UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

April 22, 2008

EA-08-123
EN 43946

Mr. J. D. Fuller
Chief Executive Officer and Facility Manager
Global Nuclear Fuels - Americas, L.L.C.
P.O. Box 780
Wilmington, NC 28402

SUBJECT: NRC SPECIAL INSPECTION TEAM REPORT NO. 70-1113/2008-002

Dear Mr. Fuller:

This report refers to the special inspection team (SIT) inspection activities conducted from January 31, through February 4, 2008, at your Global Nuclear Fuels – Americas, L.L.C. (GNF-A) facility; our subsequent in-office review of your root cause evaluation dated February 6, 2008; and teleconferences with members of your staff conducted on March 7, 2008, March 20, 2008, and April 7, 2008. The purpose of the SIT was to inspect and assess the facts and circumstances surrounding the potential for the introduction of moisture into the Dry Conversion Process (DCP) Line-2 cooling hopper 'A' (L-2A) containing uranium dioxide powder, and the associated activities which resulted in your declaration of an Alert event on January 30, 2008. A copy of the SIT Charter is included as Enclosure 1.

Enclosure 2 contains the Special Inspection Team report. The inspection included a review of your facility's safety operations, including criticality safety, plant operations, management control measures, and emergency response activities to determine if your facility was operated safely and in compliance with your license. Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, interviews with personnel, and observation of activities by your staff during, and subsequent to the January 30, 2008, event.

The SIT objectives were to: (1) develop a complete sequence of events related to the declared Alert; (2) identify and evaluate the effectiveness of licensee corrective actions; (3) evaluate the actual and/or reasonable potential criticality safety significance; (4) evaluate the risk significance to workers, public, and environment; (5) evaluate the licensee's root cause analysis; (6) evaluate the licensee's emergency response organization activities; (7) determine the contributing events and root causes; and (8) determine planned actions to prevent recurrence.

The SIT determined that based on the 'as found' conditions for the DCP L-2A equipment and on-going maintenance activities at the time of the January 30, 2008, Alert event, there was no actual health and safety impact to licensee workers, nor to offsite personnel and the offsite environs. However, the SIT did conclude that controls established to prevent an inadvertent criticality during routine operations were significantly compromised based on the observed maintenance practices, identified management control deficiencies including inadequate procedural guidance and safety committee review, and ineffective communication among licensee staff regarding the status of DCP control room alarms. The SIT further concluded that, although GNF-A ultimately entered the subject Alert emergency status based on the available information, a delay in declaring the subject Alert did not meet established procedural guidance.

The SIT concurred, in general, with your Root Cause Analysis and contributing factors surrounding the event as discussed in your report dated February 6, 2008. Further, your corrective actions implemented or planned have been determined to be adequate to address the identified deficiencies.

Based on the results of this inspection, the SIT has identified four apparent violations (AVs) of NRC requirements that are being considered for escalated enforcement action in accordance with the NRC Enforcement Policy. The Enforcement Policy is included on the NRC's Web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html. The AVs discussed in Paragraphs 3.a, 6.a, and 7.a of this report involved a failure to have approved procedures and safety reviews for maintenance activities, a failure to maintain double contingency requirements, and a failure to declare an Alert in accordance with your approved Radiological Contingency and Emergency Plan implementing procedures. The circumstances surrounding these AVs, the significance of the issues, and our evaluation of your corrective actions were discussed with members of your staff on March 7, March 20, and April 7, 2008.

Before the NRC makes its enforcement decision, we are providing you an opportunity to either: (1) respond to the AVs addressed in this inspection report within 30 days of the date of this letter or (2) request a pre-decisional enforcement conference. If a conference is held, it will be open for public observation. The NRC will also issue a press release to announce the conference. Please contact George B. Kuzo (404-562-4658) or Omar López (434-847-7343) within seven days of the date of this letter to notify the NRC of your intended response.

If you choose to provide a written response, it should be clearly marked as a "Response to Apparent Violations in Inspection Report No. 70-1113/2008-002; EA-08-0123" and should include for each apparent violation: (1) the reason for the apparent violation, or, if contested, the basis for disputing the apparent violation; (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. In presenting your corrective actions, you should be aware that the promptness and comprehensiveness of your actions will be considered in assessing any civil penalty for the apparent violations. The guidance from NRC Information Notice 96-28, "Suggested Guidance Relating to Development and Implementation of Corrective Action," may be helpful. Your response may reference or include previously

docketed correspondence, if the correspondence adequately addresses the required response. If an adequate response is not received within the time specified or an extension of time has not been granted by the NRC, the NRC will proceed with its enforcement decision or schedule a predecisional enforcement conference.

In addition, please be advised that the number and characterization of AVs described in the enclosed inspection report may change as a result of further NRC review. You will be advised by separate correspondence of the results of our deliberations on this matter.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room 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, if you choose to respond, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this letter, please contact us.

Sincerely,

/RA/

Douglas M. Collins, Director
Division of Fuel Facility Inspection

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

Enclosures: 1. SIT Charter
2. NRC Inspection Report

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

Beverly Hall, Chief
Radiation Protection Section
N.C. Department of Environmental Commerce & Natural Resources
Electronic Mail Distribution

Distribution w/encls: (See page 4)

Distribution w/encls:
G. Kuzo, RII
R. Gibson, RII
C. Evans, RII
P. Habighorst, NMSS
N. Baker, NMSS
M. Adams, NMSS
OE Mail
PUBLIC

X PUBLICLY AVAILABLE ☐ NON-PUBLICLY AVAILABLE ☐ SENSITIVE X NON-SENSITIVE

ADAMS: X Yes ACCESSION NUMBER:_____

OFFICE	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI	HQ:NMSS	RII:EICS
SIGNATURE	GK 4/18/08	GK 4/18/08	GK 4/18/08	GK 4/18/08	GK 4/18/08	GK 4/18/08	CFE 4/22/08
NAME	GKuzo	RGibson	OLopez	JJiminez	CCramer	TMarenchin	SSparks
DATE	04/ /20084/ /2008	04/ /2008	04/ /2008	04/ /2008	04/ /2008	04/ /2008	04/ /20084/ /2008
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

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January 31, 2008

MEMORANDUM TO: George B. Kuzo, Leader
Global Nuclear Fuel – Americas Special Inspection Team

FROM: Victor M. McCree, Acting Regional Administrator
/RA by Joseph W Shea Acting For/

SUBJECT: SPECIAL INSPECTION TEAM CHARTER FOR GLOBAL NUCLEAR FUEL – AMERICAS (GNF-A), DOCKET NO. 70-1113 (INSPECTION REPORT NO. 70-1113/2008-02)

This memorandum confirms the establishment of a Special Inspection Team (SIT) at Global Nuclear Fuel - Americas (GNF-A) to inspect and assess the facts and circumstances surrounding the introduction of moisture into cooling hopper 2.A. which contained uranium dioxide powder. The event occurred on January 30, 2008, (Event # 43946) and was reported to the NRC Operations Center on January 30, 2008, (7:00 p.m. EST). You are the team leader and should report status directly to me. Your team members are: T. Marenchin (NMSS), O. Lopez (RII), J. Jimenez (RII), and C. Cramer (RII).

The inspection and report will be performed in accordance with the guidance of Inspection Procedure (IP) 88003, and the applicable provisions of IP 93812, and will be consistent with Management Directive 8.3 and Manual Chapter 2600. The report will be issued within 30 days of the completion of the inspection.

A copy of the Charter is enclosed for your use. The objective of the team is to gather information and make appropriate findings and conclusions in the areas listed in the Charter. These will then be used as a basis for any necessary follow-up. As indicated in the Charter, the foremost objective is to determine the safety implications and adequacy of the licensee's short-term corrective actions for the sequence of events which resulted in the event.

