September 21, 2006

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

SUBJECT: NRC INSPECTION REPORT 70-1113/2006-202 AND NOTICE OF VIOLATIONS

Dear Mr. Fuller:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced nuclear criticality safety (NCS) inspection at your facility in Wilmington, North Carolina, from August 21 through 24, 2006. 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 24, 2006.

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 and observations of in-plant conditions and activities related to NCS assumptions and controls. Throughout this inspection, observations were discussed with your managers and staff.

Based on the results of the inspection, NRC has determined that two Severity Level IV violations of NRC requirements occurred. The violations were 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; select What We Do, Enforcement, then Enforcement Policy. The violations are being cited in the enclosed Notice of Violations (Notice) as Severity Level IV violations, and the circumstances surrounding them are described in detail in the subject inspection report. The violations are being cited in the Notice because they were identified as the result of events. The first violation being cited as a Severity Level IV violation is the failure to perform adequate maintenance on exterior criticality alarm horns. The second violation being cited as a Severity Level IV violation is the failure to maintain criticality alarm horn audibility in the dry conversion process (DCP) area.

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.

This also refers to an investigation completed by the NRC's Office of Investigations (OI). The investigation (2-2005-032) was completed on September 9, 2005, and involved a review to determine whether Global Nuclear Fuel management willfully failed to initiate the required compensatory measures when criticality alarm annunciators were not functional. Based on the evidence developed, the investigation did not substantiate this issue. A copy of the synopsis to this OI report is included as Enclosure 3 to this letter.

In accordance with 10 Code of Federal Regulations (CFR) 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be available in the public electronic reading room of the NRC's Agency-Wide Documents 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 Christopher Tripp, of my staff, at (301) 415-7648.

Sincerely,

/RA/

Melanie A. Galloway, Chief
Technical Support Section
Special Projects Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket No.: 70-1113

License No.: SNM-1097

Enclosures:
1. Notice of Violations
2. NRC Inspection Report 70-1113/2006-202
3. Synopsis to OI Report

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

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

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NOTICE OF VIOLATIONS

Global Nuclear Fuels - America
Wilmington, NC

Docket No. 70-1113
License No. SNM-1097

During a U.S. Nuclear Regulatory Commission (NRC) inspection from August 21 through 24, 2006, two violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violations are listed below:

A. Safety Condition No. 1 of License No. SNM-1097 requires that material be used in accordance with the statements, representations, and conditions in the license application dated June 5, 1997, and December 7, 1999, and supplements thereto.

Section 6.4.3 of the license application states, in part, that the nuclear criticality alarm system is a safety-significant system and is maintained through routine calibration and scheduled functional tests conducted in accordance with internal procedures.

Contrary to the above, on and before August 26, 2005, Global Nuclear Fuels - America (GNF) failed to maintain the nuclear criticality alarm system, such that 8 out of 19 horns in the exterior alarm system became inoperable. Specifically, all horns on the GNF criticality alarm system identified as Data Acquisition Monitor 23 were inoperable.

This is a Severity Level IV violation (Supplement VI)

B. 10 CFR 70.24(a) requires the licensee to maintain, in each area in which special nuclear material above specified quantities is handled, used, or stored, a monitoring system which will energize clearly audible alarm signals if accidental criticality occurs.

Contrary to the above, on and before August 1, 2006, GNF failed to maintain, in each process area in which special nuclear material above specified quantities is handled, used, or stored, a monitoring system which would energize clearly audible alarm signals if accidental criticality occurs. Specifically, due to failure of the uninterruptible power supply, the licensee's criticality alarm system in the dry conversion area did not have operable horns that would make a clearly audible alarm signal if an accidental criticality occurred in the covered area.

