double contingency was ensured for each revised credible accident sequence leading to inadvertent criticality, and that NCS controls for equipment and processes ensured the safety of operations.

c. Conclusions

The NCS program was adequate for maintaining acceptable levels of safety.

3.0 Plant Operations (88015, 88016)

a. Inspection Scope

The inspectors toured the production facility. The inspectors performed plant walkdowns to review activities in progress and to determine whether risk-significant [REDACTED] material operations were being conducted safely and in accordance with regulatory requirements. The inspectors interviewed operators and NCS engineers both before and during walkdowns. The inspectors reviewed selected aspects of the NCSEs listed in Section 2.0 and the NCS audits listed in Section 4.0 prior to performing the walkdowns.

b. Observations and Findings

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 to acceptable levels. The inspectors performed walkdowns of the risk-significant [REDACTED] material processing activities in [REDACTED], the waste water treatment facility, and [REDACTED] in the BPF. No safety concerns were noted during walkdowns.

[REDACTED]

c. Conclusions

Plant operations involving [REDACTED] materials were conducted safely and in accordance with written procedures.

4.0 Nuclear Criticality Safety Inspections, Audits, and Investigations (88015)

a. Inspection Scope

The inspectors reviewed licensee internal safety audit procedures and records of previously completed NCS audits of [REDACTED] operations. The inspectors reviewed selected aspects of the following documents:

- "Safety Audits and Inspections," Revision 8, dated January 29, 2004
- "NCS Audit [REDACTED]," dated July 21, 2006
- "NCS Audit [REDACTED] Facility (Third Audit)," dated January 13, 2006
- "NCS Audit of the NCSE [REDACTED] Sampling Area (Second Audit)," dated March 22, 2006
- "NCS Audit of the BPF Ventilation Evaluation (First Audit)," dated July 17, 2006
- "NCS Audit of the Waste Discard Tanks (Fourth Audit)," dated July 21, 2006
- "NCS Audit [REDACTED] (Third Audit)," dated June 14, 2006
- "NCS Audit of the Recovery Cooling Water System (Third Audit)," dated May 19, 2006
- "NCS Audit of the NCSE [REDACTED] Supply System, Revision 1, (Fourth Audit)," dated October 19, 2006
- "NCS Audit of the NCSE for QC [REDACTED] (Fourth Audit)," dated July 21, 2006

b. Observations and Findings

The inspectors observed that NCS audits were conducted in accordance with safety audit procedural requirements (NFS-HS-A-16). The inspectors noted that: (1) NCS engineers reviewed NCSEs, previous audits, and other relevant documents as part of the NCS audit; (2) audit observations and findings were entered into the licensee's Problem Identification, Resolution, and Correction System (PIRCS); and (3) NCS management reviewed the audit report and ensured that observations and findings in the NCS audit were appropriately resolved.

The inspectors noted a weakness in the NCS audit program because not all recommended corrective actions identified during NCS audits were placed into the licensee's PIRCS. The audit procedure did not require that the recommended corrective actions associated with observations and findings in the audit be placed into PIRCS. After discussions, the licensee recognized the weakness in not having all the corrective actions from NCS audits being placed into PIRCS. The licensee agreed to modify the safety audit procedure to require that all recommended corrective actions be entered

[REDACTED]

into PIRCS, along with an appropriate reference to work orders or other documentation for corrective actions completed during the audit. **This will be tracked as Inspector Followup Item (IFI) 2006-207-01.**

c. Conclusions

The licensee's safety audit procedure will be revised to require all recommended corrective actions to be entered into PIRCS.

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

a. Inspection Scope

The inspectors reviewed licensee follow-up and corrective actions to reportable events and non-reportable NCS infractions in PIRCS that occurred since the last inspection. The inspectors reviewed selected aspects of the following documents:

- PIRCS Items for 3rd and 4th Quarters 2006
- "The NFS PIRCS," Revision 6, dated September 13, 2005

b. Observations and Findings

The inspectors determined that the items entered into PIRCS since the last inspection were associated with incorrectly putting laboratory samples on a shelf between operations and the laboratory. The inspectors determined that those deviations from the procedure were of low safety significance because the amount of special nuclear material involved was less than a critical mass. Despite the low safety significance, the licensee took appropriate corrective action by placing a very large and clearly visible operator aid at both sides of the shelf to reinforce the appropriate operator and laboratory action.

c. Conclusions

No safety concerns were identified relating to licensee event review and followup.

