

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

Docket No: 70-143

Licensee No: SNM-124

Report No: 70-143/2005-201

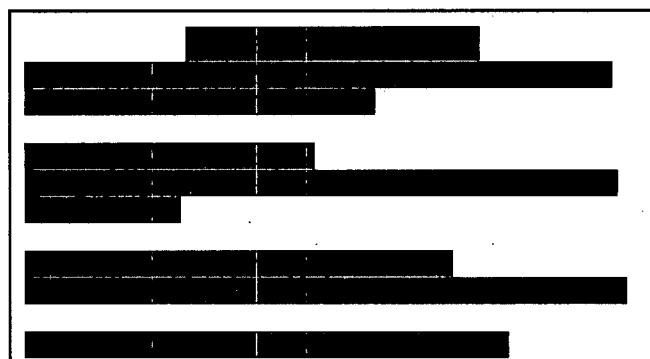
Licensee: Nuclear Fuel Services, Inc.

Location: Erwin, TN

Inspection Dates: March 28 - April 1, 2005

Inspectors: Larry Berg, Criticality Safety Inspector
Tamara Powell, Criticality Safety Technical Reviewer

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



Enclosure

EXECUTIVE SUMMARY

**Nuclear Fuel Services, Inc.
NRC Inspection Report No. 70-143/2005-201**

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 March 28 through April 1, 2005. The inspection included an on-site review of the licensee programs dealing with plant operations, the criticality alarm system, the NCS function, NCS Audits, and NCS-related corrective actions. 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 [redacted]

Results

- The NCS function was adequate for maintaining acceptable levels of safety.
- Licensee NCS audits were adequate for maintaining acceptable levels of safety.
- The licensee demonstrated adequate criticality accident alarm system coverage [redacted]
[redacted]
- Plant operations involving [redacted] materials were conducted safely and in accordance with written procedures.
- Double contingency protection was maintained and the likelihood of criticality remained highly unlikely following the March 24, 2005, reportable event. No safety concerns were identified.

REPORT DETAILS

1.0 NCS Function (88015)

a. Scope

The inspectors reviewed NCS evaluations 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 selected aspects of the following documents:

- 54T-05-0013, "Nuclear Criticality Safety Evaluation for the Oxide Conversion Building (OCB) [REDACTED]," Revision 1 (Final draft)
- 54T-04-0046, "Nuclear Criticality Safety Analysis [REDACTED]" dated June 7, 2004
- 54T-04-0132, "Addendum 2 to Revision 0 of the NCSE [REDACTED]" dated December 13, 2004
- 54X-04-0049, "NCSE [REDACTED] Facility," Revision 3, dated December 16, 2004
- 54T-05-0010, "NCSE [REDACTED]" Revision 0, dated April 4, 2004
- 54X-05-0003, "Nuclear Criticality Safety Evaluation [REDACTED]" Revision 1, dated March 17, 2005

b. Observations and Findings

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

c. Conclusions

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

2.0 NCS Inspections, Audits and Investigations (88015)

a. Scope

The inspectors reviewed records of previously completed audits of [REDACTED] operations to determine whether licensee NCS audits were adequate for maintaining acceptable levels of safety. The inspectors reviewed selected aspects of supporting documents (e.g., audit/inspections guides, criticality safety audit reports from November 2004-present, and applicable operating procedures).

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 and audit procedure. 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

Licensee NCS audits were adequate for maintaining acceptable levels of safety.

3.0 Criticality Accident Alarm System (88015)

a. Scope

The inspectors reviewed criticality accident alarm system (CAAS) detector placement analyses to determine the adequacy of models, assumptions, and calculation results used to demonstrate adequate coverage [REDACTED]. The inspectors visually inspected detector placement configurations to verify that dual detector coverage of risk significant operations was being maintained. The inspectors reviewed selected aspects of the following documents:

- 21T-01-1211, "Demonstration of Criticality Accident Alarm System (CAAS) [REDACTED]" Revision 0, dated June 23, 2003
- 21T-05-0721, "Demonstration of Criticality Accident Alarm System (CAAS) [REDACTED]" Revision 0, dated April 1, 2005

b. Observations and Findings

The inspectors observed that the licensee's detector placement methodology employed a conservative source term based only on the prompt gammas emitted by primary fission events. The inspectors observed that the dose contribution from prompt neutrons, neutron-induced photons, and delayed fission/activation product photons was excluded from the coverage analyses. In addition, the inspectors observed that prompt gammas from secondary fission events were omitted. The inspectors reviewed the calculated results [REDACTED] and determined that detector coverage of risk-significant operations was adequate.

c. Conclusions

The licensee demonstrated adequate CAAS coverage [REDACTED]

4.0 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 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 [REDACTED]

[REDACTED] The inspectors interviewed operators and NCS engineers both before and during walkdowns.

