

September 2, 2010

EN 42747, EN 43637, EN 44161, EN 45785, EN 46168

Mr. Sean M. Fuller  
COO & Facility Manager  
Global Nuclear Fuel - Americas, LLC  
P.O. Box 780  
Wilmington, NC 28402

SUBJECT: INSPECTION REPORT NO. 70-1113/2010-202

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 August 9-13, 2010. 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 August 13, 2010.

The inspection, which is described in the enclosure, focused on the most hazardous activities and plant conditions; the most important controls relied on for safety and their analytical basis; and the principal management measures for ensuring controls are available and reliable to perform their functions 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.

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>.

S.M. Fuller

- 2 -

If you have any questions concerning this report, please contact Thomas Marenchin, of my staff, at (301) 492-3209.

Sincerely,

**/RA/**

Patricia A. Silva, Chief  
Technical Support Branch  
Division of Fuel Cycle Safety  
and Safeguards  
Office of Nuclear Material Safety  
and Safeguards

Docket No.: 70-1113

Enclosures: Inspection Report No. 70-1113/2010-202

Attachment: Supplementary Information

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

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

S.M. 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.: 70-1113/2010-202

Licensee: Global Nuclear Fuel - Americas, LLC

Location: Wilmington, North Carolina

Inspection Dates: August 9-13, 2010

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

Approved: Patricia A. Silva, Chief  
Technical Support Branch  
Division of Fuel Cycle Safety  
and Safeguards  
Office of Nuclear Material Safety  
and Safeguards

**Enclosure**

## **EXECUTIVE SUMMARY**

### **Global Nuclear Fuel - Americas, LLC Fuel Fabrication Facility NRC Inspection Report 70-1113/2010-202**

#### **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 August 9-13, 2010, which included an on-site review of the licensee's NCS program, NCS analyses, NCS-related audits and investigations, and plant operations. The inspection focused on risk-significant fissile material processing activities including the dry conversion process (DCP), dry scrap recovery (DSR), gadolinium scrap recovery, pellet pressing operations, outside storage pads, bundle assembly areas, sintering furnaces, gadolinium processing, waste recovery, and ceramics.

#### **Results**

- No safety concerns were identified during review of the licensee's NCS program and NCS analyses.
- No safety concerns were identified during review of NCS administrative and operating procedures.
- No safety concerns were identified during review of NCS audits.
- No safety concerns were identified during review of the NCS event review and follow-up.
- No safety concerns were identified during a review of the licensee's criticality warning system (CWS).
- No safety concerns were identified during walkdowns of plant operations.

## REPORT DETAILS

### 1.0 Plant Status

GNF, 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 to  $UO_2$  in DCP 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 (IP 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] 1320.02, "Uniform and Non-Uniform Moderation Limits," Revision 7, dated October 5, 2007
- CSA 1320.08, "DCP Additive Moderation Effects for  $UO_2$  Powder," Revision 5, dated October 3, 2007
- CSA 1335.01, "DCP-Blend, Pre-compact, Granulate and Tumble, Revision 8, dated July 12, 2005
- CSA 1210.01, "Feed Hood," Revision 05, dated June 4, 2010
- CSA "Gad Grind Buffer Fuel Storage Cabinet," Revision 00, May 25, 2010
- CSA "Ceramics Lab," Revision 00, dated June 10, 2010
- NSR/R [Nuclear Safety Release/Requirements] 02.16.06, "UPMP Recycle Blender," Revision 1, dated June 15, 2000
- NSR/R 02.16.16, "UPMP Recycle Lubricant," Revision 0, dated December 3, 19970
- NSR/R 02.16.20, "UPMP Recycle Can-Hood," Revision 2, dated December 11, 2003
- NSR/R 02.16.21, "UPMP Recycle Container Transfer," Revision 3, dated August 21, 2003
- NSR/R 15.01.12, "DCP General Additive – RM2," Revision 1, dated May 3, 2010
- NSR/R 15.03.03, "DCP BPG Blend," Revision 16, dated May 3, 2010
- NSR/R 15.03.05, "DCP BPG Tumble," dated June 30, 2004
- NSR/R 15.06.09, "DCP MRA [moderator restricted area] Additive," Revision 7, dated May 3, 2010
- OP [Operating Procedure] 1230.00, "Dry Recycle Blender," Revision 13, dated June 8, 2006
- OP 1335.05, "DCP Bicone Tumbling," Revision 20, dated August 9, 2010
- Procedure Responsibilities and Instructions-6-09, "FMO [fuel manufacturing operation] and WFSC [Wilmington Field Service Center] Operating Procedures," dated February 8, 2010
- TOP [Temporary Operating Procedure]-4296, "Rework material Through Mill and DCP Blend Only," dated March 4, 2009

- TOP 5814, "Screening of Bicones at the DSR Transfer Station Using an 8-inch Screen," dated February 23, 2010

b. Observations and Findings

The inspectors determined that NCS analyses were performed by qualified NCS engineers and independent reviews were completed for the evaluations by other qualified NCS engineers. The inspectors determined that appropriate NCS controls were identified in NCS analyses and that the controls assured the safety of the operations.

