April 18, 2014

EN49878

Mr. Amir Vexler
FMO Facility Manager
Global Nuclear Fuel - Americas, L.L.C.
P.O. Box 780, Mail Code J20
Wilmington, NC 28402

SUBJECT: GLOBAL NUCLEAR FUEL – AMERICAS, L.L.C. – U.S. NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NUMBER 70-1113/2014-201

Dear Mr. Vexler:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine, announced nuclear criticality safety (NCS) inspection at your facility in Wilmington, North Carolina, from March 17 - 20, 2014. The purpose of the inspection was to determine whether activities involving special nuclear material were conducted safely and in accordance with your license and regulatory requirements. Throughout the inspection, observations were discussed with your staff. An exit meeting was held on March 20, 2014, during which inspection observations and findings were discussed with your management and staff.

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. Based on the inspection, your activities involving nuclear criticality hazards were found to be conducted safely and in accordance with regulatory requirements.

In accordance with Title 10 of the *Code of Federal Regulations* (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 Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions concerning this report, please contact Timothy Sippel of my staff at (301) 287-9151, or via email to Timothy.Sippel@nrc.gov.

Sincerely,

/RA/

Michael X. Franovich, Chief
Programmatic Oversight and
Regional Support Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-1113

Enclosure:
NRC Inspection Report No. 70-1113/2014-201
w/Attachment: Supplementary Information

cc w/enclosure:
Scott Murray, Manager
Facility Licensing
Global Nuclear Fuels – Americas, L.L.C.
Electronic Mail Distribution

Lee Cox, Chief
North Carolina Department of Health and Human Services
Division of Health Service Regulation
Radiation Protection Section
Electronic Mail Distribution

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N.C. Department of Environmental
Commerce and Natural Resources
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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.:	70-1113/2014-201
Licensee:	Global Nuclear Fuel - Americas, LLC
Location:	Wilmington, North Carolina
Inspection Dates:	March 17-20, 2014
Inspectors:	Timothy Sippel, Criticality Safety Inspector Patricia Glenn, Fuel Facility Inspector
Approved:	Michael X. Franovich, Chief Programmatic Oversight and Regional Support Branch Division of Fuel Cycle Safety and Safeguards Office of Nuclear Material Safety and Safeguards

EXECUTIVE SUMMARY

Global Nuclear Fuel - Americas, LLC Fuel Fabrication Facility
NRC Inspection Report 70-1113/2014-201

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine, announced nuclear criticality safety (NCS) inspection of the Global Nuclear Fuel – Americas (GNF), LLC's, fuel fabrication facility in Wilmington, North Carolina, from March 17-20, 2014. The inspection included an onsite review of the licensee's NCS program, NCS training, NCS analyses, NCS-related audits and investigations, internal NCS event review and follow-up, criticality warning system, plant operations, and open items follow-up. The inspection focused on risk-significant fissile material processing activities and areas including the dry conversion process (DCP), dry scrap recovery (DSR), pellet pressing operations, 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 audits.
- No safety concerns were identified during a review of recent licensee investigation of internal and external events; corrective actions were adequately tracked by the licensee.
- No safety concerns were identified during a review of the licensee's criticality accident alarm system (CAAS).
- No safety concerns were identified during walkdowns of plant operations.

REPORT DETAILS

1.0 Summary of Plant Status

GNF manufactures uranium dioxide (UO_2) powder, pellets, and light water reactor fuel bundles at its Wilmington, North Carolina 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 the licensee's NCS program and analyses. The inspectors evaluated the adequacy of the program and analyses to assure the safety of fissile material operations. The inspectors reviewed selected NCS analyses to determine that criticality safety of risk-significant operations was assured through engineered and administrative controls with adequate safety margin and prepared and reviewed by qualified staff. The inspectors interviewed licensee managers and engineers in the safety and production departments, operations engineers, and selected operators. The inspectors reviewed selected NCS-related items relied on for safety (IROFS) to determine that the performance requirements have been met for selected accident sequences. The inspectors accompanied NCS and other technical staff on walkdowns of NCS controls in selected plant areas. The inspectors reviewed selected portions of the documents listed in Section 2.2 of the Attachment.

b. Observations and Findings

The inspectors observed that the licensee had an NCS program which was independent from production and was implemented through written procedures. The inspectors also observed that the licensee NCS program reviewed process changes affecting criticality safety. The inspectors determined that, for the NCS analyses reviewed, the analyses were performed by qualified NCS engineers, that independent reviews of the evaluations were completed by qualified NCS engineers, and that the analyses provided for subcriticality of the systems and operations through appropriate limits on controlled parameters. The inspectors verified that double contingency was assured for each of the credible accident sequences leading to inadvertent criticality that was selected for review. The inspectors reviewed selected IROFS supporting NCS controls and determined that the IROFS corresponded to the approved analytical results and designated controls and were adequate to meet performance requirements for the selected accident sequences. NCS analyses and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits.

