

[REDACTED]

Mr. Kerry Schutt, President  
and General Manager  
Nuclear Fuel Services, Inc.  
P.O. Box 337, MS 123  
Erwin, TN 37650

September 9, 2005

SUBJECT: INSPECTION REPORT NO. 70-143/2005-205 AND NOTICE OF VIOLATION

Dear Mr. Schutt:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your facility in Erwin, Tennessee, from August 8 through 12, 2005. 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 August 12, 2005. 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 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 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](http://www.nrc.gov); select What We Do, Enforcement, then Enforcement Policy. The violation is

[REDACTED]

[REDACTED]

[REDACTED]

K. Schutt

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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 follow procedures.

The violation involves the use of positive bias (i.e., credit for over-predicting  $k_{eff}$ ) in calculating the maximum allowed  $k_{eff}$  or upper safety limit (USL) (values below the USL are subcritical) in validation reports for the HEU operations. Your procedure prohibits use of positive bias, and this is consistent with NRC policy. We note that NRC staff, in consultation with management, expended significant time to convince you that the issue existed and that prompt corrective action was required. The NRC views the inability to demonstrate subcriticality as defined in your license as a significant concern. Ultimately, your staff was able to recalculate the USL in accordance with a procedure using a less conservative (but still acceptable) statistical approach and was able to provide adequate assurance that abnormal conditions with calculated  $k_{eff}$  near the 0.95 safety limit contained in your license would be subcritical. The NRC understands that you have committed to begin a dialogue with the licensing staff to clarify the license application with regard to determining the maximum allowable  $k_{eff}$ , and we look forward to having this dialogue.

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]

If you have any questions concerning this report, please contact Lawrence Berg, of my staff, at (301) 415-6215.

Sincerely,

/RA/

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

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

Enclosures: (1) Notice of Violation  
(2) Inspection Report 70-143/2005-205

[REDACTED]



K. Shutt

- 2 -

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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.



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Sincerely,  
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Division of Fuel Cycle Safety  
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Docket No. 70-143  
License No. SNM-124

Enclosures: (1) Notice of Violation  
(2) Inspection Report 70-143/2005-205

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[REDACTED]  
**NOTICE OF VIOLATION**

Nuclear Fuel Services, Inc.  
Erwin, TN

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

During an NRC inspection conducted from August 8 through 12, 2005, 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:

Safety Condition No. S-1 of Special Nuclear Material License No. 124 requires that material be used in accordance with the statements, representations, and conditions in the license application dated July 24, 1996, and supplements thereto.

Section 2.7 of the license application requires operations and safety function activities to be conducted in accordance with written procedures.

Procedure NFS-HS-A-63, Section 6.2, "Validation of NCS Analytical Methods," states, in part, that "The maximum allowed  $k_{eff}$  or  $k_{safe}$  value [REDACTED] where...the bias and bias uncertainty are determined [REDACTED] at the 95% confidence level." In addition, "Only negative bias values are used, positive bias values are [REDACTED]"

Contrary to the above, in validation reports 54T-04-0043 and WRS-97-001, the licensee established upper safety limits (USLs) using the 95/99.9 single-sided tolerance limit approach, but took credit for positive bias in several subgroupings of the data. This resulted in an over-estimation of the USL for two of the high-enriched uranium subgroupings and, in one instance, for the entire set of experiments analyzed. Use of positive bias resulted in a USL greater than the maximum allowed  $k_{eff}$  limit of 0.95 for abnormal conditions, when assuming positive biases to be zero would have resulted in a USL less than 0.95.

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 Regional Administrator, Region II, and the Chief, Technical Support Group, Division of Fuel Cycle Safety and Safeguards, NMSS, 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

Enclosure 1

[REDACTED]

[REDACTED]

compliance will be achieved. Your response may reference or include previous 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, with the basis for your denial, to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

[REDACTED]

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

Dated this 9th day of September 2005

[REDACTED]



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

Docket No.: 70-143

Licensee No.: SNM-124

Report No.: 70-143/2005-205

Licensee: Nuclear Fuel Services, Inc.