CONTACT: Douglas M. Collins, RII/DFFI
404-562-4700

Enclosure 1

If you have any questions, please contact me.

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

Enclosure: Special Inspection Charter

cc w/encl:
C. Casto, RII
M. Weber, NMSS
P. Habighorst, NMSS
R. Pierson, NMSS
D. Collins, RII
R. Gibson, RII

Special Inspection Charter
Global Nuclear Fuel - Americas
Identification of Moderator in Cooling Hopper

Basis

On Wednesday, January 30, 2008, a dew point alarm was activated on cooling hopper 2A of the Dry Conversion Line 2. The line had been shutdown for maintenance. The licensee determined that moisture (neutron moderating material) was introduced into the hopper which contained an estimated 36 kilograms of uranium dioxide powder enriched to 4% U-235. The hopper was a moderator-limited vessel (an unfavorable geometry) based on the nuclear criticality safety analysis, and it should have been empty for a maintenance procedure. The licensee is conducting a Root Cause Analysis investigation.

The material was removed from the bottom of the hopper into a favorable geometry container. The licensee determined there were 28.6 kilograms of uranium dioxide powder in the container containing 1000 parts per million of moderator, which is within the acceptable range of moisture for the container.

Scope

In order to determine the cause(s) and safety significance of the event, the team should focus on the areas listed below. They are listed in order of importance.

1. Develop a complete sequence of events related to the event. Include review of any available data logging information.

2. Identify and evaluate the effectiveness of the immediate corrective actions taken by the licensee in response to the event.

3. Evaluate the significance of the actual and reasonable potential criticality safety significance of the event given the potential for more uranium, a different uranium enrichment, more moderation, etc.

4. Evaluate the risk significance to workers, the public, and environment.

5. Review and evaluate the licensee's root cause analysis for adequacy of scope, depth, and identification of causal factors.

6. Evaluate the adequacy of the licensee's emergency organization response. Determine adequacy of internal and external licensee event reporting including emergency declaration. This should include a review of the information available to the licensee to use as indicators of a problem, timeliness of reporting to offsite agencies (NRC, State, etc.) and the response to safety issues.

7. Determine the probable contributing and root causes of the event.

8. Determine the adequacy of the licensee's planned actions to prevent recurrence.

Documentation

Document the inspection findings and conclusions in an inspection report within 30 days of the completion of the inspection.

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

SPECIAL INSPECTION TEAM

Docket No.:	70-1113
License No.:	SNM-1037
Report No.:	70-1113/2008-002
Licensee:	Global Nuclear Fuels – Americas, L.L.C
Location:	Wilmington, NC 28402
Dates:	January 31, 2008, through April 7, 2008
Inspectors:	G. Kuzo, Team Leader, (Region II) O. López, Fuel Facility Inspector (Region II) J. Jimenez, Fuel Facility Inspector (Region II) T. Marenchin, Criticality Safety Inspector (Headquarters) C. Cramer, Fuel Facility Inspector (Region II)
Approved by:	D. M. Collins, Director Division of Fuel Facility Inspection

EXECUTIVE SUMMARY

Global Nuclear Fuels – Americas, L.L.C
NRC Inspection Report 70-1113/2008-002

The purpose of the Special Inspection Team (SIT) was to inspect and assess the facts and circumstances surrounding the potential introduction of moisture into Dry Conversion Process (DCP) Line 2A (L-2A) cooling hopper which contained uranium dioxide powder. The SIT objectives were to: (1) develop a complete sequence of events related to the declared Alert; (2) identify and evaluate effectiveness of licensee corrective actions; (3) evaluate the actual and/or reasonable potential criticality safety significance; (4) evaluate the risk significance to workers, public, and environment; (5) evaluate the licensee's root cause analysis; (6) evaluate the licensee's emergency response organization activities; (7) determine the contributing events and root causes; and (8) determine planned actions to prevent recurrence. The inspection results were as follows:

Event Description

At 6:30 p.m. Eastern Standard Time on January 30, 2008, Global Nuclear Fuels – Americas (GNF-A), L.L.C. located at Wilmington, North Carolina, declared an Alert based on the identification of an unsafe mass condition associated with fissile material within their DCP area equipment. The observed conditions leading to the declared Alert included an engaged moisture interlock associated with the DCP L-2A cooling hopper, a nonfavorable geometry vessel, containing uranium dioxide (UO_2) powder estimated to be in excess of established safe mass limits. Subsequent to the actual Alert declaration, licensee representatives made the appropriate notifications regarding the Alert condition to local and State of North Carolina officials, and to the NRC Headquarter Operations Office as required. NRC staff from the Region II Division of Fuel Facility Inspections and Headquarters Office of Nuclear Material Safety and Safeguards staff conducting routine inspection activities at GNF-A during the week of January 28, 2008, were notified and returned to the site's Emergency Control Center at approximately 7:00 p.m. At 7:22 p.m., the NRC entered the monitoring mode with communications between the onsite NRC inspectors and the NRC Region II Incident Response Center established to monitor and report ongoing licensee actions.

At approximately 8:52 p.m., the UO_2 was transferred safely from the L-2A cooling hopper into a safe geometry container. Subsequently the licensee quantitatively determined the mass of the subject powder transferred from the L-2A cooling hopper, and collected and analyzed three samples of the UO_2 for moisture content. Based on the quantitative measurement results, moisture content within normal range and actual mass of UO_2 less than the established safe mass criteria, the licensee exited the Alert at approximately 9:21 p.m. At approximately 9:42 p.m. licensee representatives notified local, State, and NRC officials of their stand-down from the Alert status.

Effectiveness of Immediate Corrective Actions

The licensee took immediate and appropriate actions to evaluate and determine the extent of conditions within facility operations which led to the Alert declaration. Licensee actions ensured worker safety and prevented the potential for any impact to members of the public and/or to surrounding environs.

Significance of the Actual and Reasonable Potential Criticality Safety Significance of the Event

The inspectors determined that during the GNF-A declared Alert, the licensee lost one of two nuclear criticality safety controls identified in the cooling hopper equipment criticality safety analysis. An apparent violation (AV) was identified for the failure to maintain double contingency control for the DCP Line 2 powder cooling hoppers (AV 70-1113/2008-002-01).

Risk Significance to Other Workers, Public, and Environment

Based on the actual mass and percent moisture of the fissile material within the L-2A cooling hopper which was determined subsequent to the January 30, 2008, Alert declaration, the inspectors noted that an actual criticality event was not credible for the 'as found' conditions. However, the inspectors noted that based on a result of the licensee's standard practice of leaving UO_2 powder in the cooling hoppers during maintenance, identified concerns for ensuring appropriate hatch valve alignment, and the use of moisture (steam) to conduct startup testing, controls established to prevent an inadvertent criticality during routine operations were significantly compromised.

Adequacy of Licensee's Root Cause Analysis

In general, the SIT concurred with the licensee's root cause analysis and proposed corrective actions. However, the SIT did not conclude that the licensee met double contingency requirements during the observed DCP L-2 maintenance activities on January 29, 2008, when the potential existed for moisture passing through the hatch valves during pre-operational test activities. Nevertheless, the SIT concluded the licensee's root cause investigation was satisfactory and proposed corrective actions were adequate.

Adequacy of Licensee's Response to the Event

Licensee command and control of the ECC operations were deemed adequate. An apparent violation was identified for failure to declare an Alert in accordance with established Radiological Contingency and Emergency Plan implementing procedure guidance (AV 70-1113/2008-002-02).

