

February 15, 2007

Mr. Jack D. Fuller
Facility Manager, M/C A20
Global Nuclear Fuel - Americas, LLC
P.O. Box 780
Wilmington, NC 28402

SUBJECT: INSPECTION REPORT NO. 70-1113/2007-201

Dear Mr. Fuller:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced nuclear criticality safety (NCS) inspection of your facility in Wilmington, North Carolina, from January 29 through February 2, 2007. The purpose of the inspection was to determine whether operations involving special nuclear material were conducted safely and in accordance with regulatory requirements. Inspection observations and findings were discussed with members of your staff and management throughout the inspection. An exit meeting was conducted at the conclusion of the inspection on February 2, 2007.

The inspection, which is described in the enclosure, focused on NCS analysis, risk-significant NCS controls, items relied on for safety, and principal management measures for ensuring that NCS controls are capable, available, and reliable. The inspection consisted of NCS analytical basis review, selective examinations of relevant procedures and records, examinations of NCS-related equipment, interviews with plant personnel, and facility walkdowns to observe in-plant conditions and activities related to NCS assumptions and controls. Throughout this inspection, observations were discussed with your managers and staff.

In accordance with 10 CFR 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be made publicly available in the public electronic reading room of the NRC's Agency-Wide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/ADAMS.html>.

J.D. Fuller

- 2 -

If you have any questions concerning this report, please contact Dennis Morey, of my staff, at (301) 415-6107.

Sincerely,

/RA/

Wilkins R. Smith, Acting Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket No.: 70-1113

Enclosure: Inspection Report No. 70-1113/2007-201

cc: w/enclosure: Scott Murray
Global Nuclear Fuels - Americas, LLC

cc: w/o enclosure: Beverly O. Hall
North Carolina Department of Environmental
Health and Natural Resources

J.D. Fuller

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

Docket No.: 70-1113

License No.: SNM-1097

Report No.: 70-1113/2007-201

Licensee: Global Nuclear Fuel - Americas, LLC

Location: Wilmington, North Carolina

Inspection Dates: January 29 - February 2, 2007

Inspectors: Dennis Morey, Senior Criticality Safety Inspector, Headquarters
Thomas Marenchin, Criticality Safety Inspector, Headquarters

Approved: Wilkins R. Smith, Acting Chief
Technical Support Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

ENCLOSURE

**Global Nuclear Fuel - Americas, LLC Fuel Fabrication Facility
NRC Inspection Report 70-1113/2007-201**

EXECUTIVE SUMMARY

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection at Global Nuclear Fuel - Americas (GNF), LLC, fuel fabrication facility in Wilmington, North Carolina, from January 29 through February 2, 2007. The inspection included an on-site review of the licensee NCS program, NCS analyses, administrative and operating procedures, NCS-related audits and investigations, NCS-related internal events, criticality warning system issues, plant operations, and open item follow-up. The inspection focused on risk-significant fissile material processing activities including the dry conversion process (DCP), dry scrap recovery, gadolinium process, ceramics, rod and bundle loading, ammonium diuranate (ADU) and uranium recovery safe store areas, incinerator, uranium hexafluoride (UF₆) cylinder receiving, and oil storage warehouse.

Results

- A minor violation was identified during walkdowns of licensee fissile material operations which was immediately corrected.
- No safety concerns were identified regarding the licensee NCS program.
- No safety concerns were identified regarding licensee NCS administrative and operating procedures.
- No safety concerns were identified regarding the licensee NCS training program.
- No safety concerns were identified regarding licensee internal audits.
- No safety concerns were identified regarding licensee internal event reporting, investigation, and correction action.

REPORT DETAILS

1.0 Plant Status

Global Nuclear Fuels - America, LLC manufactures uranium dioxide (UO_2) powder, pellets, and light water reactor fuel bundles at its Wilmington, NC facility. During the inspection, the facility was converting uranium hexafluoride (UF_6) to UO_2 with a dry conversion process and performing normal powder, UO_2 and gadolinia pellet and fuel fabrication operations. Waste operations consisted primarily of packaging and storage of dry waste and processing of wet sanitary waste.