Location: Erwin, TN

Inspection Dates: August 8 - 12, 2005

Inspectors: Lawrence Berg, Criticality Safety Inspector  
Christopher Tripp, Senior Criticality Safety Reviewer

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



Enclosure 2

[REDACTED]

## EXECUTIVE SUMMARY

### Nuclear Fuel Services, Inc. NRC Inspection Report No. 70-143/2005-205

#### 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., Erwin, Tennessee, facility from August 8 through 12, 2005. The inspection included an on-site review of the licensee programs dealing with the NCS program, audits and inspections, plant operations, 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 in [REDACTED].

#### Results

- No safety concerns were noted during the inspection, with the exception of the issues discussed herein.
- There were a number of inconsistencies and deficiencies in the facility validation reports, involving treatment of experimental uncertainties, verification of the normality of the benchmarks, definition of the area of applicability (AOA), and calculation of upper safety limits (USLs). The most significant was the violation regarding use of positive bias in calculating USLs applicable to highly enriched uranium (HEU) systems. The inspectors determined, however, that there was adequate conservatism in the statistical method to demonstrate compliance with the maximum abnormal case k-effective ( $k_{eff}$ ) of 0.95 without taking credit for positive bias. In addition, the inspectors determined that the licensee was correctly using the single  $k_{eff}$  method in NCS evaluations.
- The licensee NCS audits were adequate for maintaining acceptable levels of safety.
- Plant operations involving [REDACTED] materials were conducted safely and in accordance with written procedures.

[REDACTED]

## REPORT DETAILS

### 1.0 NCS Program (88015)

#### a. Scope

The inspectors reviewed NCS evaluations (NCSEs) to determine that criticality safety of risk-significant operations was assured through engineered features and human performance (controls) with adequate safety margin/certainty, preparation and review by capable staff. The inspectors reviewed documentation associated with criticality code validation to confirm that the licensee appropriately validated its criticality codes and had adequate assurance of subcriticality. Documents reviewed included several validation reports and the procedure for performing validation and verification. The inspectors also reviewed application of the "single  $k_{eff}$  method" described in Section 4.2.3.2 of the license application. The inspectors reviewed selected aspects of the following documents:

- 54X-05-0001, "Nuclear Criticality Safety Evaluation [REDACTED] Facility," Revision 1, dated May 23, 2005
  - 54X-04-0050, "Nuclear Criticality Safety Evaluation [REDACTED]" Revision 0, dated June 28, 2005
  - 54T-05-0016, "Addendum 2 to Nuclear Criticality Safety Evaluation [REDACTED]" Revision 0, dated May 10, 2005
  - 21T-05-1144, Procedure NFS-HS-A-63, "Verification and Validation of Nuclear Criticality Safety Analysis Codes," Revision 3, dated June 23, 2005
  - 54T-04-0043, "Validation of the [REDACTED]" Revision 0, dated May 2004
  - 54T-03-0054, "Validation of [REDACTED]" Revision 0, dated November 2003
  - 54T-03-0009, "Validation [REDACTED]" Revision 1, dated March 2003
  - WRS-97-001, "Validation of the [REDACTED]" dated May 20, 1997
  - 54T-05-0014, "Nuclear Criticality Safety Evaluation [REDACTED]" Revision 8, dated April 2005
  - 54X-01-0030, "Nuclear Criticality Safety Analysis [REDACTED]" Revision 0, dated February 22, 2002
  - 21T-05-1191, "Nuclear Criticality Safety Evaluation/Analysis Writer's Guide," Revision 5, dated June 24, 2005
- [REDACTED]

[REDACTED]

b. Observations and Findings

The inspectors determined that evaluations or analyses were performed by qualified NCS engineers, that independent reviews were completed for the evaluations or analyses by other qualified NCS engineers, and that subcriticality of the systems and operations was assured through appropriate limits on controlled parameters. The inspectors determined that NCS controls for equipment and processes assured the safety of the operations.