This is a Severity Level IV violation (Supplement VI)

Pursuant to the provisions of 10 CFR 2.201, Global Nuclear Fuels - America is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555 with a copy to the Chief, Technical Support Section, Fuel Cycle Safety and Safeguards, NMSS, and the Regional Administrator, Region II 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 for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (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 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 a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action 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 to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room (PDR), or from the NRC's document system (ADAMS), accessible from the NRC web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld, and provide in detail the basis for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

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

Dated at Rockville, Maryland

this 21st day of September 2006

U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

Docket No.:	70 -1113
License No.:	SNM-1097
Report No.:	70-1113/2006-202
Licensee:	Global Nuclear Fuel - Americas, LLC
Location:	Wilmington, North Carolina
Inspection Dates:	August 21 through 24, 2006
Inspectors:	Dennis Morey, Senior Criticality Safety Inspector, Headquarters Christopher Tripp, Senior Criticality Safety Inspector, Headquarters
Approved by:	Melanie A. Galloway, Chief Technical Support Section Special Projects Branch Division of Fuel Cycle Safety and Safeguards, NMSS

Enclosure 2

EXECUTIVE SUMMARY

Global Nuclear Fuel - Americas, LLC Fuel Fabrication Facility
NRC Inspection Report 70-1113/2006-202

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed an announced routine nuclear criticality safety (NCS) inspection at Global Nuclear Fuel - Americas (GNF), LLC, fuel fabrication facility in Wilmington, North Carolina (NC), from August 21 through 24, 2006. The inspection included an on-site review of the licensee NCS program, NCS analyses, NCS-related internal events, criticality warning system issues, plant operations, and open item followup. The inspection focused on risk-significant fissile material processing activities including the dry conversion process, ceramics, rod and bundle loading, and outside waste and scrap storage areas.

Results

- A severity level IV violation was identified for failure to perform adequate maintenance on exterior criticality alarm horns.
- A severity level IV violation was identified for failing to maintain criticality alarm horn audibility in the dry conversion process area.
- The NCS program was adequate for maintaining acceptable levels of safety.
- The licensee's validation report was adequate for ensuring the validity of the Geometry Enhanced MERit (GEMER) criticality code.
- The licensee's internal event reporting, investigation, and correction was adequate for maintaining acceptable levels of safety.
- The licensee's change control process and flowdown of controls into the Integrated Safety Analysis (ISA) Summary was adequate.
- No safety concerns were identified during walkdowns of the facility and operations.

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) with a dry conversion process while performing normal powder 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)

a. Inspection Scope

The inspectors reviewed NCS analyses to determine that criticality safety of risk-significant operations was assured through engineered and human performance 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] 1080.12, "Waste Box Storage," Revision 3, dated December 15, 2005
- CSA 1050.30, "Automated Bundle Assembly Machine," Revision 2, dated March 29, 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 NCS controls for equipment and processes assured the safety of the operations.

c. Conclusions

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

3.0 Criticality Warning System (88015)

a. Inspection Scope

The inspectors reviewed licensee corrective actions related to a recent inadequate audibility concern. The inspectors reviewed selected aspects of the following documents:

- Drawing 2004E977 Sheet 7, "Criticality Alarm System Instrumentation Locations for Site," Revision 2, dated October 14, 2005
- Drawing 2004E977 Sheet 7, "Criticality Alarm System Instrumentation Locations for Site," Revision 3, dated June 21, 2006
- Procedure NSI [Nuclear Safety Instruction] O-4.0, "Nuclear Safety Instrumentation," Revision 62, dated July 12, 2006
- Procedure PRI [Procedural Responsibilities & Instruction] 6-09, "FMO [Fuel Manufacturing Operation] and WFSC [Wilmington Fuel Services Center] Operating Procedures," dated August 18, 2006
- TOP [Temporary Operation Procedure] 2006308, "Special Test of Outside Criticality Alarm Horns," Revision 0, dated August 17, 2006

b. Observations and Findings

The inspectors reviewed the licensee's criticality warning system (CWS) including detector placement, audibility, maintenance, and outage procedures.