2.0 Nuclear Criticality Safety Program [88015, 88016]

a. Inspection Scope

The inspectors reviewed NCS analyses to determine that criticality safety of risk-significant operations was assured through engineered and administrative controls, with adequate safety margin and preparation and review by qualified staff. The inspectors accompanied NCS and other technical staff on walkdowns of NCS controls in selected plant areas. The inspectors reviewed selected aspects of the following documents:

- CSA [criticality safety analysis], "Minimum Gd_2O_3 [gadolinium oxide] Content for Homogeneous UO_2 Powder in an MCA [moderator controlled area]," Revision 0, dated January 16, 2007
- CSA, "Chemet Lab Operation at 5% Enriched UO_2 ," Revision 6, dated December 8, 2006
- CSA, "Rod Storage Cabinets," Revision 5, dated November 16, 2006
- CSA 1320.02, "Uniform and Non-Uniform Moderation Limits for UO_2 Powder," Revision 6, June 23, 2006
- CSA, "Bundle Forest with Channels," Revision 3, December 6, 2006
- CSA, "West Gad Interaction GEMER Model," Revision 9, dated November 17, 2006
- CSA 1930.00, "FMO Radwaste Quarantine," Revision 4, dated September 6, 2006
- CSA 1080.69, "Fuel Support Waste Treatment pH Adjust Tank," Revision 0, dated August 30, 2006

b. Observations and Findings

The inspectors determined that analyses were performed by qualified 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 appropriate NCS controls were identified in analysis and that the controls as identified for equipment and processes assured the safety of the operations.

c. Conclusions

No safety concerns were identified regarding the licensee NCS program.

3.0 Administrative and Operating Procedures [88015]

a. Inspection Scope

The inspectors reviewed NCS administrative procedures to determine whether the procedures adequately implement the NCS program described in the license. The inspectors reviewed selected aspects of the following documents:

- NSI [Nuclear Safety Instruction] E-3.0, "Nuclear Safety Reviews," Revision 32, dated August 16, 2006
- NSI A-4.0, "Nuclear Safety Instructions Issuance and Control," Revision 18, dated November 29, 2006
- NSI E-4.0, "Criticality Safety Analysis Methods and Verification," Revision 35, dated May 9, 2006
- NSI E-5.0, "Nuclear Safety Release Requirements," Revision 3, dated August 15, 2006
- NSI O-4.0, "Nuclear Safety Instrumentation," Revision 66, dated January 10, 2007

b. Observations and Findings

The inspectors reviewed licensee administrative procedures, a selection of new and changed NCS analyses, and selected NCS controls. The inspectors interviewed licensee managers, NCS engineers, system engineers, and facility operators during document reviews and facility walkdowns. Based on the procedures and NCS analysis reviewed, the inspectors determined that the licensee NCS program was conducted in accordance with written administrative procedures that reflected the program described in the license.

c. Conclusions

No safety concerns were identified regarding licensee NCS administrative and operating procedures.

4.0 Nuclear Criticality Safety Training and Qualifications [88015]

a. Inspection Scope

The inspectors reviewed the content of NCS training for general workers and for fissile material handlers. The inspectors evaluated the effectiveness of the licensee NCS training through interviews with both categories of workers. The inspectors also interviewed licensee training management. The inspectors reviewed selected aspects of the following document:

- NS203A, "Criticality Safety Full Red Bar Training Course," dated May 2006.

b. Observations and Findings

The inspectors reviewed the NCS training, which is a separate module in the general employee safety training. The inspectors determined that the training effectively identified NCS parameters and related facility NCS controls to those parameters. The inspectors noted that the most important NCS controls were clearly identified and emphasized in the training materials.

c. Conclusions

No safety concerns were identified regarding the licensee NCS training program.