The inspectors reviewed the licensee's changes made to the [REDACTED] NCSE. The inspectors noted that the NCSE had been revised to eliminate a physically impossible accident scenario that was the subject of **VIO 70-143/2004-207-05**. The inspectors observed that the revised NCSE still did not clearly articulate the worst case normal condition model as required in Section 4.1.1 of the license application. The inspectors noted that section 2.7 of the licensee's NCSE Writer's Guide stated that NCS engineers should strive to communicate very clearly what is intended in the NCS evaluation. The inspectors discussed this concern with the NCS manager, who committed to revise the NCSE to clearly articulate the technical basis. The licensee's revision of [REDACTED] [REDACTED] NCSE to clearly articulate the technical basis will be tracked as **Inspector Followup Item (IFI) 70-143/2005-205-01**.

The inspectors reviewed the validation reports 54T-03-0054 and 54T-03-0009, applicable to the Blended Low-Enriched Uranium (BLEU) processes, and determined that each adequately determined an AOA and USL for BLEU operations. [REDACTED]

[REDACTED]

The inspectors noted that the two BLEU validation reports appeared to use a methodology that differed from that in other validation reports on-site, and appeared to differ from the single-sided lower tolerance limit approach specified in procedure NFS-HS-A-63. The licensee stated that this was due to the validation being performed by the BLEU contractor (Framatome ANP), rather than Nuclear Fuel Services (NFS)

[REDACTED]

[REDACTED]

NCS staff. Upon further review, the inspectors determined that the method was in fact consistent with the single-sided lower tolerance limit with a 95/95 confidence.

The inspectors, however, identified a number of other concerns with the two BLEU validation reports. [REDACTED]

[REDACTED]

[REDACTED] The inspectors observed that large spreads in the data could be attributable to the use of critical experiments that are not well-characterized [REDACTED]. Therefore, the inspectors questioned whether the [REDACTED] experiments analyzed were of sufficient benchmark quality to be used for validation. The licensee committed to determine the appropriate experimental uncertainties and the reason for the observed spread in  $k_{eff}$  values. Determination of the appropriate experimental uncertainties and the reason for the observed spread in  $k_{eff}$  values in the BLEU validations will be tracked as **IFI 70-143/2005-205-02**.

The inspectors also noted that the computer platform and operating system used to perform the validation was not indicated. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. The licensee committed to reanalyze the normality of the data. The impact of the lack of normality of the data on the adequacy of the  $0.97 k_{eff}$  limit in the BLEU validations will be tracked as **IFI 70-143/2005-205-03**.

The inspectors also determined that the definition of the AOA corresponded to the range of important parameters covered by the benchmark experiments as a whole, but that it was not sufficiently detailed to convey the fact that certain materials covered only certain portions of the range. [REDACTED]

[REDACTED]

[REDACTED] The licensee committed to examine the coverage of different parts of the neutron energy range by materials in the critical experiments. The specification of which materials cover which portions of the AOA in the BLEU validation reports will be tracked as **IFI 70-143/2005-205-04**.

The inspectors also reviewed the validation reports 54T-04-0043 and WRS-97-001, which were performed by NFS NCS personnel. [REDACTED]

[REDACTED]

[REDACTED] For each of these subgroupings, the licensee calculated a USL using the 95/95 single-sided lower tolerance limit approach, as specified in procedure NFS-HS-A-63. The inspectors noted, however, that some of these subgroupings exhibited a positive bias [REDACTED]

[REDACTED]. Procedure NFS-HS-A-63, Section 6.2, Step 5, contains the following equation for calculating the USL:

[REDACTED]

[REDACTED] Procedure NFS-HS-A-63, Section 6.2, Step 5c, also specifies that only negative bias values are to be used [REDACTED]