The inspectors reviewed the licensee's procedures for the use of additives in their fuel manufacturing process. The licensee mixes neutron-moderating additives with uranium powder during processing which is a criticality concern. The licensee uses these additives or powder that contains additives in the DCP and the Container Transfer station in the DSR process.

In DCP the licensee has designed the equipment so that only one type of additive container can be connected to the blender and the amount of additive is controlled by computer. The entire licensee process of mixing additives with uranium powder is controlled by procedure. The equipment in DSR is identical to the equipment in DCP but the powder processed in DSR does not contain additives except for the Container Transfer station. The licensee has designed the DSR blender equipment such that an additive container cannot be connected to the blender. Licensee procedures for adding powder to the DSR blender only authorize the transfer of powder that does not contain additives.

The inspectors reviewed procedures associated with the equipment in DCP and DSR that deal with additives. The Dry Recycle Blender does not handle powder that has additives but the powder may contain moisture from other sources. OP 1230.00, Dry Recycle Blender, includes instructions for the operators for instances in which they discover that the powder being processed is found to have high moisture content due to off spec material. The instructions in OP 1230.00 for powder containing high moisture content ensures that powder entering the Dry Recycle Blender stays within the established NCS limits for the blender. NSR/R 02.16.21, Container Transfer, allows the licensee to process powder that may contain additives through the Container Transfer station. At the Container Transfer station in DSR the powder is being transferred from one container to another container. There is no safety concern with powder being handled that has additives at the Container Transfer station in DSR. The inspectors observed that due to the operations in DSR that the use of temporary operating procedures (TOPs) is higher than other areas in the facility. The inspectors also reviewed TOPs that the licensee had performed over the previous five years using additives in the facility in DCP and DSR. The inspectors determined that the licensee had never processed powder with additives in equipment that was not designed to handle powder with additives. No safety concerns were identified during the review of the use of additives in DCP and DSR.

c. Conclusions

No safety concerns were identified during review of the licensee's NCS program and NCS analyses.

### **3.0 Administrative and Operating Procedures (IP 88015)**

#### **a. Inspection Scope**

The inspectors reviewed licensee NCS administrative and operating procedures to determine if the NCS program is adequately controlled through adherence to approved written procedures. The inspectors reviewed selected aspects of the following documents:

- NSI [Nuclear Safety Instruction] E-1.0, "Nuclear Safety Review Records," Revision 27, dated July 29, 2010
- NSI E-2.0, "Internal Nuclear Safety Audits," Revision 47, dated August 4, 2010
- NSI E-3.0, "Nuclear Safety Reviews," Revision 35, dated October 6, 2009
- NSI E-4.0, "Criticality Safety Analysis Methods and Verification," Revision 40, dated February 10, 2010
- NSI E-5.0, "Nuclear Safety Release Requirements," Revision 6, dated February 22, 2010
- Practices and Procedures 40-06, "EHS Regulatory Compliance Audits," Revision 23, dated July 27, 2009

#### **b. Observations and Findings**

The inspectors evaluated licensee administrative procedures controlling NCS reviews, NCS internal audits, and NCS records. The inspectors interviewed licensee managers, NCS engineers, system engineers, and facility operators regarding NCS program implementation during document reviews and facility walkdowns. The inspectors noted that nuclear safety operating procedures have been updated to reflect recent organizational changes, to clarify the validation process and to clarify CSA documentation requirements. The inspectors determined that the licensee's NCS program is adequately controlled through compliance with approved administrative and operating procedures.

#### **c. Conclusions**

No safety concerns were identified during review of NCS administrative and operating procedures.