5.0 Nuclear Criticality Safety Inspections, Audits, and Investigations [88015]

a. Inspection Scope

The inspectors reviewed licensee internal audit procedures, records of previously completed audits of fissile material operations, and records of NCS infractions. The inspectors observed a member of the licensee's NCS staff conduct an audit in the Fuel Support, Incinerator, UF₆ Cylinder Dock, Chemical Tech Lab, and Oil Storage Warehouse areas. The inspectors reviewed selected aspects of the following internal event reports and associated documents:

- NSI E-2.0, "Internal Nuclear Safety Audits," Rev. 40, dated October 2, 2006
- Shipping, Box Factory, Pad 12, Warehouse, Refurb, dated December 19, 2006
- HF building, dated November 14, 2006
- URU, Laundry, New Decon, DURF, dated October 10, 2006
- Fabrication Bundle Assembly Area, dated November 28, 2006
- QA Labs (Chemical Tech Lab, URU, Env.), dated December 5, 2006
- DCP: Homo, Blend, Precompact, Gramulate, Tumble, Power Pack, dated December 12, 2006
- Fuel Support, Incinerator, UF₆ Cylinder Dock, Chemical Tech Lab, Oil Storage Warehouse, dated November 2, 2006
- Fuel Support, Incinerator, UF₆ Cylinder Dock, Chemical Tech Lab, Oil Storage Warehouse, dated January 30, 2007

b. Observations and Findings

The inspectors found that NCS audits were conducted according to procedural requirements. The inspectors noted that NCS audits were focused on determining that plant operational requirements conform to those listed in the applicable NCS specification documents. During the audit of the Fuel Support, Incinerator, UF₆ Cylinder Dock, Chemical Tech Lab, and Oil Storage Warehouse areas, the inspectors observed that the licensee's NCS auditor examined NCS postings, labels, and other controls.

c. Conclusions

No safety concerns were identified regarding licensee internal audits.

6.0 Nuclear Critically Safety Event Review and Followup [88015]

a. Inspection Scope

The inspectors reviewed recently reported internal events related to NCS. The inspectors reviewed selected aspects of the following documents:

- FAB-0624, "Tray #2220 Rolled Off the Mechanical Stops," dated October 4, 2006
- FAB-0628, "Over Loaded Rod Lot," dated November 8, 2006
- PP&SS-0638, "Incorrect Calibration Parameters," dated October 19, 2006

b. Observations and Findings

The inspectors reviewed selected licensee internally-reported events. The inspectors observed that internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned. The inspectors did not identify any safety concerns regarding licensee reporting, investigation, and correction of internal NCS-related events.

c. Conclusions

No safety concerns were identified regarding licensee internal event reporting, investigation, and correction action.

7.0 Plant Operations [88015]

a. Inspection Scope

The inspectors performed plant walkdowns to review activities in progress and to determine whether risk-significant fissile material operations were being conducted safely and in accordance with regulatory requirements. The inspectors interviewed operators, NCS engineers, and process engineers both before and during walkdowns. The inspectors reviewed selected aspects of the following documents:

- OP [operating procedure] 1320, "DCP General," Revision 51, dated January 8, 2007
- NSR/R [nuclear safety release/requirement] 15.01.07, "DCP Sinks," Revision 3, dated March 14, 2005
- NSR/R 15.06.07, "DCP Cleaning," Revision 5, dated February 11, 2003

b. Observations and Findings

The inspectors performed walkdowns of the dry conversion process, dry scrap recovery, gadolinium process, ceramics, rod and bundle loading, ADU and uranium recovery safe store areas, incinerator, UF₆ cylinder receiving, oil storage warehouse.

Dry Conversion Process

The inspectors performed walkdowns of moderator controlled areas (MCAs) and moderator restricted areas (MRAs) in order to understand how the licensee implements NCS controls in these areas. During walkdowns of the DCP, the inspectors observed full, partially full, and empty containers of cleaning solutions in DCP process areas. In one of the process areas, the number of containers present totaled a volume of nearly 7 liters which was substantially in excess of the 3-liter limit on cleaning solutions in the process areas although the amount of solution present appeared to be around 3 liters. The inspectors noted that the 3-liter procedural limit was one-third of the 9-liter safety limit for moderator in an MRA and that the system involved was sealed. The inspectors concluded that the issue was of minor safety significance but were concerned that work practices involving cleaning solutions in the DCP may conflict with procedural requirements. Although this issue should be corrected, it constitutes a violation of minor significance that is not subject to enforcement action in accordance with Section IV of the Enforcement Policy. The licensee took immediate action to remove containers, brief operators, and revise a procedural requirement. The inspectors did not identify any other issues related to MCA or MRA-related NCS controls.