[REDACTED] However, in validation reports 54T-04-0043 and WRS-97-001, the licensee used the following equation to calculate the USL [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

If the USL calculated as above exceeded the maximum allowable  $k_{eff}$  of 0.95 [REDACTED] the licensee concluded that applications within the AOA in the report would be acceptably subcritical with a maximum  $k_{eff}$  of 0.95 (for abnormal conditions). The inspectors recalculated the USL for those subgroupings which had a positive bias, and noted that in some cases this resulted in a USL below 0.95. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Based on these results, the conclusion that the  $k_{eff}$  limit of 0.95 was shown to be acceptable based on the validation was erroneous. The use of positive bias in the HEU operation validations is a violation of the validation procedure, and will be tracked as **VIO 70-43/2005-205-05**. The licensee stated during the inspection that in its view, the license allows the use of positive bias, notwithstanding statements in Section 4.2.3.2 to the effect that positive values [REDACTED] p. 44 of Chapter 4.0 of the license application). The licensee stated that this particular section of the license application does not apply to validation, but to individual  $k_{eff}$  calculations, and that this section was nonetheless superceded by License Condition S-10. The NRC does not agree with this interpretation, but rather believes that the intent of the license was to preclude the use of positive bias in calculating maximum  $k_{eff}$  limits.

The inspectors determined that this raised a safety concern which needed to be addressed promptly as to whether there was adequate assurance that the licensee's abnormal condition cases were subcritical. The licensee stated that there was additional conservatism in the statistical methodology used to calculate the USL, due to its use of a 95/99.9 confidence criterion in implementing the single-sided lower tolerance method (i.e., 95% confidence that 99.9% of all future calculations below the USL will be subcritical). License Condition S-10 allows use of a 95/95 confidence criterion with the single-sided lower tolerance method. The licensee recalculated the USLs for all subgroupings in the affected validations, by zeroing out the positive biases and switching to a 95/95 confidence criterion. The results of this analysis showed that in all cases the licensee could demonstrate a USL exceeding 0.95. Upon making this determination, the inspectors concluded that the maintenance of subcriticality had been adequately addressed such that the safety concern was resolved.

[REDACTED]

In response to this violation, the licensee made certain commitments to ensure the continued subcritical operation of the facility. The licensee's commitment to revise the validation reports to calculate the USL without crediting positive bias will be tracked as

**IFI 70-143/2005-205-06.** The licensee has also committed to maintain the current prohibition on the use of positive bias in the procedure for performing code validation and verification, and to work with the NRC's licensing staff to clarify licensee commitments regarding the calculation of  $k_{eff}$  in general, and the use of positive bias in particular. These commitments are closely related and will be tracked as **IFI 70-143/2005-205-07.**

The inspectors also observed that the definition of the AOA in the HEU operation validation reports seemed overly broad. Although there was a large number of benchmark experiments, the AOA was defined to include all chemical and physical forms, geometries, reflection conditions, and any values of enrichment, moderation and density. Due to the lack of parameter trending in the HEU operation validation reports, it was difficult to confirm the exact bounds of the AOA. The licensee committed to reexamine the definition of the AOA. Determination of the appropriate bounds of the defined AOA in the validation reports covering HEU operations will be tracked as **IFI 70-143/2005-205-08.**

In addition, the inspectors determined that the HEU operation validation reports relied on the single-sided lower tolerance limit method, but did not contain any reference to verifying that the data were normally distributed. The licensee committed to analyze the data for normality. This will be tracked as part of **IFI 70-143/2005-205-02.**

Finally, the inspectors noted several apparent inconsistencies in the terminology and methods used in the HEU operation validation reports. [REDACTED]

[REDACTED]

[REDACTED] Neither of these definitions is consistent with procedure NFS-HS-A-63, which requires the minimum subcritical margin [REDACTED] to be applied to the 95/95 lower tolerance limit to determine  $k_{safe}$  (also known as the USL). In addition, the report states that the margin of subcriticality is [REDACTED] for all subgroupings, but the table immediately preceding this shows that this is not the case.