Exterior Criticality Alarm Horn Test

On August 22, 2006, the licensee conducted a test of the exterior criticality alarm horns to determine the audibility of the exterior horns without the six data acquisition monitor (DAM) #23 horns. The test was conducted with an appropriately reviewed and approved Temporary Operating Procedure. The inspectors observed the test and noted that the exterior criticality alarm horns were audible without the DAM #23 horns sounding.

During the CWS audibility test, the inspectors noted that the licensee announcement of the test said to ignore criticality alarms during the test when, in fact, the licensee expected employees to respond to public address announcements in the event of a criticality event during the test, which took approximately 30 minutes. In addition, the inspectors noted that, although the CWS console was continuously monitored during the test, the licensee's test procedure did not specify the continuous observation in order to initiate an evacuation in the event of a criticality event during the test. The licensee agreed to clarify and improve the CWS test procedure and announcement.

Exterior Horn Audibility

During audibility testing of CWS horns, licensee maintenance staff identified questionable audibility of horns from the exterior system known as DAM #23. During a previous inspection, the inspectors determined that DAM #23 had six horns, one on a pole at the detector site, one at the incinerator building, one at the nitrogen building, and three at the fuel examination technology building. The failure of these six horns along with two horns at DAM #20 due to inadequate maintenance was characterized as unresolved item (URI) 70-1113/2005-005-02 during a joint HQ/Region II inspection conducted immediately after the issue was identified. On June 22, 2006, the inspectors conducted a telephonic re-exit of inspection 2005-005 during which they recharacterized URI 2005-005-02 as an apparent violation.

During the current inspection, the inspectors observed the test of the exterior criticality alarm horns and discussed exterior horn coverage with respect to exterior areas containing fissile material. The licensee had recently recalculated the extent of

coverage of the FMO criticality alarm detectors. The licensee agreed with inspectors that, within a group of interior detectors constituting a DAM, the area of coverage should be determined from the most remote detector. This allowed the inspectors to clearly understand the extent to which the FMO detectors provided coverage of exterior fissile material areas. The inspectors agreed that the failure of the DAM #23 horns would partially undermine the license-required prompt evacuation due to a criticality alarm activation.

Section 6.4.3 of the license application states, in part, that the nuclear criticality alarm system is a safety-significant system and is maintained through routine calibration and scheduled functional tests conducted in accordance with internal procedures. Contrary to the above, on and before August 26, 2005, GNF failed to maintain the nuclear criticality alarm system, such that 8 out of 19 horns in the exterior alarm system became inoperable. Specifically, all horns on the GNF criticality alarm system identified as DAM #23 were inoperable. The licensee failure to perform adequate maintenance on exterior criticality alarm horns is **Violation (VIO) 70-1113/2006-202-01**.

c. Conclusions

A severity level IV violation was identified for failure to perform adequate maintenance on exterior criticality alarm horns.

4.0 Validation (88015)

a. Inspection Scope

The inspectors reviewed the licensee's validation report for its GEMER criticality code to determine whether it established an acceptable upper subcritical limit (USL) for plant operations. The inspectors reviewed selected aspects of the following document:

- "GEMER Monte Carlo Code Validation Report," Revision 2, May, 2006

b. Observations and Findings

The GEMER validation subdivides all facility calculations into one of eight different areas of applicability (AOAs): low-enriched uranium (LEU) solutions; high-enriched uranium (HEU) solutions; LEU homogeneous compounds; LEU heterogeneous systems (lattices) with varying absorbers (no absorbers, cadmium, boron, or gadolinium); and metal systems. The AOAs most directly applicable to GNF applications are the LEU solutions (AOA-1), homogeneous compounds (AOA-3), and heterogeneous lattices with various absorbers (AOA-4, -5, -6, and -7). The licensee uses three different statistical techniques to determine an USL for each AOA. The statistical techniques are the single-sided lower confidence band (with administrative margin), the single-sided lower tolerance band, and the single-sided lower tolerance limit. In addition to applying these three techniques, the licensee performed additional statistical tests to determine whether the conditions for the three techniques were met; these consisted of the Shapiro-Wilk normality test, the chi-squared goodness-of-fit test, and the F-test for significance. The licensee developed its own Matlab-based code, upper subcritical limit statistical analysis (USLSA) to perform the necessary statistical calculations and to determine the USL. The inspectors reviewed the methodology description for each of

