

[REDACTED]

July 21, 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. 70-143/2006-205 AND NOTICE OF VIOLATION

Dear Mr. Ferguson:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your facility in Erwin, Tennessee, from June 19 through 23, 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 June 23, 2006. Throughout this inspection, inspection observations were discussed with your management and staff.

The inspection, which is described in the enclosure, focused on: (1) corrective actions taken in response to recent criticality accident alarm system events, (2) on-going plant activities in the [REDACTED] and Blended Low-Enriched Uranium (BLEU) facility, (3) recent changes to the BLEU Preparation Facility (BPF) blending operation, (4) recent reportable and non-reportable events and problem reports, and (5) open items from previous inspection reports. The inspection involved review of pertinent documents, facility walkdowns, and interviews with plant personnel.

Based on the results of the inspection, the NRC has determined that a Severity Level IV violation of NRC requirements occurred. The violation was evaluated in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600. The current Enforcement Policy is included on the NRC's web site at www.nrc.gov; select What We Do, Enforcement, then Enforcement Policy. The violation is being cited in the enclosed Notice of Violation (Notice) as a Severity Level IV violation, and the circumstances surrounding it are described in detail in the subject inspection report. The violation is being cited in the Notice because it was identified by the NRC during the inspection. The violation being cited as a Severity Level IV violation is the failure to maintain coverage of relevant areas by two criticality detectors.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice of Violation when preparing your response. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

[REDACTED]

[REDACTED]

D. Ferguson

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If you have any questions concerning this report, please contact Christopher Tripp, of my staff, at (301)-415-7733.

Sincerely,

/RA/

Dennis C. Morey, Acting Chief
Technical Support Section
Special Projects Branch
Division of Fuel Cycle Safety
and Safeguards

Docket No. 70-143
License No. SNM-124

Enclosures: (1) Notice of Violation
(2) Inspection Report 70-143/2006-205

D. Ferguson

-2-

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NOTICE OF VIOLATION

Nuclear Fuel Services, Inc.
Erwin, TN

Docket No. 70-143
License No. SNM-124

During an NRC inspection from June 19 through 23, 2006, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violation is listed below:

10 CFR 70.24(a)(1) The monitoring system shall be capable of detecting a criticality that produces an absorbed dose in soft tissue of 20 rads of combined neutron and gamma radiation at an unshielded distance of 2 meters from the reacting material within one minute. Coverage of all areas shall be provided by two detectors.

Contrary to the above, on and before June 23, 2006, the criticality accident alarm system for [REDACTED] which cover [REDACTED] of the Waste Water Treatment Facility (WWTF) only had one detector in service.

This is a Severity Level IV violation (Supplement VI).

Pursuant to the provisions of 10 CFR 2.201, Nuclear Fuel Services, Inc., is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, with copies to the Chief, Technical Support Section, Division of Fuel Cycle Safety and Safeguards, NMSS, and the Regional Administrator, Region II, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include: (1) the reason for the violation, or, if contested, the basis for disputing the violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previously docketed correspondence if the correspondence adequately addresses the required response.

If an adequate reply is not received within the time specified in this Notice, an Order or Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other actions as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Enclosure 1

[REDACTED]

[REDACTED]

[REDACTED] In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated at Rockville, Maryland

this 21ST day of July 2006

[REDACTED]

**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS**

Docket No.: 70-143

License No.: SNM-124

Report No.: 70-143/2006-205

Licensee: Nuclear Fuel Services, Inc.

Location: Erwin, TN

Inspection Dates: June 19 - 23, 2006

Inspectors: Christopher S. Tripp, Sr. Criticality Safety Reviewer
Thomas Marenchin, Criticality Safety Inspector

Approved by: Dennis C. Morey, Acting Chief
Technical Support Section
Special Projects Branch
Division of Fuel Cycle Safety and
and Safeguards, NMSS

Enclosure 2

EXECUTIVE SUMMARY

Nuclear Fuel Services, Inc. NRC Inspection Report No. 70-143/2006-205

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 June 19 through 23, 2006. The inspection included an on-site review of the licensee programs dealing with the criticality accident alarm system, plant operations, NCS change control, NCS event review and follow-up, and open items. The licensee programs were acceptably directed toward the protection of public health and safety and in compliance with NRC regulatory requirements. The inspection focused on risk-significant [REDACTED] material processing activities including the blended low enriched uranium (BLEU) preparation facility, the BLEU oxide conversion building (OCB), the BLEU uranyl nitrate building (UNB), and the waste water treatment facility (WWTF).