Independent Determination of Root Causes and Contributing Factors

The inspectors identified lack of procedures for determination of system boundaries during maintenance activities, lack of safety function review of maintenance activities involving Items Relied On For Safety, improper installation of powder outlet top hatch valve actuator, lack of

interlock actuation audible signal and the lack of attention to alarms during maintenance activities as contributing root causes for the event. Two apparent violations were identified for the failure to have a properly issued and approved management control procedure for conducting maintenance activities (AV 70-1113/2008-002-03) and for the failure to conduct maintenance activities which were not assessed by the criticality safety function (AV 70-1113/2008-002-04).

Adequacy of Licensee's Planned Actions to Prevent Recurrence

The inspectors considered the corrective actions taken by the licensee to be appropriate to ensure safe restart of the DCP line operations.

Attachments:
Partial List of Persons Contacted
List of Inspection Procedures Used
List of Items Open/Closed
List of Acronyms Used

REPORT DETAILS

1. Event Description (NRC Event No. 43946)

At 6:30 p.m. Eastern Standard Time on January 30, 2008, Global Nuclear Fuels – Americas (GNF-A), L.L.C. located at Wilmington, North Carolina, declared an Alert based on the identification of potential unsafe mass conditions associated with fissile material within their dry conversion process (DCP) area equipment. The observed conditions leading to the declared Alert included known maintenance activities, an engaged moisture monitoring instrumentation interlock associated with the DCP Line 2 (L-2) 'A' cooling hopper, and a nonfavorable geometry vessel, containing uranium dioxide (UO_2) powder estimated to be in excess of established safe mass limits. Detailed description of DCP operations and a diagram of process equipment are provided in Section 3 and Figure 3 of this report. From a review of records, DCP logs and interviews with personnel directly involved with activities prior to and during the declared Alert, the inspectors independently developed a time-line of L-2 maintenance activities and tests, maintenance results, 'as found' conditions, and licensee responses as detailed below and in Figures 1 and 2.

On December 30, 2007, the DCP L-2 was shut-down for maintenance activities. At that time, all UO_2 powder remaining within the L-2 kiln was sent to the cooling hoppers. The L-2 kiln rebuild and maintenance activities commenced on January 10, 2008, with the re-installation of the hatch valve actuators occurring on January 18, 2008. Although approximately 90 kilograms (kg) of UO_2 powder was removed from the L-2B cooling hopper on January 29, 2008, none of the estimated 36 kg of powder present in the L-2A hopper was removed at that time. On January 25, 2008, the licensee completed kiln rebuild activities with preventative maintenance testing (PMT) of the kiln and associated hatch valves initiated the next day. As part of required PMT leak testing and sequencing of the hatch valves, steam was valved into the kiln on January 29, 2008. During three separate attempts, the licensee failed the leak-tests and a high moisture alarm engaged within the DCP control room. Subsequently, the kiln was put in hot standby and the steam valved out. Early during the day on January 30, 2008, the licensee valved out the nitrogen purge to the powder outlet. Subsequently, licensee representatives identified a misaligned top hatch valve which contributed to the PMT failures and took appropriate corrective actions. On January 30, 2008, at approximately 1:00 p.m. the moisture interlock associated with the L-2A cooling hopper moisture sensors engaged in the DCP control room. Although the interlock most likely engaged as a result of ambient moisture conditions following termination of the nitrogen purge, this information was not communicated successfully to responsible DCP control room shift personnel.

At approximately 5:40 p.m. on January 30, 2008, the Acting Manager for the Fuel Manufacturing Operation (FMO) Building recognized the moisture interlock in the control room and also recognized that fissile material, UO_2 powder, was present in the DCP L-2A cooling hopper indicating the potential for moderated unsafe mass conditions in the nonfavorable geometry vessel. In response to the FMO manager's observations, the licensee staffed their Emergency Control Center (ECC) at 6:19 p.m.. Based on the

mass of material estimated to be in excess of the licensee's established 31 kg safe mass limit for uncontrolled powder and suspected ingress of moisture into the cooling hopper, the licensee declared an Alert at 6:30 p.m.

Subsequent to the actual Alert declaration, licensee representatives made the appropriate notifications regarding the Alert condition to local government and State of North Carolina officials, and to the NRC Headquarter Operations Office (HOO) as required. NRC staff from the Region II (RII) Division Fuel Facility Inspections and Headquarters Office of Nuclear Material Safety and Safeguards (NMSS) staff conducting routine inspection activities at GNF-A during the week of January 28, 2008, were notified and returned to the site's ECC at approximately 7:00 p.m.. At 7:22 p.m., the NRC entered the monitoring mode with communications between the onsite NRC inspectors and the NRC Region II Incident Response Center established to monitor and report ongoing licensee actions.

At approximately 8:52 p.m., the UO_2 powder was transferred safely from the L-2A cooling hopper into a safe geometry container. Subsequently the licensee quantitatively determined the mass of the subject powder transferred from the L-2A cooling hopper, and collected and analyzed three samples of the UO_2 material for moisture content. Based on the quantitative measurements, normal moisture content and less than the established safe mass, the licensee exited the Alert at approximately 9:21 p.m.. At approximately 9:42 p.m., licensee representatives notified local, State, and NRC officials of their stand-down from the Alert status. At that time all DCP operations were suspended pending completion of a root-cause analysis and development of corrective actions to prevent recurrence. In addition, production activities outside of the DCP also were suspended pending licensee management review regarding potential extent of similar conditions within those areas. Figure 2 presents a timeline of the licensee's response to the event.

2. Effectiveness of Immediate Corrective Actions

a. Inspection Scope and Observations

Through direct observation, data reviews, and discussions with responsible licensee representatives involved in the event, the inspectors evaluated immediate and short-term actions taken by the licensee during, and subsequent to the declared Alert. The evaluation included review of immediate actions completed to evaluate and analyze conditions contributing to the event declaration, actions taken to monitor and mitigate those conditions and safely terminate the Alert, and actions taken to evaluate extent of condition for all facility operations.