Integrated Safety Analysis

The inspectors reviewed items relied on for safety (IROFS) assigned in the facility integrated safety analysis (ISA) to accident sequences associated with introducing moderator to UO₂ powder in DCP process areas. The inspectors noted that the licensee had identified appropriate accident sequences for moderator intrusion and had declared certain engineered features such as vessel integrity as IROFS. The inspectors did not identify any failure to meet performance requirements of 10 CFR §70.61.

c. Conclusions

A minor violation was identified during walkdowns of licensee fissile material operations which was immediately corrected.

8.0 Open Item Followup

VIO 70-1113/2006-202-01

This violation concerned the failure to perform adequate maintenance on exterior criticality alarm horns in the criticality warning system (CWS) resulting in 8 out of 19 horns in the exterior alarm system becoming inoperable. Specifically, all horns on the GNF exterior criticality alarm system identified as DAM [data acquisition monitor] #23 had become inoperable. The inspectors determined that the licensee has replaced all affected horns and modified procedural requirements for testing. This item is closed.

VIO 70-1113/2006-202-02

This violation concerned the failure to maintain criticality alarm horn audibility in the DCP area. The licensee had conducted a test of the CWS and observed that the horns did not

sound in the DCP area due to failure of a switch in the uninterruptible power supply (UPS) to restore AC power following a momentary loss of power. As a result of the UPS failure, the licensee CWS in the DCP area did not have operable horns that would make a clearly audible alarm signal if an accidental criticality had occurred in the covered area. The inspectors determined that the licensee has installed and tested a new UPS, has revised maintenance procedures for the UPS, installed new switch hardware, modified ISA review requirements related to the CWS and installed a fault tolerant relay to notify the control room of switch failure. This item is closed.

9.0 Exit Meeting

The inspectors communicated observations and findings to licensee management and staff throughout the week of the inspection and presented the final results to licensee management during an exit meeting held on February 2, 2007. The licensee management acknowledged the results of the inspection and understood the findings presented.

SUPPLEMENTARY INFORMATION

1.0 Items Opened, Closed, and Discussed

Items Opened

None.

Items Closed

VIO 70-1113/2006-202-01 Concerns the failure to perform adequate maintenance on exterior criticality alarm horns.

VIO 70-1113/2006-202-02 Concerns the failure to maintain criticality alarm horn audibility in the DCP area.

Items Discussed

None.

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

Global Nuclear Fuel

Q. Ao Principal Criticality Safety Engineer
K. Clark Manager, Shop Operations - Fuel
J. DeGolyer Criticality Safety Engineer
M. Dodds Senior Criticality Safety Engineer
B. Hines Manager, Shop Operations - Powder
S. Murray Manager, Licensing
L. Paulson Manager, Nuclear Safety
G. Smith Manager, Configuration Management
C. Vaughan Manager, Facility Licensing
J. Zino Program Manager, Criticality Safety

NRC

D. Morey Senior Criticality Safety Inspector
T. Marenchin Criticality Safety Inspector

All attended the exit meeting on February 2, 2007.

4.0 List of Acronyms and Abbreviations

ADAMS	Agency-wide Documents Access and Management System
ADU	ammonium diuranate
CSA	criticality safety analysis
CFR	code of federal regulations
CWS	criticality warning system
DAM	data acquisition monitor
DCP	dry conversion process
FMO	fuel manufacturing operation
Gd ₂ O ₃	gadolinium oxide
GNF	Global Nuclear Fuels - America (licensee)
HEU	high-enriched uranium
IP	inspection procedure
IROFS	item relied on for safety
ISA	integrated safety analysis
MCA	moderator controlled area
MRA	moderator restricted area
NCS	nuclear criticality safety
NMSS	Office of Nuclear Material Safety and Safeguards
NSI	Nuclear Safety Instruction
NSR/R	nuclear safety release/requirement
OP	operating procedure
UF ₆	uranium hexafluoride
UO ₂	uranium dioxide
UPS	uninterruptible power supply
VIO	violation