The licensee had recently revised the CSA (Criticality Safety Analysis) for the Decontamination Inner Room (CSA-701-1, dated December 2013). The CSA was revised to include an expanded discussion of how the imposed controls ensure that the

double contingency principle is met for operations in the Inner Room. To address the NRC's concerns raised in IFI 2013-202-01, the licensee expanded the discussion of how the independence criterion of the double contingency principle is met.

The revision also includes crediting a number of additional criticality safety controls as IROFS to reduce the number of 'sole IROFS' and improve the integrated safety analysis (ISA) to better reflect the actual safety basis of the facility. However, this hasn't been completely implemented yet. The CSA's discussion of possible upsets and event sequences in Section 4 was written in order to make the CSA more closely line up with the licensee's other ISA documentation. The CSA also discusses a wider range of controls and other factors in the double contingency arguments than are credited as IROFS. A comprehensive list of these controls and other factors are provided in Section 6 of the CSA.

c. Conclusion

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

3.0 Nuclear Criticality Safety Inspections, Audits, and Investigations (IP 88015)

a. Inspection Scope

The inspectors reviewed licensee internal audit procedure and records of previously completed audits of fissile material operations to assure that appropriate issues were identified and resolved. The inspectors accompanied a nuclear safety audit team (NCS and Rad Safety) on an audit of Dry Conversion. The inspectors reviewed selected portions of the documents listed in Section 2.3 of the Attachment.

b. Observations and Findings

The inspectors found that the licensee's nuclear safety audits were conducted according to written procedural requirements that implemented the requirements in the license. The inspectors noted that the NCS portion of the audit was 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. The inspectors confirmed that deficiencies identified during the audit were appropriately captured in the licensee's corrective action program and resolved in a timely manner. During this audit, the audit team did not interview any operators, but the results and findings of the audit were discussed with the area's operations engineer and supervisor. An audit qualification is required to perform an audit; this qualification is separate from the Criticality Safety Engineer and Sr. Criticality Safety Engineer qualifications. The inspectors also reviewed the licensee's external audit that is required to be conducted triennially.

c. Conclusions

No safety concerns were identified during review of NCS audits.

4.0 Nuclear Criticality Safety Event Review and Follow-up (IP 88015 & 88016)

a. Inspection Scope

The inspectors reviewed the licensee response to a selection of recent internally-reported events and a recent NCS-related event that the licensee reported to NRC. The inspectors reviewed the progress of investigations and interviewed licensee staff regarding immediate and long-term corrective actions. The inspectors reviewed selected portions of the documents listed in Section 2.4 of the Attachment.

b. Observations and Findings

The inspectors reviewed select licensee internally reported events that occurred since the last nuclear criticality safety inspection. This included reviewing the condition report, investigation conducted, and corrective action(s) taken or in progress that were associated with the internally reported events. The inspectors also interviewed licensee staff concerning these events and the tracking and trending of internal events. Additionally, the inspectors preformed field walk-downs to independently evaluate the internal events reported and verified that corrective actions required were implemented as committed to. The inspectors determined that the licensee adequately evaluated whether these events were reportable to the NRC. The inspectors determined that internal events reviewed were investigated in accordance with written procedures and that corrective actions were assigned and tracked. The inspectors noted that the licensee is continuing to improve their new corrective action tracking system. The inspectors also reviewed the event that was reported to the NRC and selected licensee internally reported events.

Event Report 49878

This event involves a feed tube level sensor that was discovered to be inoperable. The feed tube level sensor is IROFS 402-15. When discovered the licensee was unable to determine how long the IROFS had been inoperable as so reported under Title 10 of the *Code of Federal Regulations* (10 CFR) Appendix A (a)(5). Between the initiating event and IROFS 402-16, Press Feed System with Heat Detector and Isolation, which is also credited in the applicable sequences, the likelihood of these sequences remained highly unlikely, and the licensee continued to meet the performance requirements. The licensee has not yet completed its investigation into the event and associated corrective actions. The inspectors reviewed the event and the corrective actions that had been completed.

IROFS 402-15 is credited with controlling the amount of fissile material in the feed tube by closing valves to stop more material from getting into the feed tube when the level of material in the feed tube gets too high. This IROFS is rarely challenged because non-IROFS process controls using the same type of sensor usually keep the powder level

within the normal operating range. At the time of discovery, the feed tube level sensor failed to detect the material in the feed tube and close the valves. However, the sensor still passed its functional test (FTI [Functional Test Instruction] F1-1020.14), so the licensee concluded that the sensor was calibrated incorrectly and/or had drifted such that it would pass the functional test but fail to perform its safety function when actually challenged. This functional test had also been used for the process controls, which are routinely challenged, with no such problems being encountered before.