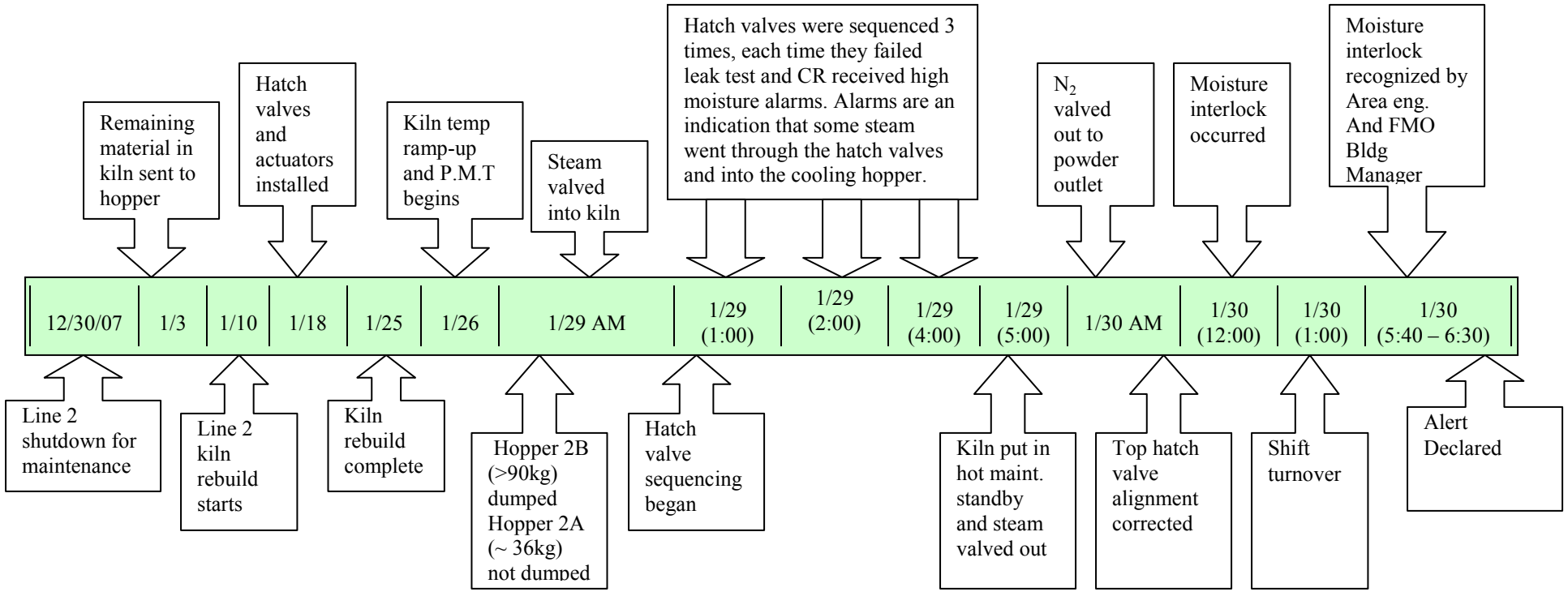

Figure 1
Sequence of Events that Led to the Alert Declaration

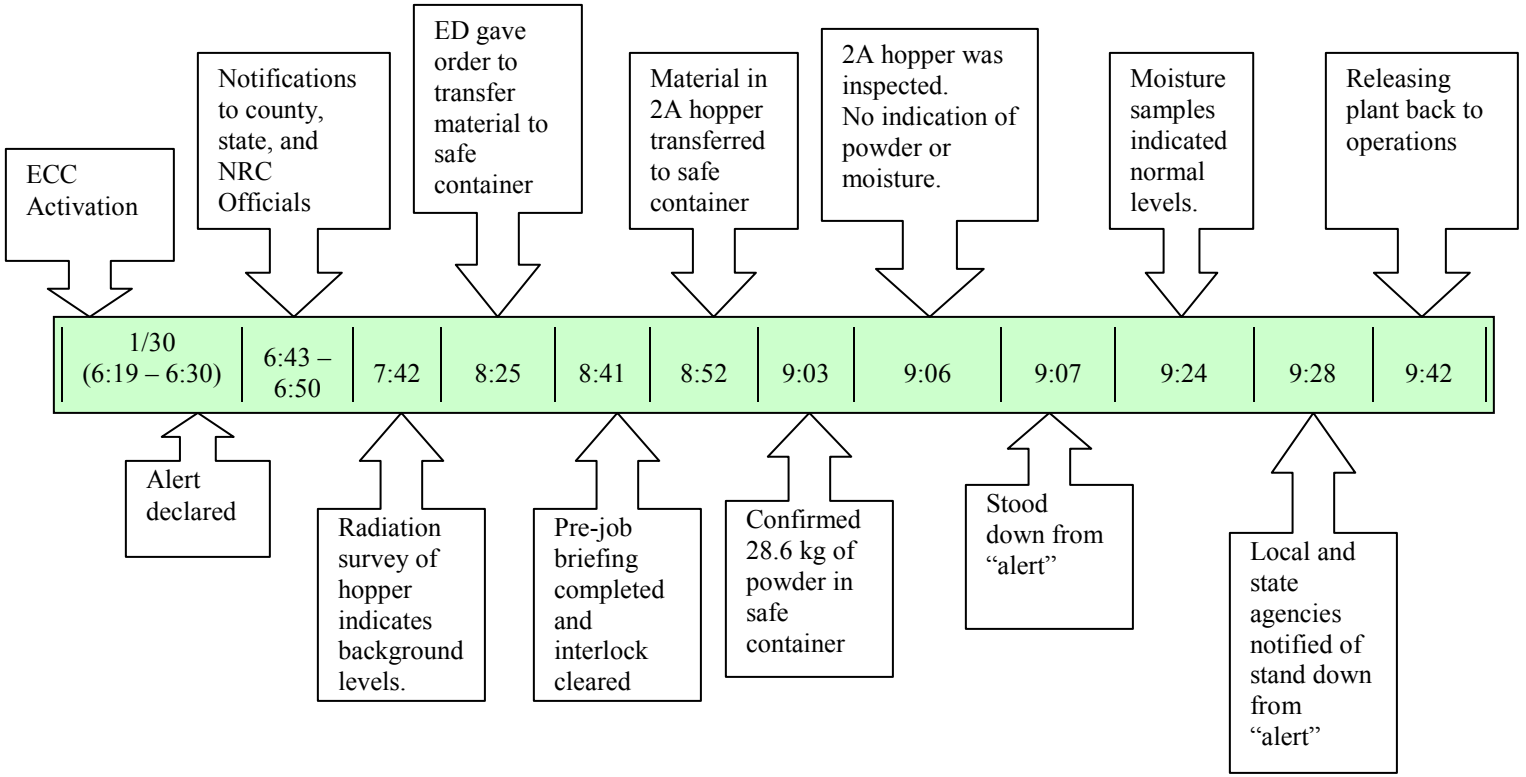

Figure 2
Licensee's Response to the Event

The inspectors noted that the declared activation to the Alert status was based on the information available at the time of the event and included approximate estimates of the UO_2 mass in the L-2A cooling hopper, general knowledge of on-going L-2 maintenance activities, and the moisture sensor equipment interlock observed in the control room. Immediate licensee actions included cessation of work in the plant and evacuation of personnel from the DCP area. Prior to sending a team to assess actual conditions in the area, the licensee assessed radiological conditions using the plant's remote radiological monitoring system. After actual radiological conditions within the affected process line equipment were understood, licensee staff including Safety, Licensing, and Operations personnel developed a planned course of action to remove and place the fissile material from the L-2A cooling hopper into a safe geometry configuration prior to additional quantitative analyses. Subsequently, the fissile material was removed successfully from the L-2A cooling hopper. The licensee conducted detailed measurements of the powder mass and moisture content for the UO_2 removed from the L-2A cooling hopper.

After verifying that plant personnel were not affected by the event and that the material was removed safely from the cooling hopper, the nonfavorable geometry vessel, licensee management reviewed the observed conditions with technical experts. Subsequently, licensee management shutdown all DCP process operations pending an investigation of the event using root cause analysis techniques and the development of corrective actions, as necessary.

In addition, the licensee management initiated an evaluation of additional processes outside of the DCP area for other facility operations including homogenization, blending, press and granulate, dry scrap recycle, and powder packaging facility processes to evaluate those operations for extent of condition. Following review of these operations for extent of condition by the licensee's Wilmington Safety Review Committee (WSRC), activities within these areas were approved for restart on February 4, 2008.

Conclusions

The licensee took immediate and appropriate actions to evaluate and determine the extent of conditions within facility operations which led to the Alert declaration. Licensee actions ensured worker safety and prevented the potential for any impact to members of the public and or to surrounding environs.