Results

- A violation was identified due to the failure to maintain dual CAAS detector coverage at the WWTF.
- An unresolved item was identified regarding splitting an accident sequence into additional sequences.
- Licensee identified NCS-related events and their corrective actions were adequately tracked by the licensee problem reporting system.
- No safety concerns were noted during walkdowns of [REDACTED] materials operations.

REPORT DETAILS

1.0 Criticality Accident Alarm System (88015)

a. Scope

The inspectors reviewed the CAAS for the BLEU uranyl nitrate building (UNB) and the WWTF to determine if the equipment met the requirements and could be expected to reliably detect inadvertent criticality.

- NFS-HS-A-21, "Operation and Testing of the [REDACTED] Systems," Rev. 24, dated October 31, 2005
- ANSI/ANS-8.3-1986, "Criticality Accident Alarm System," dated August 29, 1986
- Plant Superintendents's Log
- Problem Identification, Resolution, and Corrective System (PIRCS) (first and second quarters 2006)

b. Observations and Findings

The inspectors noted that [REDACTED] WWTF Victoreen criticality detectors started to alarm after a recent electrical storm and could not be reset. The licensee initiated a work request to repair the detector but the licensee was unable to get the detector to function properly, and the inoperable detector was placed in an alarm status. No further corrective actions were taken to replace or fix the detector; the licensee stated that this was because it did not have the parts to fix the detector, an old model that is no longer being manufactured. The inspectors examined the [REDACTED] which showed that the [REDACTED] was the [REDACTED] covering [REDACTED]

[REDACTED] 10 CFR 70.24 requires coverage of all areas by two detectors. The inspectors noted that the inoperable detector had been in an alarm state since May 31, 2006. In addition, the inspectors noted that no compensatory measures were taken during the time period in which there was only one functioning alarm in the area. Failure to have dual CAAS detector coverage is **Violation (VIO) 70-143/2006-205-01**.

The inspectors also noted that during the same electrical storm that disabled one of the WWTF Victoreen detectors, the audible alarm system for the BLEU complex CAAS was also disabled. This CAAS failure was not noted because the lightning strike had disabled both the alarm and the diagnostic panel that should have indicated alarm failure. Because the licensee was preoccupied with other effects of the lightning storm, the alarm failure was not noticed for several days. The licensee has since instituted a new requirement to perform a "lamp test" on the diagnostic panel every shift to ensure that it is still working properly.

The inspectors determined that the BLEU complex has lightning protection but that the installed lightning protection failed to protect the CAAS equipment in this instance. The licensee stated that it is conducting a comprehensive review of the design of the lightning protection system, including a review to see what enhancements can be made to the minimal features needed to meet the applicable codes. Licensee review of its lightning protection system will be tracked as **Inspection Follow-up Item (IFI) 70-143/2006-205-02.**

c. Conclusions

A violation was identified due to the failure to maintain dual CAAS detector coverage at WWTF.

2.0 **Plant Activities (88015)**

a. Scope

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.

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 risk-significant [REDACTED] material processing activities in the [REDACTED] preparation facility, OCB, the UNB, the [REDACTED] and outside of the WWTF. Most of the process areas (with the exception [REDACTED]) were shut down during the inspection, either as the result of the strike or the shutdown of the OCB. No safety concerns were noted during these walkdowns.

c. Conclusions

No safety concerns were noted during walkdowns of [REDACTED] materials operations.

3.0 Nuclear Criticality Safety Change Control (88015)

a. Scope

The inspectors examined recent changes to the blue preparation facility (BPF) enrichment blend tank to determine whether the changes were made safely and in accordance with regulatory requirements. In addition, the inspectors examined whether the change met the requirements of 10 CFR 70.72 for being permissible without prior NRC review and approval. The inspectors reviewed selected aspects of the following documents:

- 54T-05-0040, "Nuclear Criticality Safety Evaluation for the BLEU Preparation Facility Downblending," Rev. 6, dated June 6, 2006
- NFS-GH-044, "Verification and Validation," Rev. 0, dated April 27, 2006
- NFS-GH-901, "Configuration Management Program," Rev. 6, dated April 13, 2006

b. Observations and Findings

The inspectors walked down the modified BPF blend tank with licensee NCS staff to determine whether the changes were made safely and in accordance with regulatory requirements. Most of the criticality controls on the tank are engineered controls that ensure there is a minimum amount of low-enriched uranium (LEU) [REDACTED] in the tank prior to [REDACTED] and a maximum amount of high-enriched uranium (HEU) feedstock, to limit the concentration in the [REDACTED] tank to [REDACTED], the limiting condition for operation (LCO). The inspectors concluded that the criticality controls appeared adequate to prevent the LCO from being exceeded and operations were being conducted in accordance with the current nuclear criticality safety evaluation (NCSE).