the three statistical techniques against that in NUREG/CR-6698, “Guide for Validation of Nuclear Criticality Safety Calculational Methodology,” and determined that, while many of the equations were similar, there were differences. The licensee stated that it had modified and enhanced the methods using more modern statistical approaches.

For each AOA, the validation report included a description of the critical benchmarks chosen, which included identification of the fissile material chemical and physical form, enrichment, moderator type and hydrogen-to-fissile isotope (H/X) ratio, reflectors and absorbers present, and neutron energy spectrum (fast, intermediate, or thermal). Similar sets of parameters were defined for each of the eight validated AOAs. The inspectors determined that, in almost all cases, the range of parameters covered by the validated AOA was consistent with the range of parameters covered by the benchmarks. The inspectors found a few apparent discrepancies in the determination of the AOAs, and discussed these with the licensee. For some AOAs, the benchmarks covered a certain range in enrichment (4.89 - 10.07wt% ^{235}U for AOA-1), but the description of the AOA only included the upper enrichment value (<10.07wt%). The licensee stated that the lower enrichment range was not included because all plant processes are analyzed at the maximum allowed enrichment of 5wt% ^{235}U. The licensee explained that the description “poly material” in the description of several AOAs included all reflecting materials composed of polyethylene-like hydrocarbons (water, paraffin, plexiglass, plastics such as Stereotex). The inspectors determined that those materials all had very similar atom densities of hydrogen and carbon, and therefore it was appropriate to include them in the AOA. The inspectors noted that the benchmarks for several AOAs included reflecting and absorbing materials that were not included in the definition of the AOAs, and the licensee agreed to revise the validation report to include those materials. The omission of those materials from the validated AOA is not a safety concern, so this item will not be tracked. The inspectors determined that a large proportion of benchmarks were drawn from *International Handbook of Evaluated Criticality Safety Benchmark Experiments* or other published sources, most of which had experimental uncertainties well-documented. For those that did not, the licensee applied a uniform uncertainty of 1%, which appeared to be conservative based on comparison with available published uncertainties.

The inspectors determined that the licensee had selected appropriate benchmarks for each AOA, had adequately determined and described the AOAs, and had correctly performed all the necessary statistical tests and calculations to determine acceptable USLs. For all AOAs, except AOA-3 (LEU homogeneous compounds), the licensee determined there was no statistically significant fit; for AOA-3, the licensee used a quadratic regression fit to determine the bias as a function of H/X. The inspectors determined that the application of the statistical techniques was appropriate.

c. Conclusions

The inspectors determined that the licensee had appropriately validated its GEMER code for use in performing criticality calculations at its facility. The licensee selected appropriate benchmarks, adequately determined and described its AOAs, and correctly performed its numerical analysis. This provides assurance that criticality calculations will be performed correctly to ensure the subcriticality of normal and credible abnormal conditions.

5.0 Nuclear Criticality Safety-Related Internal Events (88015)

a. Inspection Scope

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

- UIR FAB-0606, "Loss of Automated Bundle Assembly Machine Physical Barrier"
- High Level Critique - DCP Criticality Alarm Horn Failure

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 had no safety concerns regarding licensee reporting, investigation, and correction of internal NCS-related events.