3. Significance of the Actual and Reasonable Potential Criticality Safety Significance of the Event

a. Inspection Scope and Observations

The inspectors evaluated criticality safety aspects of the L-2A hopper event. The evaluation included walk downs of the L-2 equipment; procedure reviews; interviews with engineers, operators, and root cause investigators; and reviews of technical analyses and applicable documentation including:

- Criticality Safety Analysis (CSA), DCP Conversion Process – Powder Outlet, Revision (Rev) 7
- CSA, DCP Conversion Reactor-Kiln, Rev.10
- CSA, Safe Mass Limits for Uranium Systems, Rev. 1
- Nuclear Safety Release/Requirements (NSR/R) 15.02.06, DCP Convert PWDER-OUTLET, Rev. 9
- NSR/R 15.02.13, DCP Convert KILNOUT-LOCK, Rev 3
- NSR/R 15.06.06, DCP MRA MAITEN, Rev. 2

System Description

The licensee DCP facilities include three separate process lines, each consisting of a reactor chamber, rotating kiln tube, and two outlet hoppers. Each conversion line converts vaporized uranium hexafluoride (UF_6) into UO_2 powder. The conversion process uses steam, UF_6 gas, nitrogen, and hydrogen in the reactor chamber and kiln for the process reactions (see **Figure 3)**. Steam, nitrogen, hydrogen, and gaseous hydrogen fluoride are removed from the conversion line equipment by the process off-gas recovery system.

The UO_2 powder collects in the powder outlet at the end of the kiln which is transferred to powder cooling hoppers located in a separate room directly below the conversion reactor-kiln in the DCP facility. The UO_2 powder is transferred from the kiln powder outlet, through two in-line hatch valves to a 'Y' junction which passes the powder to one of two available nonfavorable geometry powder cooling hoppers below the kiln (see **Figure 3**). The two cylindrical cooling hoppers and the unicone powder containers normally positioned below the hoppers are expected to contain UO_2 powder during operations.

DCP Conversion Process – Criticality Controls

The licensee's CSA for the cooling hopper equipment identifies two engineered NCS controls for the hoppers consisting of outlet-hatch valve operation and redundant dewpoint (moisture) probe interlocks in each cooling hopper. Moderation is limited by controls in the conversion reactor-kiln which interface directly to the cooling hoppers. During normal DCP operations the hatch valves operate in a sequence that prevents the ingress of conversion process gases into the hoppers during the gravity transfer of UO_2 powder from the kiln to the cooling hoppers. One of the two, in-line hatch valves is expected to be closed at all times during normal operations.

Prior to the alert declaration, the licensee was performing maintenance consisting of rebuilding the conversion reactor-kiln on L-2 of the DCP area. The maintenance included replacing the two in-line hatch valves leading to the cooling hoppers. During this maintenance, one of the two hatch valves was connected incorrectly to its actuator which resulted in misalignment thereby preventing the subject valve from closing completely. After completion of the maintenance, the licensee performed startup testing of the rebuilt equipment which included sending steam to the reactor-kiln and cycling the

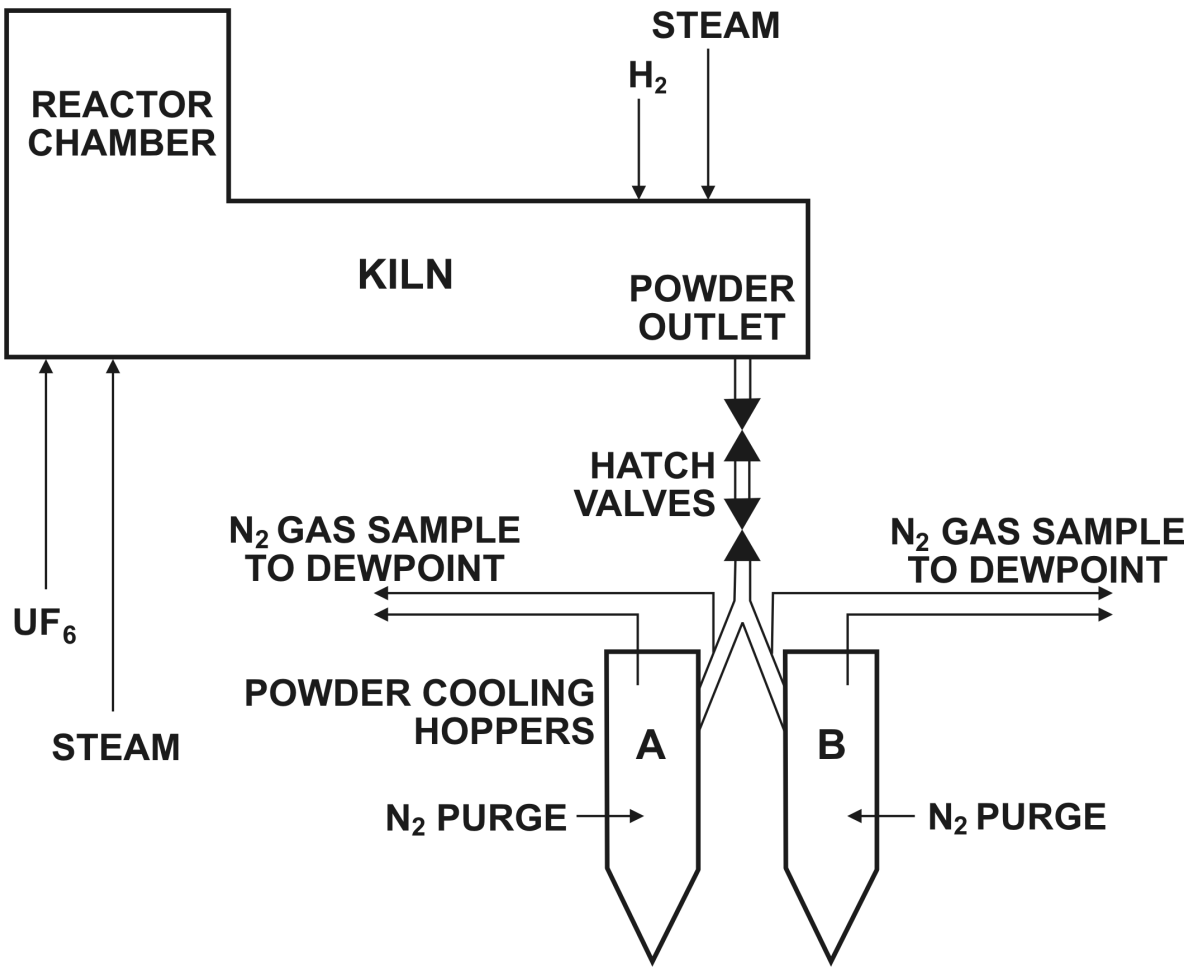

Figure 3
Conversion Reactor/Kiln and Cooling Hopper Equipment Arrangement

hatch valves to ensure that both hatch valves were seating properly. Hatch valve cycling consists of opening one valve at a time and pressure checking between the valves while both are closed to assure that there is no direct path for steam to enter the hoppers. Because the hatch valves were cycled while the top hatch valve was unable to fully close, a direct path for steam to enter the hoppers was present. Thus, the hatch valves were not preventing the ingress of conversion process gases as stated in the CSA. The hatch valve operational sequence is an engineered NCS control, one of two double contingency controls assuring exclusion of moderation from the hoppers.

The inspectors determined that the hatch valve control was lost while fissile material remained in the L-2A cooling hopper. Section 5.1.1 of the license application (Application) requires that process designs shall incorporate sufficient margins of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible. For each significant portion of the process, a defense of one or more system parameters is documented in the CSA, which is reviewed and enforced. The failure to maintain double contingency control for the DCP L-2 powder cooling hoppers was considered an **Apparent Violation (AV 70-1113/2008-002-01)**.

b. Conclusions

The inspectors determined that during the GNF-A declared Alert, the licensee lost one of two nuclear criticality safety controls identified in the cooling hopper equipment criticality safety analysis. An apparent violation was identified for the failure to maintain double contingency control for the DCP L-2 powder cooling hoppers (AV 70-1113/2008-002-01).