Revision 6 of the NCSE was made to remove reliance on the HEU mass flow meter, [REDACTED], as an item relied on for safety (IROFS) in the Integrated Safety Analysis (ISA) Summary. The purpose of the mass flow meter was to limit the volume of HEU solution that could be fed from the HEU staging columns to the BPF blend tank, to limit the enrichment and concentration for criticality control. The mass flow meter is part of an interlock that closes two HEU feed isolation valves if [REDACTED] solution is transferred. According to licensee staff, the mass flow meter performed its intended safety function, but often fails conservatively because it interprets air left in the line following a transfer as additional solution. Because of this defect, the licensee replaced the mass flow meter with other criticality controls.

The inspectors also reviewed the ISA Summary information for the scenario of allowing too much HEU into the blend tank [REDACTED], to determine whether the change should have been made without prior NRC approval under 10 CFR 70.72. The blend process consists of [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

and will remain open during the campaign unless too much solution passes through the mass flow meter or the limiting concentration in the in-line monitor is exceeded.

Before the change, the initiating events (IE) and IROFS and their likelihood index values were as follows:

[REDACTED]

[REDACTED]

[REDACTED]

Thus, the licensee removed credit for verifying the proper volume in the [REDACTED] and replaced the mass flow meter [REDACTED] and an administrative control to close the manual valve prior to transfer. The licensee stated that it had analyzed the maximum volume of the [REDACTED] and associated piping and concluded that even if the entire volume of HEU [REDACTED] were transferred to the blend tank, the system would remain subcritical. The requirement to verify the proper volume (to less than the LCO limit [REDACTED] is still a criticality control, but is no longer identified as an IROFS. The inspectors concluded that the actual criticality controls did not change, with the exception of the mass flow meter, and that the IROFS appeared appropriate. The inspectors did identify that there was an inconsistency in the NCSE, in that Table 4.4 and Appendix A contained different sets of IROFS for this sequence. The licensee corrected this discrepancy while the inspectors were on-site. The inspectors questioned whether the replacement of an active engineered control with an active and an administrative control constituted an "equivalent replacement" under 10 CFR 70.72. The inspectors reviewed the 70.72 worksheet for the change, which concluded that it did constitute an "equivalent replacement" of the safety function of the removed IROFS. The inspectors noted that the two new IROFS controlled the same parameter (volume of HEU) to the same LCO value, retained the reliability of the replaced IROFS and the overall likelihood of the accident sequence decreased.

[REDACTED]

The inspectors also noted that the manual valve [REDACTED], whereas the isolation valves that are actuated by the mass flow meter [REDACTED]. The result of this is that the IROFS on [REDACTED] were insufficient to protect against a second means of getting HEU solution [REDACTED]. Therefore, the licensee relabeled the accident sequence involving failure to prevent more material from being transferred to [REDACTED] and analyzed a new accident sequence [REDACTED] cover backflow of HEU solution into the [REDACTED]. Because of this, a new passive IROFS had to be established for the new sequence [REDACTED]. The inspectors determined that the change to the NCS controls on the BPF blend tank operation were adequate.

The inspectors questioned whether this change should have resulted in an amendment under 10 CFR 70.72, because it caused the creation of a new accident sequence. The licensee stated that in its view, the splitting of an accident sequence into two or more accident sequences did not constitute a new sequence, because the original sequence bounded any means of transferring additional solution [REDACTED]. Splitting the downblending accident sequence into additional sequences will be tracked as **Unresolved Item (URI) 70-143/2006-205-03**.

c. Conclusions

An unresolved item was identified regarding splitting an accident sequence into additional sequences.

4.0 **Nuclear Criticality Safety Event Review and Follow-up**

a. Scope

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

- Problem Identification, Resolution, and Corrective System (PIRCS) Event Reports for 1st and 2nd Quarters 2006

b. Observations and Findings

Four events were chosen to review in further detail:

- PIRCS 7938 - [REDACTED] Victoreen detector [REDACTED] will not rest.
- PIRCS 7479 - Out of service elevator with no IROFS in place to prevent a solution leak entering into this location.
- PIRCS 7952 - [REDACTED] Victoreen detector alarming and taken out of service.
- PIRCS 7674 - Modifications were made to the CAAS without an approved work order.