DCP UPS Event

On August 1, 2006, the licensee conducted a test of the CWS and observed that the horns did not sound in the DCP area. The licensee determined that the uninterruptible power supply would not pass alternating current (AC) power due to a faulty switch. Without power, the CWS electric horns would not operate. The inspectors determined that, in the event of a CWS activation in the DCP area, remaining horns would sound throughout the FMO complex and an evacuation would ensue in accordance with license requirements. The inspectors determined that the remaining FMO horns would be audible on the ground floor of the DCP area and that the evacuation signal would be audible to the DCP supervisor due to the licensee management (4/1) notification system. The inspectors determined that an area of inaudibility had existed in the DCP area for up to three weeks that would have had a minor impact on the rapidity of evacuating the fuel manufacturing (FM) complex.

10 CFR 70.24(a) requires the licensee to maintain, in each area in which special nuclear material above specified quantities is handled, used, or stored, a monitoring system which will energize clearly audible alarm signals if accidental criticality occurs. Contrary to the above, on and before August 1, 2006, due to failure of the uninterruptible power supply, the licensee's criticality alarm system in the DCP area did not have operable horns that would make a clearly audible alarm signal if an accidental criticality occurred in the covered area. The licensee failure to maintain criticality alarm horn audibility in the DCP area is **VIO 70-1113/2006-202-02**.

c. Conclusions

A severity level IV violation was identified for failing to maintain criticality alarm horn audibility in the dry conversion process area.

The licensee's internal event reporting, investigation, and correction was adequate for maintaining acceptable levels of safety.

6.0 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.

b. Observations and Findings

The inspectors performed walkdowns of the CWS, the DCP, the ceramics area including gadolinium shop, rod and bundle loading, outside waste and scrap storage, and the calcium floride (CaF_2) warehouses.

c. Conclusions

No safety concerns were identified during walkdowns of the facility and operations.

7.0 Integrated Safety Analysis (88015)

a. Inspection Scope

The inspectors examined new and recently revised criticality safety analyses (CSAs), to determine that changes to facility operations were safe and made in accordance with regulatory requirements. The inspectors examined the flow-down of controls from CSAs to the Integrated Safety Analysis (ISA) Summary and associated facility documents. The inspectors reviewed selected aspects of the following documents:

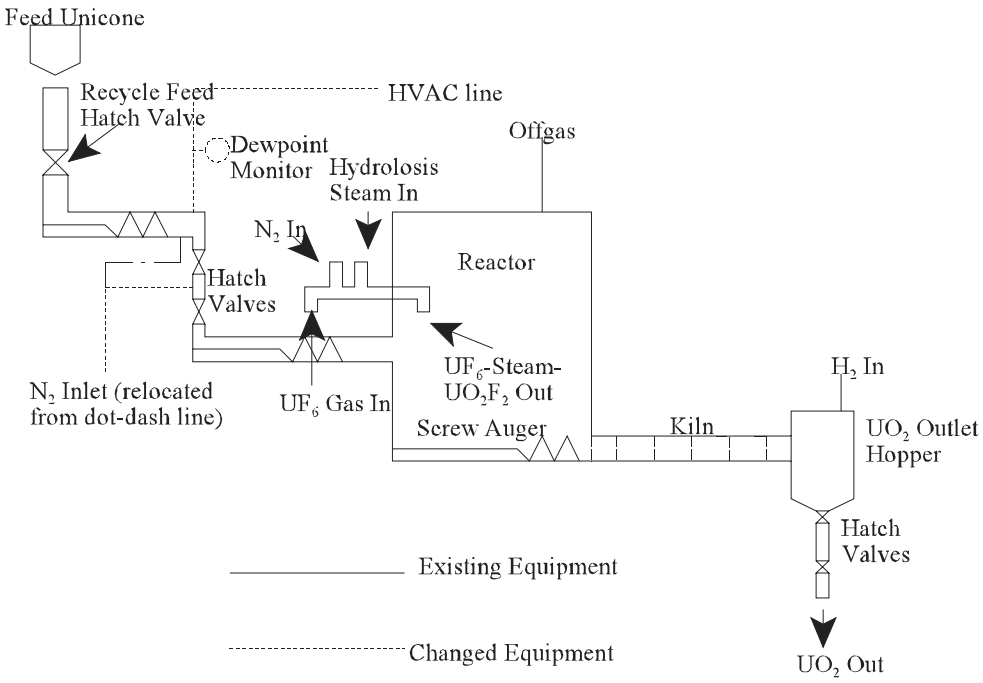
- CSA 1332.01, "DCP Conversion Reactor-Kiln," Revision 10, dated June 23, 2006
- Change Request 06-0174
- FMO Change Initiation Request Form 2006174
- Change Request 2006174
- Functional Test Instruction (FTI) 1332-20, Rev. 0
- FMO ISA Reviewer Change Evaluation Form
- Software Modification Plan DCP1-164
- FMO Configuration Management Center (CMC) Documentation Approval Form for FTI 1332-20, Rev. 0