However, the inspectors determined that with the exception of low-enriched [REDACTED] experiments, the subcritical margin thus determined was [REDACTED], so that there would have still been adequate margin [REDACTED] if the lower tolerance limit method had been used. (Low-enriched [REDACTED] are not typical of facility operations, with the possible exception of the BLEU project, which is covered by the other validation reports

[REDACTED]

[REDACTED]

discussed previously.) In principle, however, the different uses of these terms and inconsistencies between the validation reports and the applicable procedure (e.g., using the confidence limit, which is not discussed in the procedure, to calculate the margin of subcriticality) could lead to considerable confusion and could lead to having less than the minimum margin required. The licensee committed to consult with outside experts and revise the validation reports appropriately. The resolution of inconsistencies between the validation reports and the procedure, and correcting the methods used to verify adequacy of the margin, will be tracked as **IFI 70-143/2005-205-09**.

The inspectors also reviewed the application of the [REDACTED] for demonstrating subcriticality. This method is described in Section 4.2.3.2 of the license application. Additional guidance is provided in 21T-05-1191, "Nuclear Criticality Safety Evaluation/Analysis Writer's Guide," Appendix D. This method consists of performing a

[REDACTED]

The inspectors determined that the explanation provided in the writer's guide is consistent with the license requirements.

The inspectors then reviewed several applications of the [REDACTED] to determine if the licensee was complying with the specified procedure and it gave acceptable results. Section 4.2.2.16 of 54T-05-0014, "Nuclear Criticality Safety Evaluation for the [REDACTED]

[REDACTED]. The licensee varied the [REDACTED] and calculated  $k_{eff}$  to determine the variation. In these instances, the licensee did not carry the calculation all the way up to  $k_{eff}$  of 0.95, but truncated the sensitivity analysis before reaching 0.95, and then used the highest calculated  $k_{eff}$  and backed off the specified amount to determine the maximum normal case [REDACTED]. Because the licensee used a failure limit established at a  $k_{eff}$  less than 0.95, and because the actual spacing was much greater than the maximum allowed by the procedure, there was considerable margin in the results.

The inspectors also reviewed a similar application in 54X-01-0030, "Nuclear Criticality Safety Analysis [REDACTED]," and found it to be acceptable for similar reasons. The inspectors thus determined that the licensee had correctly applied the technique.

[REDACTED]



c. Conclusions

There were a number of inconsistencies and deficiencies in the facility validation reports, involving treatment of experimental uncertainties, verification of the normality of the benchmarks, definition of the AOA, and calculation of USLs. The most significant was the violation regarding use of positive bias in calculating USLs applicable to HEU systems. The inspectors determined, however, based on licensee reanalysis, that there was adequate conservatism in the statistical method to demonstrate compliance with the maximum abnormal case  $k_{eff}$  of 0.95 without taking credit for positive bias. In addition, the inspectors determined that the licensee was correctly using the single  $k_{eff}$  method in NCS evaluations.

**2.0 NCS Inspections, Audits, and Investigations (88015)**

a. Scope

The inspectors reviewed previously completed audits of [REDACTED] operations. The inspectors reviewed selected aspects of the following documents:

- 21T-05-1191, "Nuclear Criticality Safety Evaluation/Analysis Writer's Guide," Revision 5, dated June 24, 2005
- Audit records (April - July 2005)

b. Observations and Findings

The inspectors observed that the NCS audits were conducted in accordance with the requirements specified in the NCS audit writer's guide. The inspectors noted that the NCS engineers: (1) reviewed open NCS issues from previous audits; (2) reviewed the adequacy of control implementation; (3) reviewed plant operations for compliance with license, procedures, and postings; and (4) examined equipment and operations to determine that past evaluations remain adequate. The inspectors determined that licensee NCS audits were adequate for maintaining acceptable levels of safety.

c. Conclusions

The licensee NCS audits were adequate for maintaining acceptable levels of safety.