4. Risk Significance to Other Workers, Public, and Environment

a. Inspection Scope and Observations

The inspectors reviewed maintenance activities and the 'as found' conditions for DCP L-2 reactor/kiln, the hatch valve system, the cooling hoppers, and the events that led to the declared Alert on January 30, 2008. Based on measurements taken after the material was transferred to a safe geometry configuration on the evening of January 30, 2008, the licensee determined the total mass of UO_2 powder in cooling hopper 2A was 28.6 kg with a moisture content of 0.1 weight percent (wt%). The inspectors determined that, based on worst case scenarios, there was not enough UO_2 mass within the L-2A cooling hopper for a criticality accident to have occurred. The inspectors reviewed and evaluated the licensee's CSA , Safe Mass Limits for Uranium Systems' demonstrating a safe mass limit of 31kg of UO_2 powder with less than 11.2 wt% water to be subcritical.

The inspectors noted that at the time of the event, the licensee had not established controls to prevent more than 31kg of UO_2 powder from being stored in the cooling hoppers during maintenance. For example, from interviews and data reviewed, the inspectors determined that approximately 90 kg (more than a critical mass) of UO_2 was left in L-2B cooling hopper during reactor/kiln shutdown and maintenance, and was not removed until January 29, 2008. Further, the inspectors noted from interviews with responsible licensee staff that in the past a maximum mass of approximately 200 kg of UO_2 had been present in the DCP cooling hoppers during other reactor/kiln maintenance activities.

At the time of the event there was one source of moderator that was piped into the system, steam to the reactor kiln, during startup test activities on January 29, 2008. This steam had an operating flow rate of 33 kg/hr. During maintenance activities prior to the Alert, the hatch valves were opened three times for ten second intervals. Although supporting data were not provided, licensee representatives stated that they believed

that only nominal quantities of steam could enter the cooling hoppers as a result of the system's nitrogen purge creating a pressure boundary above the hatch valve system. The inspectors noted that if the nitrogen purge failed, a maximum of 0.28 kg of water (0.97 wt%) could have entered the L-2A cooling hopper during this 30-seconds when both valves were determined to be opened. The inspectors noted that based on these 'as found' conditions, an actual criticality event was not credible. However, the inspectors further noted that based on the identified maintenance practices which included the failure to remove fissile material from nonfavorable geometry vessels in adjacent systems, the use of steam during startup testing, and a lack of methods to identify misaligned valves, those controls established to prevent an inadvertent criticality during normal operations were significantly compromised.

b. Conclusions

Based on the actual mass and percent moisture of the fissile material within the L-2A cooling hopper determined subsequent to the January 30, 2008, Alert declaration, the inspectors noted that an actual criticality event was not credible for the 'as found' conditions. However, those controls established to prevent an inadvertent criticality during normal operations, were significantly compromised based on the identified maintenance practices.

5. Adequacy of Licensee's Root Cause Analysis

a. Inspection Scope and Observations

The inspectors reviewed the licensee's root cause investigation report, dated February 6, 2008. The report discussed the contributing factors and root causes, and recommended corrective actions following the declaration of an alert due to the potential moisture intrusion into a DCP non-favorable geometry cooling hopper during maintenance activities. The licensee identified the following causal factors/root causes:

- Causal Factor 1 - Equipment Cleanout Did Not Include Cooling Hoppers

  Root Cause 1 – Situation Not Covered

  DCP operating procedures did not address cooling hoppers cleanout when performing maintenance on the powder outlet hatch valves (Items Relied On For Safety [IROFS] 1108). Based on interviews and documentation review, the inspectors determined that it was a standard practice to leave powder in the cooling hoppers during maintenance activities.

  Root Cause 2 – Standards, Policies or Administrative Controls Incomplete

  General maintenance cleanout requirements did not include a consideration for adjoining equipment. No maintenance guidance or procedures were issued regarding work on IROFS in the equipment record.

- Causal Factor 2 – Valve Became Misaligned During Actuator Installation

  Root Cause 3 – Errors Not Detectable

  If the hatch valve becomes misaligned during actuator installation, there was no indication or requirement to test that the valve seat was positioned properly until startup testing.

  Root Cause 4 – Task Not Analyzed

  There was no training provided to maintenance personnel regarding proper methods to install a powder outlet hatch actuator.

- Causal Factor 3 - High Moisture Interlock Not Recognized By DCP Control Room

  Root Cause 5 – Monitoring Alertness Needs Improvement

  In the DCP control room, when a condition changed from an alarm to an interlock condition, there was no audible signal. In addition, the inspectors noted that the DCP operating procedures allowed the control room operators to ignore alarms while maintenance activities were performed.

The recommended corrective actions included issuing procedures to assure fissile material within potentially affected equipment is cleaned-out prior to maintenance, improving means to identify powder outlet valve misalignment, adding an IROFS designation to appropriate equipment records, and enhancing methods to assure proper response is taken for alarms and interlocks during maintenance.

Excluding the effect of the observed maintenance activities on ensuring the double contingency principle, the inspectors agreed, in general, with the licensee's identified contributing factors and root causes, and their subsequent recommended corrective actions. However, the licensee stated in their root cause analysis that double contingency principle was not compromised while the inspectors drew a different conclusion as described in Section 3 above. In addition, the inspectors noted that the report did not evaluate and discuss the potential for moisture to have passed the powder outlet hatch valves on January 29, 2008, during the start-up test valve sequencing. The inspectors noted that the high alarm indication may have been an identification of moisture passing into the cooling hoppers as a result of the misaligned powder outlet hatch valves failing to perform their intended safety function.

b. Conclusions

In general, the SIT concurred with the licensee's root cause analysis and proposed corrective actions. However, the SIT did not conclude that the licensee met double contingency requirements during the observed DCP L-2 maintenance activities on January 29, 2008, when the potential existed for moisture passing through the hatch

valves during pre-operational test activities. Nevertheless, the SIT concluded the licensee's root cause investigation was satisfactory and proposed corrective actions were adequate.

6. Adequacy of Licensee's Response to the Event

a. Inspection Scope and Observations

Licensee emergency response activities associated with the January 30, 2008, declared Alert event were evaluated. The evaluation included review of licensee activities leading up to the declared Alert at 6:30 p.m. on January 30, 2008, and direct observation of licensee activities within the licensee's ECC from approximately 7:00 p.m. until termination of the Alert at 9:07 p.m. The evaluation included review of the licensee's implementation of selected Radiological Contingency and Emergency Plan (RC&EP) and notification guidance, review of ECC event records, training documents, and interviews of licensee staff directly involved in the initial Alert declaration and actual response activities. The review included evaluation of the following documents:

- Radiological Contingency & Emergency Plan
- Preliminary Notification, PNO-11-08-001, Alert Declared Based on Moderator Limited Process Vessel
- Tap Root Investigation Report, Potential Moisture in Dry Conversion Process (DCP) Non-Favorable Geometry Vessel Event, 02/06/2008
- Primary and Interim Emergency Director Initial Qualification Records (Primary and Interim Staff)
- EHS Procedure Number 40-32, Integrated Safety Event Communication and Notification, Rev.11
- RC&EP Event Documentation and Critique (typical) for DCP Line 2A Hopper, 01/30/2008

The inspectors arrived at the licensee's ECC at approximately 7:00 p.m. and directly observed appropriate command and control of ongoing monitoring, response, and recovery activities. At that time, the primary emergency director (ED) had arrived onsite and had taken over responsibility for ECC operations from the interim ED. The inspectors verified that subsequent to the Alert declaration at 6:30 p.m., required notifications were made to appropriate State and Local Authorities, and that the NRC HOO was notified in accordance with established procedures and/or requirements. In addition, licensee actions to assess potential health impacts from the perceived L-2A unsafe mass conditions, and actions to mitigate the identified concerns were deemed appropriate.