b. Observations and Findings

The inspectors reviewed several changes to the DCP Reactor-Kiln CSA made in response to a recent internal event. CSA 1332.01, Rev. 10, was issued to add a dewpoint moisture probe on the Heating, Ventilation, and Air Conditioning (HVAC) vent on the upper recycle screw feed for the reactor-kiln in Conversion Line 1 (Change Request 06.0174). At the same time, the pressure transmitter for the diatomic nitrogen (N_2) supply was relocated (Change Request 06.0231) so that pressure could be easily controlled (see Figure 1). The licensee stated that these changes were made following a recent event in which a unicone feeding the reactor-kiln was left attached and accumulated a small quantity (stated as ~1/2 cup) of liquid water. The licensee

determined that this occurred as a result of two leaking “hatch valves” on the reactor feed. The two valves comprise an air lock on the inlet side that is intended to maintain the appropriate atmosphere in the interior of the kiln and prevent backflow to the feed unicone. As a result of that event, the licensee determined that the failure of the hatch valves could lead to a previously unanalyzed backflow scenario. The inspectors determined that the event was not safety significant because the unicone must be essentially empty for backflow to occur, and the amount of uranium and moisture present was small. The inspectors determined that the moisture probe, upstream of the hatch valves, should provide for effective early warning of backflow.

Figure 1 Schematic of Reactor-Kiln



The inspectors confirmed that functional test 1332-20 for the dewpoint monitor specified that the test must confirm that the recycle feed hatch valve closes when the moisture detection probe exceeds its setpoint. The licensee indicated that it performed the test by removing the probe and exposing it to ambient air, which contains enough moisture to actuate the interlock. The inspectors determined that the functional test was adequate in that it tested the entire system. The inspectors determined that the change was safe.

The inspectors also examined the double contingency basis for the moisture controls on the reactor-kiln itself, because of an unresolved question on the independence of active temperature interlocks raised during the ISA Summary review (the “common controller” issue). The inspectors determined that the reactor-kiln met the double contingency

principle through multiple, independent controls on temperature. For example, the kiln is divided into six temperature zones, each with its own electric heater. Each zone has three criticality controls that shut off the steam supply, by means of double block-and-bleed valves, when the temperature falls below a specified value above the condensation point. One of the controls monitors the internal temperature of the kiln, one monitors the output of the heater (hot box), and another actuates an alarm that notifies the operator to verify that the steam supply valves are closed. Other temperature controls, such as those on the steam superheaters, ensure independence by having two identical temperature controllers, one of which is controlled by the Provox distributed control system (DCS), the other of which is hardwired. The inspectors determined that there was a sufficient degree of independence between the controls (different measurement points, defect circuitry) to meet the double contingency principle.