This same type of sensor is credited elsewhere as an IROFS and there are other process-related sensors of the same type. Therefore, the inspectors questioned what corrective actions the licensee took to ensure that other IROFS of this type were available and reliable. The licensee first shut down all presses relying on a similar control until an extent of condition review was completed. Because the failed IROFS passed the functional test, the licensee next developed a new functional test that simply fills the feed tube with powder to the level of the sensor. The disadvantage of this is that it actually challenges the safety limit, rather than using a surrogate. When the IROFS feed tube level sensors on other presses were tested with the new functional test, they passed. The licensee restarted the other presses but hasn't restarted the press with the failed sensor as of the end of the inspection.

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. On April 3, 2014, the licensee retracted EN 49878 after determining that "a second control remained available, reliable, and the remaining IROFS was sufficient to meet performance requirements."

c. Conclusions

No safety concerns were identified during a review of recent licensee investigation of internal and external events; corrective actions were adequately tracked by the licensee.

5.0 Criticality Alarm Systems (IP 88017)

a. Inspection Scope

The inspectors reviewed documentation of criticality accident alarm detector coverage, interviewed engineering and maintenance staff, observed audibility tests, and performed facility walkdowns to determine the adequacy of the licensee criticality alarm system. The inspectors reviewed selected portions of the documents listed in Section 2.5 of the Attachment.

b. Observations and Findings

The inspectors discussed the status of the new criticality accident alarm system (CAAS) and determined that installation of the new system has been completed and the system is undergoing final testing. The licensee has not yet transitioned to the new system; they are still relying on the old system. In order to distinguish between the two systems, the licensee refers to the new system as a CAAS and the old system as a criticality warning

system (CWS). After the transition to the new CAAS, the CWS will be deactivated except for the lagoon area, which will still be covered by the CWS.

The licensee recently experienced an event where one loop of CAAS horns was lost. This is believed to be due to an installation error. After this event, the licensee decided to conduct audibility tests while running just one of the loops. The tests were performed to determine the audibility of the CAAS with only one loop running so that they will know what compensatory actions are required in the event that issues are encountered with one loop of the horns in the future. The inspectors observed audibility testing of the CAAS horns during the inspection. This included participating in the pre-job briefing, walkdown of various criticality horns in the process area and office areas, and observing audibility determination and documentation.

There are two warehouses where fissile material is no longer handled or stored that are used for non-NRC licensed activities. These warehouses are not to be covered by the CAAS system, and the CWS will not be maintained in this area. The licensee has isolated the warehouse area from areas where fissile material is handled and stored by erecting a fence. There are two gates between the warehouse area and areas where fissile material is handled and stored. Access controls have been imposed on these gates, and postings are in place to warn personnel entering the warehouse area that SNM is not permitted. The NRC inspectors walked down the fence and the gates.

c. Conclusions

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

6.0 Plant Activities (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 verified that controls identified in NCS analyses and Nuclear Safety Release Requirments were installed or implemented and were adequate to ensure safety. The inspectors also verified that safety was maintained for observed facility operations. The cognizant NCS engineers were knowledgeable and interacted periodically with operators in the process areas. 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. During walkdowns, 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.

7.0 Exit Meeting

The inspectors 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, including Amir Vexler, during an exit meeting held on March 20, 2014. The licensee's management acknowledged the results of the inspection and the findings presented.

SUPPLEMENTARY INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Item Number	Status	Description
IFI 2012-202-01	Discussed	Tracks the licensee's revision of the CSA and ISA Summary to clarify the basis for double contingency in the decontamination area and to clearly demonstrate independence.
EN49878	Withdrawn	Feed Tube Level Sensor Failed as an Item Relied On For Safety

2.0 Key Documents Reviewed:

Inspectors reviewed selected aspects of the following documents. Documents that apply to multiple sections are listed in the section that is most applicable.