**3.0 Plant Operations (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



[REDACTED]

operators and NCS engineers both before and during walkdowns. The inspectors reviewed selected aspects of the following documents prior to performing the walkdowns:

- 54X-05-0001, "Nuclear Criticality Safety Evaluation [REDACTED] Facility," Revision 1, dated May 23, 2005
- 54X-04-0050, "Nuclear Criticality Safety Evaluation: [REDACTED]" Revision 0, dated June 28, 2005
- 54T-05-0016, "Addendum 2 to Nuclear Criticality Safety Evaluation [REDACTED]" Revision 0, dated May 10, 2005

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]. No safety concerns were noted during walkdowns.

c. Conclusions

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

**4.0 Open Item Followup**

**VIO 70-143/2003-10-01**

This item concerned three examples of the licensee's failure to follow procedures. One example concerned the licensee's storage of SNM [REDACTED] containers in [REDACTED] facility. During inspection 70-143/2003-10-01, the inspectors observed the storage of [REDACTED] drums containing [REDACTED] in a location which was not posted with a storage station limit card. The inspectors noted that the location was not designated for storage by licensee procedure NFS-HS-CL-13, "[REDACTED]," Rev. 14, dated September 17, 2002, which applied to the scanning facility. During this inspection, the inspectors verified that the licensee revised the [REDACTED] facility posting to include storage of the drums.

A second example concerned the failure of the licensee to create a position that was required by procedure to maintain copies of station limits. During inspection 70-143/2003-10-01, the inspectors noted that section III.A of licensee procedure NFS-HS-CL-13 required the [REDACTED] Facility Manager to maintain copies of the approved station limits. Through further discussions with the licensee, the inspectors

[REDACTED]

determined that the [REDACTED] Facility Manager position had not been established, and that copies of the approved station limits were, therefore, not being maintained as required. During this inspection, the inspectors noted that licensee procedure

NFS-HS-CL-13 had been revised to eliminate the [REDACTED] Facility Manager position.

A third example concerned the failure of the licensee to establish a required guidance document. During inspection 70-143/2003-10-01, the inspectors noted that section 5.1.b of licensee procedure NFS-HS-A-62, "Implementation of Nuclear Criticality Safety Evaluations," Rev. 2, dated June 20, 2001, required the conduct of implementation in accordance with a document which could not be located by the licensee. The inspectors had determined that the required document entitled, "Guidelines and Expectations for the Implementation of Nuclear Criticality Safety Evaluations," had not been established prior to implementation. During this inspection, the inspectors noted that licensee procedure NFS-HS-A-62 had been revised to eliminate the required guidance document.

The inspectors determined that the licensee adequately completed the necessary corrective actions to both address the violation and prevent recurrence. This item is recommended for closure in the next Region II resident inspection report.

#### **IFI 70-143/2004-201-02**

This item concerned resolution of criticality accident alarm system equipment and installation problems. During inspection 70-143/2004-206, the inspectors had determined that funds to conclude the criticality alarm system upgrade project had been allocated and that the project included a central, continuously-monitored alarm station. During this inspection, the inspectors determined that hardware and software issues associated with the replacement project had been resolved, and that the licensee was on track to complete the project by the end of this fiscal year (October). The inspectors also determined that the current incidence of trouble alarms was limited to the older detectors which had not yet been replaced due to operational constraints in the production areas. The inspectors also determined that criticality accident alarm system coverage continued to be maintained by the older detectors despite the occurrence of trouble alarms. This item is closed.