The licensee chose a subset of criticality controls to designate as IROFS in the ISA Summary, which in some cases depended on the same DCS. Therefore, the inspectors determined that the "common controller" issue concerned the independence of IROFS in the ISA Summary rather than concerned double contingency controls in the applicable CSA. The inspectors determined that the double contingency principle was met for each credible source of moisture in the system, from steam generation to the reactor-kiln to the outlet hopper. In addition, the inspectors verified that the system as described in the ISA Summary was consistent with the CSAs, system drawing P00-13323, Rev. 18, "Conversion (Line 1) P&I Diagram," and the as-built configuration of the facility.

The licensee also demonstrated how it tracked the subset of criticality controls chosen as IROFS from the CSA to the Process Hazard Analysis (PHA or ISA Reference Document), to the nuclear safety release/requirements (NSR/Rs), and to the FTIs, through the use of in-house spreadsheets. The inspectors verified the flowdown of the information for the new dewpoint monitor and determined that the NSR/Rs were properly cross-referenced to the IROFS and their management measures (including functional testing).

c. Conclusions

The inspectors determined that the licensee adequately met the double contingency principle and license requirements when using moderator control, for all credible sources of moderator intrusion into the reactor-kiln and associated systems. The inspectors determined that there was a clear flowdown from the CSAs to the PHA and ISA Summary, and that appropriate management measures (including functional testing) had been specified. The criticality controls that the licensee designated as IROFS and its management measures were appropriately integrated into the licensee's configuration management system. The change to the system to address possible moisture backflow to the feed unicone was done safely.

8.0 Open Items (88015)

IFI 70-1113/2005-202-01

This item tracks the licensee's actions to revise the analysis for waste boxes. During a previous inspection, the inspectors noted that waste boxes were stored without the required gamma scan, and the basis for double contingency was not clear in the new consolidated analysis. During the current inspection, the inspectors reviewed the revised waste box analysis and noted that the basis for double contingency was established as limited mass and safe geometry storage. This item is closed.

URI 70-1113/2005-005-02

This item tracks further NRC review of the audibility of the licensee criticality warning system. During a previous inspection, the inspectors noted that eight of 19 horns connected to the exterior criticality warning system were inoperable. The inspectors were concerned that CWS alarms could not be heard in all areas of coverage. As discussed in Section 3.0 of this report, this item was determined to be a violation. This item is closed.

IFI 70-1113/2006-201-01

This item tracks licensee development of specific written maintenance instructions for the plant high-efficiency particulate air (HEPA) filter magnahelic pressure detectors. During a previous inspection, the inspectors noted that the licensee used the pressure differential on HEPA filters as a significant NCS control over mass accumulation. The inspectors observed that maintenance procedures for the pressure detection instrument (magnahelic) indicated only that maintenance consisted of assuring that the magnahelics were in good working order. The licensee acknowledged that the maintenance instruction relied excessively on process knowledge and that the maintenance instructions could be improved. During the current inspection, the inspectors determined that the licensee had provided specific maintenance instructions for calibration of the HEPA filter magnahelic pressure detectors. This item is closed.

VIO 70-1113/2006-201-02

This item concerns the failure to properly implement a credited safety control on waste box storage requiring low density spacing for 60-days prior to verification of uranium content by scanning. During a previous inspection, the inspectors noted that the licensee was operating under an approved temporary operating procedure (TOP) and that the applicable criticality safety analysis was undergoing revision. The TOP required uranium content verification before placing the waste boxes into high-density storage arrays and had excluded the 60-day aging requirement resulting in the storage of waste boxes in high-density storage arrays before their uranium content had been properly verified, as required by approved NCS analysis. During the current inspection, the inspectors determined that the licensee had corrected the inadequate TOP and had implemented new controls on the issue of TOPs. This item is closed.

VIO 70-1113/2006-201-03

This item concerned the failure to post a properly-issued and approved NSR/R for waste box storage. During a previous inspection, the inspectors observed that the licensee was operating the waste box storage area with a nuclear safety rules and requirements posting based on a criticality safety analysis which had been cancelled several months prior to the current inspection. During the current inspection, the inspectors noted that the licensee had revised the NCS analysis and NSR/Rs and had the correct NSR/Rs displayed. This item is closed.