However, from review of ECC logs, discussions with licensee representatives, and review of RC&EP implementing procedures, the inspectors identified a concern regarding delays in the licensee's entry into the actual Alert classification at 6:30 p.m. The inspectors noted that the FMO manager identified the potential unsafe mass conditions within the L-2A cooling hopper at approximately 5:30 p.m.. Although the observed unsafe mass conditions were based on imprecise UO_2 mass measurements

associated with the L-2A cooling hopper equipment and limited information regarding the underlying conditions for the observed moisture interlock, the inspectors noted that licensee representatives were unaware of any additional sources of information which could be used to corroborate the available information. Subsequently, licensee management requested the security organization to sound the 'Four Ones' initiating signal, requiring assembly of necessary personnel at the ECC based on the observed unsafe mass conditions. The ECC was activated and staffed at approximately 6:19 p.m. with an interim ED in charge. However, the inspectors noted that at that time, rather than declare an Alert classification for the 'Unsafe Mass' conditions in accordance with Criticality Director Instruction Number 5-1, the interim ED declared the event as an 'Off Normal Condition'. Upon the subsequent arrival of the primary ED at the ECC at approximately 6:30 p.m., the licensee declared an Alert based on the same information. The inspectors noted that Safety Condition S-3, of SNM-1097, requires, in part, that the licensee maintain and execute the response measures in the RC&EP and any revision made by the licensee consistent with 10 CFR 70.32(i). Further, the RC&EP Chapter 3, Classification and Notification, Section 3.2.1, and Chapter 4, Responsibilities, Section 4.2.1 specify criteria for the primary ED or the Interim ED during "off " hours or holidays to declare an Alert. Section 5.1, Activation of Emergency Response Organization, specifies, in part, that a summary of the provisions in the plan for the activation and alerting of the emergency organizations for the various emergency classifications is set forth within the emergency procedures. Procedure Number 5, Criticality Emergency Director Instruction, specifies that assembly of necessary personnel in the ECC for unsafe mass conditions requires the licensee to declare an Alert Emergency. The inspectors noted that the failure to declare an Alert event at approximately 6:19 p.m. on January 30, 2008, based on a potential unsafe mass of UO_2 powder in the L-2A cooling hopper, a nonfavorable geometry vessel, and an observed alarm interlock indicating possible moisture intrusion into the subject hopper was considered an **Apparent Violation (AV 70-1113/2008-002-02)**.

b. Conclusions

Licensee command and control of the ECC operations were deemed adequate. An apparent violation was identified for failure to declare an Alert in accordance with established RC&EP implementing procedure guidance (AV 70-1113/2008-002-02).

7. Independent Determination of Root Causes and Contributing Factors

a. Inspection Scope and Objectives

The SIT assessed the facts and circumstances surrounding the event, developed a timeline, and identified causal factors. The inspectors' evaluation focused on the management measures needed to maintain compliance with performance requirements and criticality safety during maintenance activities. The inspectors interviewed operations, maintenance personnel, and safety department personnel. The inspectors

reviewed conversion/powder outlet operating procedures, and maintenance documentation. The inspectors also reviewed applicable sections of the Integrated Safety Analysis (ISA) and CSAs for the dry conversion/powder outlet process areas.

The inspectors noted that the licensee did not have procedures for determination of system boundaries during maintenance activities. As a result, the licensee did not recognize the potential for a direct connection between the reactor/kiln and the cooling hoppers. During the reactor/kiln rebuild, the top hatch valve in powder outlet became misaligned when it was connected to the actuator which resulted in the top valve not being able to fully close. Subsequent startup tests conducted following the maintenance activities involved the sequencing of the powder outlet hatch valves while steam was present in the kiln as part of normal operating conditions. Because the top hatch valve was unable to fully close, a direct path between powder outlet and the cooling hoppers was present. The inspectors noted that the licensee did not have formal IROFS training for maintenance and operations personnel. Maintenance and operations personnel stated that they were not familiar with IROFS and their safety function. In addition, training was not provided to maintenance personnel regarding proper methods to install a powder outlet hatch valve actuator.

In addition, the inspectors noted that neither DCP conversion operating procedures nor general maintenance procedures included cleanout requirements for equipment in adjoining areas/equipment during maintenance activities. The inspectors learned through interviews that it was a standard practice to leave powder in the cooling hoppers during maintenance activities. The inspectors reviewed process data for the cooling hoppers and noted that on January 29, 2008, the L-2B cooling hopper had approximately 90 kg of UO_2. Section 3.9 of the License Application states that licensed material processing or activities will be conducted in accordance with properly issued and approved practices and procedures, plant practices or operating procedures. Contrary to the above, from December 30, 2007 to January 30, 2008, the licensee failed to have a properly issued and approved management control procedure for conducting maintenance activities while licensed material remained within potentially affected conversion process equipment. Specifically, the licensee did not have procedures for performing maintenance on an IROFS, the powder outlet hatch valve system, while licensed material remained in the DCP cooling hoppers. The failure to have a properly issued and approved management control procedure for conducting maintenance activities on an IROFS was considered an **Apparent Violation (AV 70-1113/2008-002-03)**.

During the review of the event, the inspectors also noted the lack of safety function review of maintenance activities involving IROFS. Specifically, the licensee did not take compensatory measures when the L-2 powder outlet hatch valve IROFS was not functional, i.e., during maintenance activities. During the startup tests of the reactor/kiln and hatch valves a small amount of moisture may have entered the cooling hoppers resulting in only one IROFS, dew point moisture probes, in place to prevent moisture from entering into the associated cooling hoppers, nonfavorable geometry equipment, containing UO_2. Further inspection revealed that the NCS function was not aware that maintenance activities were being performed in the reactor/kiln and powder outlet while

the cooling hoppers contained UO_2. Section 6.1.2.2 of the License Application specifies that responsibilities of the criticality safety function are described in Chapter 2.0 of the Application. Section 2.2.1.4 of Chapter 2.0 specifies that the criticality safety function is administratively independent of production responsibilities and includes establishment of criticality safety program including design criteria, procedures, and training; criticality safety support for integrated safety analysis and configuration control; assessment of normal and credible abnormal conditions; and determination of criticality safety limits for controlled parameters. Contrary to the above, from December 30, 2007, through January 30, 2008, the licensee conducted DCP L-2 maintenance activities involving the handling of enriched uranium which were not assessed for the known/expected conditions. Specifically, the licensee performed maintenance activities on conversion line outlet hatch valve systems, while the cooling hoppers contained enriched uranium without criticality safety function review and approval. The failure of the criticality safety function to assure maintenance activities was considered an **Apparent Violation (AV 70-1113/2008-002-04)**.