6.0 Nuclear Criticality Safety Training and Qualification (88015)

a. Inspection Scope

The inspectors reviewed the content of the licensee's NCS training for general workers, operators, and NCS personnel. The inspectors evaluated the effectiveness of the licensee's NCS training for general workers, operators, and NCS personnel through interviews with Training personnel, NCS personnel, and operators. The inspectors reviewed online training and qualification records of different types of workers. The inspectors reviewed selected aspects of the following documents:

- "Training Requirements for Safety Professionals," Revision 1, dated May 29, 2000
- General Employee Training
- Area Specific Common Training

b. Observations and Findings

The inspectors determined that general workers are required to take general NCS training and pass an exam as part of General Employee Training (GET). As part of GET, all plant workers are given a copy of a licensee document, "Nuclear Safety Manual or How to Avoid a Criticality," which the inspectors determined is an excellent NCS reference document. The inspectors determined that operators are required to take specific NCS training and pass an exam as part of Common Area Training (CAT) for each process area that they will be working in. The lesson plan for each CAT includes NCS topics in goals, objectives, presentation materials, handouts, workbooks, procedures, demonstrations, class discussions, and on-the-job training. The NCS portions of GET and each CAT are developed in conjunction with the NCS staff and approved by NCS management. At times, NCS staff are available in class and in the operations areas to answer NCS-related questions from students. The inspectors determined that NCS personnel are required to meet training requirements for safety professionals according to the procedure "Training Requirements for Safety Professionals." This procedure includes sign-offs by NCS managers when NCS engineers have demonstrated knowledge of new administrative procedures, NCSEs, and other NCS-related activities.

The licensee has an online system called Training and Qualification (T&Q) that allows all plant workers to know what they are qualified for at any given time. Through T&Q, all supervisors have the ability to track the training status of licensee staff and prevent the performance of tasks if staff are not qualified. All plant workers are encouraged to ensure that their training is not overdue. Through T&Q, supervisors receive e-mail notifications regarding the status of soon-to-be-overdue training. The inspectors determined that T&Q ensures that all plant employees complete appropriate training before performing risk-significant NCS tasks.

c. Conclusions

The licensee training and qualification management system ensures that general workers, operators, and NCS staff complete appropriate NCS training prior to performing risk-significant NCS tasks.

7.0 Open Item Follow-up (88015, 88016, 88017)

IFI 2005-205-01

This item tracks the licensee's revision of the [REDACTED] NCSE to clearly articulate the technical basis. The inspectors reviewed the revised NCSE and determined that the technical basis was clearly articulated. This item is closed.

IFI 2005-205-02

This item tracks determination of appropriate experimental uncertainties and the reason for the observed spread in effective neutron multiplication factor (k_{eff}) (BLEU validations 54T-03-0053 and 54T-03-0009). During this inspection, the licensee acknowledged that no work had been done to close this item. The work is expected to be completed by 12/31/06. This item remains open.

IFI 2005-205-03

This item tracks the impact of non-normality of [REDACTED] experiments on the 0.97 limit for low enriched uranium (LEU) operations (BLEU validations 54T-03-0054 and 54T-03-0009) and failure to consider normality of data in other validations (HEU operation validations 54T-04-0043 and WRS-97-001). During this inspection, the licensee acknowledged that no work had been done to close this item. The work is expected to be completed by 12/31/06. This item remains open.

IFI 2005-205-04

This item tracks specification of which materials cover which portions of the area of applicability (AOA) in BLEU validation reports (BLEU validations 54T-03-0054 and 54T-03-0009). During this inspection, the licensee acknowledged that no work had been done to close this item. The work is expected to be completed by 12/31/06. This item remains open.

VIO 2005-205-05

This item tracks failure to prohibit use of positive bias in calculating upper safety limit (USL) values for [REDACTED] operations. During this inspection, the licensee acknowledged that no work had been done to close this item. The work is expected to be completed by 12/31/06. This item remains open.

IFI 2005-205-06

This item tracks commitment to revise the validation report to correctly calculate the USL (BLEU 54T-03-0054, 54T-03-0009, and any others affected). During this inspection, the licensee acknowledged that no work had been done to close this item. The work is expected to be completed by 12/31/06. This item remains open.

IFI 2005-205-08

This item tracks the licensee's determination of the appropriate bounds of the defined AOA in the validation reports covering HEU operations (HEU operation validations 54T-04-0043 and WRS-97-001). During this inspection, the licensee acknowledged that no work had been done to close this item. The work is expected to be completed by 12/31/06. This item remains open.

IFI 2005-205-09

This item tracks the licensee's resolution of inconsistencies between the validation reports and the procedure, and correcting the methods used to verify adequacy of the margin (HEU operation validations 54T-04-0043 and WRS-97-001). During this inspection, the licensee acknowledged that no work had been done to close this item. The work is expected to be completed by 12/31/06. This item remains open:

VIO 2005-208-01

This item tracks the failure to discuss in the NCSE the actual safety limit relied on in wastewater treatment tanks to demonstrate subcriticality for normal and credible abnormal conditions. During a previous inspection, the inspectors reviewed the revised NCSE that clarified that the actual safety limit was based on mass control rather than concentration control. In that inspection report, the inspectors noted that not all NCS engineers and operators were aware that NCS control in the wastewater treatment tanks was based on mass. During this inspection, the inspectors walked down the wastewater treatment facility, interviewed NCS engineers and operators, and determined that NCS engineers and operators were aware that NCS control was based on mass, that NCS engineers and operators were trained on the mass limits, and that the mass limits were posted in the building. This item is closed.