#### **IFI 70-143/2004-206-03**

This item concerned the licensee's upgrading of criticality alarm system coverage calculations. During inspection 70-143/2004-206, the inspectors were concerned about the adequacy of older criticality coverage calculations. The inspectors were informed by licensee staff that 11 of 15 criticality coverage calculations had been revised. During this inspection, the inspectors determined that the remaining four calculations had been completed. The inspectors reviewed one such calculation, 21T-05-0103, "Demonstration of Criticality Accident Alarm System (CAAS) Detector Coverage for the

[REDACTED]

[REDACTED],” which was still in draft during the inspection. The licensee informed the inspectors that the final version of the calculation, which was not expected to differ from the draft, would be approved once the criticality accident alarm system replacement project was completed, and the final locations of the replaced detectors were documented. The inspectors determined that the draft calculation was performed correctly and demonstrated acceptable detector coverage. The inspectors noted that the calculation results were conservatively biased low since secondary gamma sources were ignored from the calculation. This item is closed.

**VIO 70-143/2004-207-05**

This item concerned the licensee’s failure to ensure that k-effective values for credible abnormal conditions did not exceed the 0.95 limit. During inspection 70-143/2005-205, the inspectors questioned the credibility of the accident analysis since a credible mechanism for transferring the more reactive materials could not be postulated. During this inspection, the inspectors reviewed the licensee’s revision of the [REDACTED] NCSE and determined that the affected scenario had been eliminated from the NCSE. This item is closed.

**5.0 Exit Meeting**

The inspectors presented the inspection scope and results to members of the licensee’s management and staff during an exit meeting on August 12, 2005. The licensee acknowledged and understood the findings as presented.

[REDACTED]

## SUPPLEMENTARY INFORMATION

### 1.0 List of Items Opened, Closed, and Discussed

#### Opened

- IFI 70-143/2005-205-01** Tracks the licensee's revision of the [REDACTED] NCSE to clearly articulate the technical basis
- 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 AOA in the BLEU validation reports (BLEU validations 54T-03-0054 and 54T-03-0009)
- VIO 70-143/2005-205-05** Failure to prohibit use of positive bias in calculating 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, 54T-03-0009, and any others affected)
- 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
- 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)
- 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)



**Closed**

- IFI 70-143/2004-201-02      Tracks the licensee's resolution of criticality accident alarm system equipment problems related to the installation of new detectors and monitors
- IFI 70-143/2004-206-03      Tracks the licensee's upgrading of criticality accident alarm system coverage calculations
- VIO 70-143/2004-207-05      Failure to ensure that  $k_{eff}$  values for credible abnormal conditions did not exceed the 0.95 limit.

**Discussed**

- VIO 70-143/2003-10-01      Three examples of a failure to follow procedures

**2.0    Inspection Procedures Used**

IP 88015                              Headquarters Nuclear Criticality Safety Program

**3.0    Key Points of Contact**

**Nuclear Fuel Services, Inc.**

- R. Droke                              Director, Safety
- B. Moore                             Vice President, Safety and Regulatory
- R. Shackelford                     Manager, NCS
- M. Tester                            Manager, Radiological Control
- J. Kirk                                Licensing Specialist
- J. Nagy                                Licensing and Regulatory Compliance
- N. Brown                             Engineer, NCS
- S. Skiles                              Engineer, NCS
- C. Lewis                              Engineer, NCS
- F. Guinn                              Manager, Production Support
- P. Johnson                          Vice President, Applied Technology

**NRC**

- S. Burris                              Resident Inspector, NRC Region II
- L. Berg                                Criticality Safety Inspector, NRC-HQ
- C. Tripp                                Criticality Safety Reviewer, NRC-HQ

All attended the exit meeting on August 12, 2005.





#### 4.0 List of Acronyms and Abbreviations

AOA	area of applicability
BLEU	blended low-enriched uranium
HEU	highly enriched uranium
IFI	inspector followup item
IP	inspection procedure
$k_{eff}$	k-effective
LEU	low enriched uranium
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NRC	U.S. Nuclear Regulatory Commission
SNM	special nuclear material
USL	upper safety limit
VIO	violation
wt%	weight percent