### **4.0 Nuclear Criticality Safety Inspections, Audits, and Investigations (IP 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 licensee audit team conduct an audit of the DCP vaporization, conversion and powder outlet. The inspectors reviewed selected aspects of the following documents:

- Audit, "Fuel Support and Pads," dated July 2, 2010
- Audit, "Shipping and Box Factory," dated July 7, 2010
- Audit, "URU, Laundry and Decon," dated July 13, 2010

- Audit, "DSR" dated July 29, 2010
- Audit, "Maintenance/HVAC FMO Roof," dated August 4, 2010

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. The inspectors observed that licensee staff carried a copy of the applicable NCS requirements; examined NCS postings, labels, and other controls; and identified appropriate NCS-related deficiencies.

c. Conclusions

No safety concerns were identified during review of NCS audits.

**5.0 Nuclear Critically Safety Event Review and Follow-up (IP 88015)**

a. Inspection Scope

The inspectors reviewed a recent NCS-related event that the licensee had reported to NRC. Also, the inspectors reviewed the licensee's response to 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:

- Procedure 40-32, "Safety Event Communication and Notification," Revision 14, dated June 11, 2010
- Finding 1687, "Review Passive IROFS [items relied on for safety] Descriptions," dated April 23, 2010
- Event 117, "11 kg Powder Spill in Pack hood," dated May 27, 2010
- Event 130, "Rod Tray Knocked off Convoy Spills Rods," dated June 26, 2010
- Event 134, "Furnace Operated without Approval after Maintenance," dated June 1, 2010
- Event 144, "HVAC Recirculation Drip Pans Overflow," dated July 22, 2010
- Event 149, "Condensation Drips on Cans of SNM [special nuclear material]," dated July 19, 2010

b. Observations and Findings

The inspectors accompanied a licensee NCS engineer during an in-plant review of a current internal event related to a leaking roof and discussed subsequent corrective actions related to the event. The inspectors observed that licensee internally reportable events were investigated in accordance with written procedures and that appropriate corrective actions were assigned and tracked.

#### **Event Report 42747**

This event involves the failure of the criticality warning system to sound during a routine monthly horn test. This event is being administratively closed based upon previous closure in IR 70-1113/2007-201.

#### **Event Report 43637**

This event involves the investigation of an unusual sinter test measurement result, it was determined that one of the IROFS, as documented in the Integrated Safety Analysis summary, had degraded. The inspectors also reviewed the root cause investigation and corrective actions associated with the event. The inspectors determined that the licensee staff had correctly determined the root cause of the event and had taken adequate corrective actions to prevent reoccurrence of the event. This closes EN 43637.

#### **Event Report 44161**

This event involves a 35 quart mop bucket being placed into an unauthorized area. The inspectors also reviewed the root cause investigation and corrective actions associated with the event. The inspectors determined that the licensee staff had correctly determined the root cause of the event and had taken adequate corrective actions to prevent reoccurrence of the event. This closes EN 44161.

#### **Event Report 45785**

This event involves SNM being placed into a waste collection bag which violated one of the administrative requirements for double contingency. This event is being administratively closed based upon previous closure in IR 70-1113/2010-201.

#### **Event Report 46168**

This event involved the failure of safe geometry IROFS 30206, "Slugger Hood Geometry," on the gadolinia slugger press in FMO. The tube connecting the powder feed station and the slugger became disconnected and misaligned. The misaligned feed tube spilled approximately 7 kilograms of uranium powder into an unfavorable geometry enclosure during routine operations of the press. The inspectors determined that the licensee had reported the event to the NRC, entered the problem in the licensee corrective action program, issued a safety communication and conducted a critique. The licensee had also modified the feed tube clamps to prevent recurrence. The inspectors determined that the licensee had taken adequate corrective action to prevent recurrence. This closes EN 46168.

#### c. Conclusions

No safety concerns were identified during review of the NCS event review and follow-up.

## **6.0 Criticality Accident Alarm Systems (IP 88017)**

### **a. Inspection Scope**

The inspectors reviewed documentation of criticality accident alarm detector coverage, interviewed engineering and maintenance staff, and performed facility walkdowns to determine the adequacy of the licensee criticality alarm system. The inspectors reviewed selected aspects of the following documents:

- NSI O-10.0, "Criticality Warning System," Revision 9, dated May 27, 2010
- Drawing 8001C0352, "Criticality Warning System FMO/FMOX," Revision 5, dated May 23, 2003
- Drawing 8001C0352, "Criticality Warning System Mezzanine," Revision 4, dated May 23, 2003

### **b. Observations and Findings**

The inspectors discussed the status of the proposed new CWS and determined that the new system is currently on hold and the schedule for installation is uncertain. The inspectors reviewed recent changes to the CWS operating procedure.

### **c. Conclusions**

No safety concerns were identified during a review of the licensee's CWS.