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

- 54T-04-0132, "Addendum 2 to Revision 0 of the NCSE [REDACTED]
[REDACTED]" dated December 13, 2004
- 54X-04-0049, "NCSE [REDACTED] Facility," Revision 3, dated December 16, 2004
- 54T-05-0010, "NCSE [REDACTED]" Revision 0, dated April 4, 2004
- 54X-05-0003, "Nuclear Criticality Safety Evaluation [REDACTED]
[REDACTED]" Revision 1, March 17, 2005

b. Observations and Findings

The inspectors verified that the controls identified in the NCS analyses were installed or implemented and were adequate to assure safety. The cognizant NCS engineers were knowledgeable and had good interfaces with operators on the process floors.

c. Conclusions

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

5.0 NCS Event Review

a. Scope

The inspectors reviewed the licensee response to a March 24, 2005, reportable event. The inspectors reviewed selected aspects of the following document:

- 54X-99-0077, "Nuclear Criticality Safety Analyses [REDACTED]
[REDACTED]" Revision 1, dated April 4, 2000

b. Observations and Findings

The inspectors observed that a reportable event occurred at the facility on March 24, 2005, involving the licensee's discovery of an existing container storage [REDACTED] which lacked a passive design feature for precluding storage of containers in the support framework between authorized container storage locations. During this event, the licensee did not find any containers stored in the support framework. The licensee's immediate corrective actions included taking affected storage positions out of service until the passive design feature had been installed and verified operational. Although the missing passive design feature was an item relied on for safety, the inspectors determined that double contingency protection continued to be maintained by at least two remaining items relied on for safety which limited the likelihood of criticality to highly unlikely.

c. Conclusions

Double contingency protection was maintained and the likelihood of criticality remained highly unlikely following the March 24, 2005, reportable event. No safety concerns were identified.

6.0 Open Items

VIO 70-143/2004-206-01

This item tracked the licensee's failure to comply with the [REDACTED] material handling requirements of procedure 55T-04-0033 and the Station Limit Card requirements of procedure NFS-HS-CL-19-01. The inspectors verified that corrective actions included operator instructions for not using the bag-out port sleeves for storage or collection of waste materials and work requests for establishing additional waste material storage locations. During tours of the process areas, the inspectors did not identify any additional examples of failures to comply with the procedural requirements. The inspectors determined that the licensee's corrective actions were adequate for preventing recurrence. This item is closed.

IFI 70-143/2004-206-02

This item tracked the licensee's development of additional guidance to ensure the completion of accurate and complete technical reviews. During inspection 70-143/2004-206, the inspectors had noted that a key technical reference associated with the revision to the Waste Water Treatment Facility NCS evaluation had not been completed prior to implementation. The inspectors reviewed the completed technical reference and verified that the technical basis for the new Waste Water Treatment Facility limits were adequately justified and documented. The inspectors reviewed the licensee's revisions to procedure NFS-HS-A-58, "Nuclear Criticality Safety Evaluations," Revision 8, dated February 22, 2005, and determined that adequate guidance for both NCS analysts and independent reviewers had been developed to ensure that all references or studies used in the performance of an NCS evaluation and relied on for safety are complete. This item is closed.

IFI 70-143/2004-207-03

This item tracked the licensee's actions to adequately justify the acceptability of replacing an engineered control with an administrative control. During inspection 70-143/2004-207, the inspectors observed that the NCSE for the Downblending operation had been recently revised to replace an active engineered NCS item relied on for safety (IROFS) with an administrative control. Given recently observed human performance issues in the BLEU Preparation Facility (e.g., October 25, 2004, reportable event associated with failure to sample uranium [REDACTED] solution prior to transfer from favorable to unfavorable geometry tanks), the inspectors had questioned the licensee's justification for replacing the [REDACTED] control with an administrative sampling control when the root cause investigation team for the reportable event recommended replacing another administrative sampling control with an active engineered control. During this inspection, the inspectors observed that the NCSE for the Downblending operation was in the process of being revised to specify that the administrative sampling control was enhanced by an independent third party (process

engineer) to ensure the blend recipe produced the target enrichment [REDACTED]

[REDACTED] On the basis that the enhanced administrative sampling control had the same risk-indexing as the [REDACTED] control being replaced, the inspectors determined that the likelihood for a criticality accident was not increased and that criticality safety was adequately maintained. This item is closed.

7.0 Exit Meeting

The inspectors presented the inspection scope and results to members of the licensee's management and staff during an exit meeting on April 1, 2005. The licensee acknowledged and understood the findings as presented.

SUPPLEMENTARY INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Opened

None.

Closed

- | | |
|-------------------------------|---|
| VIO 70-143/2004-206-01 | Failure to comply with the [REDACTED] material handling requirements of 55T-04-0033 and the Station Limits Card requirements of NFS-HS-CL-19-01 |
| IFI 70-143/2004-206-02 | Tracks development of additional guidance to ensure accurate and complete technical reviews |
| IFI 70-143/2004-207-03 | Tracks the licensee's actions to adequately justify the acceptability of replacing an engineered control with an administrative control. |

Discussed

None

2.0 Inspection Procedures Used

- | | |
|----------|---|
| IP 88015 | Headquarters Nuclear Criticality Safety Program |
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3.0 Partial List of Persons Contacted

Nuclear Fuel Services, Inc.

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|-----------------|---------------------------------------|
| *R. Mauer | Engineer, NCS |
| *N. Brown | Engineer, NCS |
| *B. Moore | Vice President, Safety and Regulatory |
| *R. Shackelford | Manager, NCS |
| *A. Vaughan | Director, Fuel Production |
| *J. Kirk | Licensing Specialist |
| *J. Nagy | Licensing and Regulatory Compliance |

NRC

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|------------|----------------------------------|
| *D. Rich | Senior Resident Inspector, NFS |
| *L. Berg | Criticality Safety Inspector, HQ |
| *T. Powell | Criticality Safety Reviewer, HQ |

* Denotes attendance at the exit meeting on April 1, 2005.