2.1 Plant Status

Not Applicable

2.2 Nuclear Criticality Safety Program (IP 88015 & 88016)

- CP-27-104, "Nuclear Safety Assurance," Revision 0.3, dated February 3, 2014.
- CSA, "Safe Mass Limits for Uranium Systems," Revision 1, dated November 17, 2007.
- CSA, "DCP Moderation Restricted Area", Revision 10, dated October 8, 2013.
- CSA-701-1, "Decon Inner Room," Revision 0, dated December 2013.
- CSA 702.1, "UPMP [Uranium Process Management Project] Floor Sump and Basin," Revision 1, dated October 11, 2013.
- CSA 900.00, "Safety Mass Limits for Uranium Systems," Revision 0, dated December 2, 2013.
- CSA 1020.00, "Rotary Press Unit Analysis", Revision 6, dated September 17, 2013.
- CSA 1050.700, "Bundle Forrest," Revision 4, dated November 19, 2013.
- CSA 1320.07, "Moderator Restricted Area," Revision 10, dated October 8, 2013.
- CSA 1332.01, "DCP Conversion Reactor-Kiln," Revision 13, dated December 18, 2013.
- CSA 1940.00, "FMO [fuel manufacturing operation]-RW [radiological waste] Laundry & Scrubber Surge," Revision 2, dated October 26, 2007.
- NSR/R [Nuclear Safety Release/Requirements] 02.01.07, "UPMP General Sump/Basin," Revision 5, dated February 3, 2014.
- NSR/R 03.03.01, "Fabricate Press General," Revision 13, dated February 17, 2014.
- NSR/R 03.03.03, "Fabricate Press Rotary-Press," Revision 27, dated November 15, 2013.
- NSR/R 03.10.14, "Fabricate Assembly Forest," Revision 7, dated December 4, 2013.

- NSR/R 04.03.06, “Support Decon Oil-Load,” Revision 12, dated November 27, 2013.
- NSR/R 05.02.41, “Gadolini Ground Rotary-Press,” Revision 11, dated September 18, 2013.
- OP-1080.20, “Decon Facility Operations,” Revision 38, dated November 27, 2013.
- WI-27-104-01, “Nuclear Safety and Security Event Communication and Notification,” Revision 3.0, dated February 27, 2014.
- WI-27-104-07, “Nuclear Safety Release Requirements,” Revision 1.0, dated August 13, 2013.
- WI-27-104-15, “NCS Calculational Methods and Verification,” Revision 1.0, dated August 28, 2013.
- WI-27-104-29, “CWS Detector Zone Coverage, Calibration, and Maintenance,” Revision 4.2, dated December 5, 2013.
- WI-27-104-30, “

2.3 Nuclear Criticality Safety Inspections, Audits, and Investigations (IP 88015)

- “2013 Triennial Criticality Safety Audit,” dated November 20, 2013.
- WI-18-104-02-F02, “Nuclear Safety Quarterly Audit Checklist, Revision 0, dated March 6, 2013.
- Nuclear Safety Instruction E-2.0, “Internal Nuclear Safety Audits”, Revision 5.0, dated May 23, 2012

2.4 Nuclear Critically Safety Event Review and Follow-up (IP 88015 & 88016)

- FTI F1-1020.14, “Mass Control on Feed Tube at 7B Rotatory Press Using Detector,” Revision 3, Conducted October 10, 2013.
- FTI, “Mass Control on Feed Tubes at 3B, 4B, and 6B Rotatory Press Using Detector,” Conducted February 27, 2014.
- 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.
- Condition Reports:
  - 5023, 4/4/12
  - 7422, 7/23/13
  - 7417, 7/23/12
  - 7423, 7/23/14
  - 7776, 8/20/13
  - 7818, 8/27/13
  - 7819, 8/27/13
  - 8349, 10/10/13
  - 8354, 10/17/13
  - 8353, 10/17/13
  - 8355, 10/17/17
  - 8653, 11/119/13
  - 8870, 11/17/13

2.5 Criticality Alarm Systems (IP 88017)

- DRF Section 0000-0147-4218, “Analysis of Criticality Accident Alarm System Coverage in GNF-A Dry Conversion Process and Shipping Warehouse Facilities,” Revision 1, dated September 2012

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2.6 Plant Activities

Documents listed in other sections were reviewed related to facility walkdowns.

2.7 Exit Meeting

Not Applicable

3.0 Inspection Procedures Used

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

4.0 Key Points of Contact

Global Nuclear Fuel

M. Dodds	Sr. Criticality Safety Engineer
E. Dunn	Criticality Safety Engineer
D. Eghbali	Sr. Criticality Safety Engineer
S. Murray	Manager, Licensing
D. Nay	Manger, Production Support
P. Ollis	Licensing Engineer
U. Latham	Licensing and Liabilities
J. Rohner	Manager, Criticality Safety
E. Saito	Manger, EHS
A. Vexler	Facility Manager
A. Thomas	Criticality Safety Engineer

NRC

Timothy Sippel, Criticality Safety Inspector
Patricia Glenn, Fuel Facility Inspector

All attended the exit meeting on March 20, 2014.

5.0 List of Acronyms and Abbreviations

ADAMS	Agencywide Documents Access and Management System
CAAS	criticality accident alarm system
CSA	criticality safety analysis
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
RW	radiological waste
UMPM	uranium process management project
UO_2	uranium dioxide
TOP	Temporary Operating Procedure