IFI 2005-208-02

This item tracks licensee actions to amend Safety Condition S-9 of the license to eliminate references to American Nuclear Standards Institute/American Nuclear Society (ANSI/ANS) series standards and clarify the meaning of "published experimental data." During this inspection, the licensee acknowledged that no work had been done to close this item. This item remains open.

IFI 2006-205-02

This item tracks licensee review of its lightning protection system. During this inspection, the licensee acknowledged that no work had been done to close this item. This item remains open.

8.0 Exit Meeting

The inspectors communicated the inspection scope and results to members of Nuclear Fuel Services, Inc. management throughout the inspection and during an exit meeting on October 27, 2006. Licensee management acknowledged and understood the findings as presented.

[REDACTED]

SUPPLEMENTARY INFORMATION

1.0 Items Opened, Closed, and Discussed

Items Opened

IFI 2006-207-01 Tracks the licensee's revision to the safety audit procedure to require that all recommended corrective actions be entered into PIRCS, along with an appropriate reference to work orders or other documentation for corrective actions completed during the audit. (Section 4.0)

Items Closed

IFI 2005-205-01 Tracks the licensee's revision of the [REDACTED] NCSE to clearly articulate the technical basis. (Section 7.0)

VIO 2005-208-01 Failure to discuss in the NCSE the actual safety limit relied on in wastewater treatment tanks to demonstrate subcriticality for normal and credible abnormal conditions. (Section 7.0)

Items Discussed

IFI 2005-205-02 Tracks determination of appropriate experimental uncertainties and the reason for the observed spread in k_{eff} (BLEU validations 54T-03-0053 and 54T-03-0009).

IFI 2005-205-03 Tracks the impact of non-normality of [REDACTED] experiments on the 0.97 limit for LEU operations (BLEU validations 54T-03-0054 and 54T-03-0009) and failure to consider normality of data in other validations (HEU operation validations 54T-04-0043 and WRS-97-001).

IFI 2005-205-04 Tracks specification of which materials cover which portions of the AOA in BLEU validation reports (BLEU validations 54T-03-0054 and 54T-03-0009).

VIO 2005-205-05 Tracks failure to prohibit use of positive bias in calculating USL values for HEU operations.

IFI 2005-205-06 Tracks commitment to revise the validation report to correctly calculate the USL (BLEU 54T-03-0054, 54T-03-0009, and any others affected).

IFI 2005-205-08 Tracks the licensee's determination of the appropriate bounds of the defined AOA in the validation reports covering HEU operations (HEU operation validations 54T-04-0043 and WRS-97-001).

ATTACHMENT

[REDACTED]

- IFI 2005-205-09** Tracks the licensee's resolution of inconsistencies between the validation reports and the procedure, and correcting the methods used to verify adequacy of the margin (HEU operation validations 54T-04-0043 and WRS-97-001).
- IFI 2005-208-02** Tracks licensee actions to amend Safety Condition S-9 of the license to eliminate references to ANSI/ANS series standards and clarify the meaning of "published experimental data."
- IFI 2006-205-02** Tracks licensee review of its lightning protection system.

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.

- | | |
|------------------|--|
| *R. Schackelford | Manager, NCS |
| S. Gizzie | NCS Engineer |
| *J. Nagy | Safety, Licensing, and Regulatory Compliance Officer |
| *M. Moore | Vice-President, Safety and Regulatory |
| *J. McCabe | Corrective Actions Program Manager |
| J. P. Street | Training |
| *N. Brown | Nuclear Safety Engineer |
| *K. Weir | Deputy Security Director |
| *R. A. Bond, Jr. | Sr. Project Director, BPF |
| H. Webb | NCS Engineer |

NRC

- | | |
|-------------|--|
| *H. Felsher | Criticality Safety Inspector, NRC Headquarters |
| *B. Purnell | Criticality Safety Reviewer, NRC Headquarters |
| *S. Burris | Sr. Resident Inspector at NFS, NRC |
| *G. Smith | Resident Inspector at NFS, NRC |

*Attended the exit meeting on October 27, 2006

4.0 List of Acronyms and Abbreviations

ANSI/ANS	American National Standards Institute/American Nuclear Society
AOA	area of applicability
BLEU	blended low-enriched uranium
BPF	BLEU Preparation Facility
CAT	Common Area Training
GET	General Employee Training
HEU	high-enriched uranium
IFI	inspector follow-up item
IROFS	items relied on for safety
ISA	Integrated Safety Analyses
k_{eff}	effective neutron multiplication factor
LEU	low-enriched uranium
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NFS	Nuclear Fuel Services, Inc. (licensee)
PIRCS	Problem Identification, Resolution, and Correction System
QC	quality control
T&Q	Training and Qualification (computer program)
USL	upper safety limit
VIO	violation