6.0 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 August 24, 2006. 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

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 Closed

IFI 70-1113/2005-202-01 This item tracks the licensee's actions to revise the analysis for waste boxes.

URI 70-1113/2005-05-02 This item tracks further NRC review of the audibility of the licensee criticality warning system.

IFI 70-1113/2006-201-01 Tracks development of specific written maintenance instructions for the plant HEPA filter pressure detectors.

VIO 70-1113/2006-201-02 Failure to properly implement a credited safety control requiring 60 days aging of waste boxes prior to uranium content verification by E-gun scan.

VIO 70-1113/2006-201-03 Failure to post a properly issued and approved NSR/R.

Items Discussed

None.

2.0 Inspection Procedures Used

IP 88015 Headquarters Nuclear Criticality Safety Program

Attachment

3.0 Partial List of Persons Contacted

Global Nuclear Fuel

C. Monetta	Manager, Nuclear Environment, Health and Safety
Q. Ao	Principal Criticality Safety Engineer
M. Dodds	Senior Criticality Safety Engineer
E. Saito	Manager, Environmental Safety and Health
A. Mabry	Program Manager, Radiological Engineering
S. Smith	Team Leader, Maintenance Support
C. Vaughan	Manager, Facility Licensing
T. Priest	Radiation Protection Team Leader
L. Paulson	Manager, Nuclear Safety
J. Zino	NCS Program Manager

NRC

D. Morey	Senior Criticality Safety Inspector
C. Tripp	Senior Criticality Safety Inspector
D. Hartland	Fuel Cycle Inspector, Region II

All attended the exit meeting on August 24, 2006.

4.0 List of Acronyms and Abbreviations

AC	alternating current
ADAMS	Agency-wide Documents Access and Management System
AOA	area of applicability
CaF_2	calcium fluoride
CFR	Code of Federal Regulations
CMC	configuration management center
CSA	criticality safety analysis
CWS	criticality warning system
DAM	data acquisition monitor
DCP	dry conversion process
DCS	distributed control system
FM	fuel manufacturing
FMO	fuel manufacturing operation
FTI	functional test instruction
GEMER	Geometry Enhanced MERit code
GNF	Global Nuclear Fuels - America
HEPA	high-efficiency particulate air
HEU	high-enriched uranium
H/X	hydrogen-to-fissile ratio
IFI	inspection follow-up item
IP	inspection procedure
IROFS	items relied on for safety
ISA	integrated safety analysis
LEU	low-enriched uranium
N_2	diatomic nitrogen
NCS	nuclear criticality safety

NMSS	Office of Nuclear Material Safety and Safeguards
NRC	U.S. Nuclear Regulatory Commission
NSI	Nuclear Safety Instruction
NSR/R	nuclear safety release/requirement
P&I	process and instrumentation (diagram)
PDR	Public Document Room
PHA	process hazards analysis
PRI	procedural responsibilities & instructions
TOP	temporary operating procedure
UF_6	uranium hexafluoride
URI	unresolved item
UO_2	uranium dioxide
USL	upper subcritical limit
USLSA	upper subcritical limit statistical analysis code
VIO	violation
WFSC	Wilmington Fuel Services Center

SYNOPSIS TO OFFICE OF INVESTIGATIONS REPORT

This investigation was initiated by the U.S. Nuclear Regulatory Commission (NRC), Office of Investigations (OI), Region II (RII), on September 9, 2005, to determine whether Global Nuclear Fuel (GNF) management willfully failed to initiate the required compensatory measures when criticality alarm annunciators were not functional.

Based on the evidence developed during this investigation, OI:RII did not substantiate that Global Nuclear Fuel (GNF) management willfully failed to initiate the required compensatory measures when criticality alarm annunciators were not functional.