The Alert was declared based on the actuation of a moisture interlock and the presence of unsafe mass conditions, UO_2 in a nonfavorable geometry (cooling hopper) vessel. Specifically, at 5:40 p.m. on January 30, 2008, the Acting FMO Building Manager realized that a moisture interlock was engaged and that fissile material (UO_2) was present in the L-2A cooling hopper indicating the potential for a criticality due to a moderated unsafe mass. The inspectors noted that the moisture interlock engaged in the previous shift (day-shift), around noon on January 30, 2008. The inspectors interviewed DCP control room personnel and reviewed shift turnover logs and noted that the actuation of the moisture interlock was not discussed during the shift turnover meeting. The control room personnel on day-shift stated that they had not recognized the actuation of the moisture interlock and that was the reason that it was not discussed during shift turnover. Further, the subsequent DCP control room shift also failed to recognize that the moisture interlock was engaged. A potential contributing factor for not recognizing the actuation of the interlock was because in the DCP control room, when a condition changed from an alarm to an interlock condition, there is no audible signal. The inspectors also noted that the DCP powder outlet operating procedures allowed the control room operators to ignore alarms while maintenance activities were performed. The inspectors considered the lack of interlock actuation audible signal and the lack of attention to alarms during maintenance activities to be another root cause for this event.

b. Conclusions

The inspectors identified lack of procedures for determination of system boundaries during maintenance activities, lack of safety function review of maintenance activities involving IROFS, improper installation of powder outlet top hatch valve actuator, lack of interlock actuation audible signal and the attention to alarms during maintenance activities as contributing root causes for the event. Apparent violations were identified for the failure to have a properly issued and approved management control procedure for conducting maintenance activities (AV 70-1113/2008-002-03) and for the failure of the criticality safety function to assess the conduct of maintenance activities (AV 70-1113/2008-002-04).

8. Adequacy of Licensee's Planned Actions to Prevent Recurrence

a. Inspection Scope and Observations

On February 6, 2008, a teleconference was held between GNF-A management and NRC RII/NMSS personnel to discuss immediate and long-term corrective actions to prevent recurrence based on both the casual and root causes identified in the licensee's analysis of the event. The licensee's root cause analysis for the event and corrective actions to prevent recurrence were approved by the WSRC on February 6, 2008. The licensee used a phased approach to ensure safe restart of the facility's conversion lines. The startup activities included the use of individual checklists outlining corrective actions for each of the conversion process lines.

On February 19, 2008, an inspector observed restart activities and verified implementation of the short term corrective actions. The short term corrective actions included:

- Addition of cleanout requirements when performing maintenance using powder outlet and reactor/kiln operating procedures.
- Addition of post maintenance startup checklists to conversion operating procedure.
- Perform general IROFS training for maintenance, engineers, and operators. Pre-startup briefing of circumstances related to the event for each shift.
- Implementation of requirements to perform local leak check after hatch valves installation.
- Installation of an audible alarm in the control room to notify operators of the moisture interlock actuation.
- Update DCP control room operator log to include engaged moisture and steam interlocks and reason for interlock condition.
- Addition of notification requirements for unexpected and unplanned interlocks that occur during maintenance using DCP operating procedures.
- Development of a temporary procedure to evaluate routine and emergent maintenance activities involving IROFS.
- Evaluation of preventive maintenance (PM) activities to verify potential impact on IROFS.
- Completion of all PMs for Line 2 Conversion
- Completion of functional test instructions for all IROFS and other active engineering controls for the reactor/kiln and powder outlet for Line 2 Conversion.

The inspectors considered the corrective actions taken by the licensee to be appropriate to ensure safe restart of the conversion lines. However, the inspectors noted that the DCP control room log was not updated to include engaged interlocks related to hydrogen fluoride and hydrogen. In addition, there are two moisture probes with interlocks in the Dry Scrap Recycle process and the licensee did not have a similar

process to record actuation of these interlocks. The inspectors discussed the observations with the licensee. The licensee acknowledged the observations and planned to take corrective actions.

In addition to the short term corrective actions that the licensee implemented, the licensee plans to implement the following long term corrective actions:

- Analyze the need for cleanout requirements on other equipment in moderation restricted areas during maintenance activities.
- Issue generic criticality safety requirements to ensure proper cleanout of adjoining equipment prior to maintenance activities.
- Issue guidance/training for performing maintenance or repairs to active engineered controls or IROFS.
- Add IROFS designation to appropriate equipment records.
- Make improvements to the hatch valve stem indicator to show valve position.
- Evaluate adding maintenance IROFS training, experience qualifications or qualification card.
- Revise Powder Outlet CSA to more thoroughly evaluate the time required to exceed credible non-uniform moderation limits.
- Convene an ISA team to review the process hazards analysis for Powder Outlet node.
- Modify radiation work permit and change request forms to IROFS evaluation prior to maintenance.
- Training on work order input accuracy to operations, engineers, and maintenance.

b. Conclusions

The inspectors considered the immediate corrective actions taken by the licensee to be appropriate to ensure safe restart of the DCP line operations.

9. Exit Interviews

The inspection scope and results were summarized with licensee management in a meeting on February 4, 2008, and during a telephone exit on March 7, 2008, March 20, 2008, and April 7, 2008, with those persons indicated in the attachment. The licensee took exception to the issues associated with the apparent violations for failure to meet double contingency principle and for failure to declare an Alert in accordance with established guidance. Although proprietary information and processes were reviewed during this inspection, proprietary information was not included in this report.

ATTACHMENT

1. PARTIAL LIST OF PERSONS CONTACTED

Licensee

E. Anderson	Manager, Emergency Preparedness and Site Security COE
J. Fuller	Chief Executive Officer – GNF-A
N. Holmes	Manager, Global Supply Chain
H. Knight	Manager, Fuels Environment, Health, & Safety
T. Leik	Environmental COE
T. Leister	Manager, Manufacturing Wilmington
A. Mabry	Radiation Safety Program Manager
R. Martyn	Manager, Material Control & Accounting
C. Monetta	Manager, Nuclear Environment, Health, & Safety
S. Murray	Manager, Licensing & Liabilities COE
P. Ollis	Licensing Engineer, Licensing & Liabilities COE
L. Paulson	Manager, Nuclear Safety
T. Priest	Manager Shop Operations, Powder Operations & Shop Support
J. Reeves	Manager, Integrated Safety Analysis
C. Roche	Manager, Services EHS
S. Smith	Manager, Fuel Component Operations Building

Other licensee employees contacted included engineers, operators, supervisors, technicians, and maintenance craft personnel.

INSPECTION PROCEDURES (IPs) USED

IP 88003	Reactive Inspection For Events At Fuel Cycle Facilities
IP 93812	Special Inspection

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description
70-1113/2008-02-01	Open	AV	Failure to maintain double contingency control for the DCP Line 2 cooling hoppers.
70-1113/2008-02-02	Open	AV	Failure to declare an Alert in accordance with the RC&EP.
70-1113/2008-02-03	Open	AV	Failure to have a properly issued and approved management control procedure for conducting maintenance activities.

70-1113/2008-02-04	Open	AV	Failure of the criticality safety function to assess maintenance activities.

4. LIST OF ACRONYMS USED

AV	Apparent Violation
CSA	Criticality Safety Analysis
DCP	Dry Conversion Process
ECC	Emergency Control Center
ED	Emergency Director
FMO	Fuel Manufacturing Operation
GNF-A	Global Nuclear Fuels – Americas
HOO	Headquarter Operations Office
IP	Inspection Procedure
IROFS	Items Relied On For Safety
ISA	Integrated Safety Analysis
kg	Kilograms
L-2A	Line-2 cooling hopper 'A'
NCS	Nuclear Criticality Safety
NMSS	Nuclear Material Safety and Safeguards
NRC	Nuclear Regulatory Commission
NSR/R	Nuclear Safety Release/Requirements
PM	Preventive Maintenance
PMT	Preventive Maintenance Testing
RCA	Root Cause Analysis
RC&EP	Radiological Contingency and Emergency Plan
RII	Region II
SIT	Special Inspection Team
UF_6	uranium hexafluoride
UO_2	uranium dioxide
WSRC	Wilmington Safety Review Committee
wt%	weight percent