[REDACTED]

The inspectors noted that the licensee: (1) reviewed all events entered into its PIRCS system for events related to NCS; (2) was identifying corrective actions for all of the events they identified; (3) a trend of similar events reoccurring was not found; and (4) no major events were found in the time period that was investigated. Corrective actions appeared to be appropriate.

c. Conclusions

Licensee identified NCS-related events and corrective actions were adequately tracked by the licensee problem reporting system.

5.0 Open Item Follow-up

IFI 70-143/2005-205-02 through 09

These items track licensee commitments to clarify facility validation. The inspectors discussed the licensee's actions to address the various validation-related issues. With the exception of IFI 70-143/2005-205-07, the licensee did not have any documentation that it had completed work on these IFIs. Licensee staff asserted that some work had been completed. These items remain open.

IFI 70-143/2005-205-07

This item tracked the licensee commitment to maintain the current prohibition on the use of positive bias in procedure NFS-HS-A-63, "Verification and Validation of Nuclear Criticality Safety Analysis Codes." The licensee showed the inspectors where it had added a statement to procedure NFS-HS-A-63 institutionalizing the commitment to zero out any positive bias when doing validation. This item is closed.

6.0 Exit Meeting

The inspectors presented the inspection scope and results to members of the licensee's management and staff during an exit meeting on June 23, 2006. The licensee acknowledged and understood the findings as presented.

[REDACTED]

SUPPLEMENTAL INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Opened

- VIO 70-143/2006-205-01 Failure to have dual CAAS detector coverage at WWTF
- IFI 70-143/2006-205-02 Tracks licensee review of its lightning protection system
- URI 70-143/2006-205-03 Splitting a downblending accident sequence into additional sequences

Closed

- IFI 70-143/2005-205-07 Tracks commitment to maintain the current prohibition on the use of positive bias in procedure NFS-HS-A-63, and to clarify license commitments regarding calculation of k_{eff} and the use of positive bias

Discussed

- IFI 70-143/2005-205-02 Tracks determination of appropriate experimental uncertainties and the reason for the observed spread in k_{eff} (BLEU validations 54T-03-0054 and 54T-03-0009)
- IFI 70-143/2005-205-03 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 70-143/2005-205-04 Tracks specification of which materials cover which portions of the area of applicability (AOA) in the BLEU validation reports (BLEU validations 54T-03-0054 and 54T-03-0009)
- IFI 70-143/2005-205-05 Failure to prohibit use of positive bias in calculating upper safety limit (USL) values for HEU operations
- IFI 70-143/2005-205-06 Tracks commitment to revise the validation reports to correctly calculate the USL (BLEU validations 54T-03-0054 and 54T-03-0009, and any others affected)
- IFI 70-143/2005-205-08 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 70-143/2005-205-09 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)

2.0 Inspection Procedures Used

IP 88015 Headquarters Nuclear Criticality Safety Program

3.0 Key Points of Contact

Nuclear Fuel Services, Inc.

R. Mauer	Engineer, NCS
N. Brown	Engineer, NCS
R. Shackelford	Manager, NCS
M. Tester	Manager, Radiological Control
T. Coates	Manager, E&I Section
R. Ratner	Health Physicist
D. Hopson	Manager, BLEU Safety and Regulatory
R. Droke	Director, Safety
B. Moore	Vice President, Safety and Regulatory
J. Nagy	Senior Licensing and Regulatory Compliance Officer
J. Wheeler	Manager, ISA
L. Willis	Engineer, Quality
G. Hazelwood	Director, Engineering
T. Sheehan	Director, HEU Operations
K. Schutt	Vice President
P. Johnson	Vice President, Applied Technology
C. Woodhale	Director
D. Ferguson	CEO
A. Ward	General Counsel

NRC

S. Burris	Senior Resident Inspector, NRC Region II
M. Crespo	Fuel Cycle Facility Inspector, NRC Region II
C. Tripp	Sr. Criticality Safety Reviewer, NRC HQ
T. Marenchin	Criticality Safety Inspector, NRC HQ

All attended the exit meeting on June 23, 2006.

4.0 List of Acronyms and Abbreviations

AOA	area of applicability
BLEU	blended low-enriched uranium
BPF	BLEU preparation facility
CAAS	criticality accident alarm system
HEU	high-enriched uranium
IE	initiating events
IFI	inspection followup item
IP	inspection procedure
IROFS	item relied on for safety
ISA	integrated safety analysis
LCO	limiting condition for operation
LEU	low-enriched uranium
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NRC	U.S. Nuclear Regulatory Commission
OCB	oxide conversion building
PIRCS	problem identification, resolution, and corrective system
UNB	uranyl nitrate building
URI	unresolved item
USL	upper safety limit
VIO	violation
WWTF	waste water treatment facility
WOG	wet off-gas