## **7.0 Plant Operations (IP 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.

### **b. Observations and Findings**

The inspectors performed walkdowns of the DCP, dry scrap recovery, gadolinium scrap recovery, and pellet pressing operations. The inspectors accompanied a licensee NCS engineer during in-plant IROFS verifications. The inspectors observed that the licensee is in the process of posting IROFS identification stickers on equipment in the facility. The inspectors did not identify any safety concerns during facility walkdowns.

### **c. Conclusions**

No safety concerns were identified during walkdowns of plant operations.

## 8.0 Open Items

### VIO 70-1113/2010-002-01

This item involves licensee failure to report to NRC in accordance with Appendix A to 10 CFR 70 section (b)(2), failure or degradation of an IROFS that results in a failure to meet the performance requirements of §70.61. The licensee failed to report a 7 kilogram uranium powder spill into the gadolinia slugger press enclosure which resulted in the failure of safe geometry IROFS 30206, "Slugger Hood Geometry." The licensee subsequently filed event report EN 46168 to report the event to the NRC. The inspectors determined that reporting the event resolves the issue originally identified by the NRC.

In response to the violation, the licensee committed to three additional corrective actions:

1. Modifying the internal event reporting procedure to provide additional guidance on reportability determinations, specifically, when credit may be taken for operator actions.
2. Incorporate operator response actions for the gad slugger press accident sequence into the IROFS so that credit may be taken.
3. Review all passive IROFS descriptions to determine if additional operator actions need to be specified.

The inspectors determined that, when completed, the above licensee corrective actions would reduce the possibility of future confusion regarding reportability determinations. This item is closed.

## 9.0 Exit Meeting

The inspector communicated observations and findings to the licensee's management and staff throughout the week of the inspection and presented the final results to the licensee's management during an exit meeting held on August 13, 2010. 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 70-1113/2010-002-01** Failure to report IAW 10 CFR 70 App A section (b) (2) degradation of an IROFS.

#### Items Discussed

None

### 2.0 Event Reports Reviewed

<b>EN 42747</b>	<b>Closed</b>	Failure of the criticality warning system to sound during a routine monthly horn test.
<b>EN 43637</b>	<b>Closed</b>	Investigation of an unusual sinter test measurement result, it was determined that one of the IROFS, as documented in the Integrated Safety Analysis summary, had degraded.
<b>EN 44161</b>	<b>Closed</b>	35 quart mop bucket being placed into an unauthorized area.
<b>EN 45785</b>	<b>Closed</b>	SNM being placed into a waste collection bag which violated one of the administrative requirements for double contingency.
<b>EN 46168</b>	<b>Closed</b>	Failure of safe geometry IROFS 30206, "Slugger Hood Geometry," on the gadolinia slugger press in FMO.

### 3.0 Inspection Procedures Used

IP 88015	Nuclear Criticality Safety Program
IP 88016	Nuclear Criticality Safety Evaluations and Analyses
IP 88017	Criticality Alarm Systems

**Attachment**

## 4.0 Key Points of Contact

### Global Nuclear Fuel

Q. Ao	Criticality Safety Engineer
J. DeGolyer	Manger, Criticality Safety Engineer
M. Dodds	Criticality Safety Engineer
S. Fuller	COO & Facility Manager
A. Kennedy	Manager, ISA
U. Latham	Licensing and Liabilities
R. Martyn	Manager, Material control and Accountability
S. Murray	Manager, Licensing
P. Ollis	Licensing Engineer
J. Reynolds	Manager, Fuels EHS
J. Rohner	Criticality Safety Engineer
C. Savage	FMO Maintenance
M. Short	Manger, PP & SS
D. Snopek	Principal Criticality Safety Engineer
M Venters	Manager, Emergency Preparedness and Site Security
A.Vexler	FMO Operations Leader

### NRC

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

All attended the exit meeting on August 13, 2010.

## 5.0 List of Acronyms and Abbreviations

ADAMS	Agency-wide Documents Access and Management System
CSA	criticality safety analysis
CFR	code of federal regulations
CWS	criticality warning system
DCP	dry conversion process
DSR	dry scrap recovery
EN	event notice
FMO	fuel manufacturing operation
GNF	Global Nuclear Fuels - America (licensee)
IP	inspection procedure
IROFS	item relied on for safety
MRA	moderator restricted area
NCS	nuclear criticality safety
NMSS	Office of Nuclear Material Safety and Safeguards
NSR/R	Nuclear Safety Release/Requirements
NSI	Nuclear Safety Instruction
OP	Operational Procedure
UO <sub>2</sub>	uranium dioxide
TOP	Temporary Operating Procedure
WFSC	Wilmington Field Service Center