



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

June 9, 2010

EA-09-268

Mr. Sean Fuller
Chief Operating Officer and Facility Manager
Global Nuclear Fuel – Americas, L.L.C.
P.O. Box 780
Wilmington, NC 28402

SUBJECT: NOTICE OF VIOLATION AND EXERCISE OF ENFORCEMENT DISCRETION
(NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NUMBER 70-1113/2010-003)

Dear Mr. Fuller:

This refers to inspections conducted from November 7, 2008, through August 28, 2009, at the Global Nuclear Fuel – Americas (GNF-A) facility, located in Wilmington, North Carolina. The purpose of the inspections was to review activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The results of our inspections, including the identification of five apparent violations under consideration for escalated enforcement, were documented in Nuclear Regulatory Commission (NRC) Inspection Report Number 70-1113/2009-010, dated November 6, 2009.

In the letter transmitting the inspection report, we requested that you attend a predecisional enforcement conference to discuss the apparent violations. On December 11, 2009, a predecisional enforcement conference was conducted at NRC's Region II office with members of your staff to discuss the significance and the root causes of the apparent violations and your corrective actions. At the conference, GNF-A disputed the characterization of the issues identified with its integrated safety analysis (ISA) methodology as violations of regulatory requirements. GNF-A provided additional information regarding its review of the ISA and discussed corrective actions that would be taken if non-compliances were identified during re-evaluation of the ISA.

Based on the information developed during the inspection and the information that you provided during the conference, the NRC has determined that three violations of NRC requirements occurred. The violations are cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding them are described in detail in the NRC's inspection report dated November 6, 2009. The violations involve: (1) the failure to identify credible accident scenarios as required by the license; (2) the failure to characterize criticality accident scenarios in the ISA as high consequence events as required by the license; and (3) the failure to designate engineered or administrative controls as items relied on for safety when necessary to comply with the performance requirements of Title 10 of the *Code of Federal Regulations*

(10 CFR) 70.61(b)-(d), as required by 10 CFR 70.61(e). The NRC determined that apparent violations 70-1113/2009-203-03, 70-1113/2009-010-01, and 70-1113/2009-010-02 were examples of the same violation and should be characterized as a single violation with three examples of non-compliance with 10 CFR 70.61(e).

The main elements of an ISA program are: (1) identification of credible accidents; (2) determination of the consequences of those accidents; and, (3) identification of items relied on for safety (IROFS) to limit the risk associated with those accidents. The violations are a programmatic concern because the ISA program at GNF-A failed in each of these elements. Specific examples of ISA program failures were identified for the nuclear criticality, fire, and chemical safety disciplines.

In this case, no actual consequences resulted from these violations because there were no incidents and no existing safety controls were identified as degraded. However, the NRC considers the violations to be of significant regulatory concern because the ISA program, as required by Subpart H of 10 CFR Part 70, was established to improve confidence in the margin of safety for facilities regulated under Part 70. The NRC is concerned that the fundamental objective of Subpart H is not being fully realized at your facility.

Enclosure 2 provides additional detail regarding the information presented by GNF-A at the pre-decisional enforcement conference and the bases for NRC's conclusions in this matter.

Based on the above, and because the three violations are related to a common programmatic issue, the significance of these violations has been characterized collectively as a Severity Level III problem, in accordance with the NRC Enforcement Policy.

In accordance with the Enforcement Policy, a base civil penalty in the amount of \$17,500 is considered for a Severity Level III problem. Since GNF-A has been the subject of escalated enforcement within the past two years¹, NRC considered whether credit was warranted for *Identification and Corrective Action* in accordance with the civil penalty assessment process in Section VI.C.2 of the Enforcement Policy. Credit is not warranted for the factor of *Identification* because the NRC identified the violations during inspections. Credit is warranted for the factor of *Corrective Action* because, although GNF-A denied that violations occurred, corrective actions taken in response to the issues identified by the NRC were considered prompt and comprehensive. These actions included but were not limited to: (1) re-evaluation of all current ISA process hazard analyses; (2) revision of the ISA based on deficiencies identified in the re-evaluation; and (3) designation of new items relied on for safety as needed to comply with the performance requirements of 10 CFR 70.61(b)-(d).

Normally, the NRC would propose that a civil penalty be assessed for this Severity Level III problem. However, upon reviewing this issue, the NRC found that during staff review and approval of the GNF-A ISA Summary, the NRC staff and the licensee did not share a common

¹ A Severity Level III violation with a civil penalty, and a separate Severity Level III Problem, was issued on August 13, 2008 (EA-08-123, EA-08-187).

understanding of GNF-A's application of its ISA methodology to scenario evaluation and IROFS identification. Consequently, the staff did not previously identify during the ISA summary review and related inspection activities that GNF-A was not actually meeting regulatory requirements in all phases of the program associated with application of the approved ISA methodology, as set forth above. Global Nuclear Fuel – Americas stated at the PEC that it believed the NRC Staff was aware of the manner in which it was implementing its ISA methodology. In consideration of these factors, the NRC concluded that enforcement discretion to forego proposing a civil penalty is appropriate in this case. Therefore, I have been authorized, after consultation with the Director, Office of Enforcement, to exercise enforcement discretion in accordance with Section VII.B.6 of the Enforcement Policy, such that a civil penalty will not be assessed in this case. Please be advised that issuance of this Notice constitutes escalated enforcement action that may subject you to increased inspection effort.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

For administrative purposes, this letter is issued as NRC Inspection Report Number 70-1113/2010-003. Apparent Violations 70-1113/2009-010-01, 70-1113/2009-010-02, 70-1113/2009-203-01, 70-1113/2009-203-02, and 70-1113/2009-203-03 are closed. The following violations are open: Violation 70-1113/2010-003-01, the failure to identify credible accident scenarios as required by the license; Violation 70-1113/2010-003-02, failure to characterize criticality accident scenarios in the ISA as high consequence events as required by the license; and Violation 70-1113/2010-003-03, failure to designate engineered or administrative controls as items relied on for safety when necessary to comply with the performance requirements of 10 CFR 70.61(b)-(d), as required by 10 CFR 70.61(e).

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response 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>. The NRC also includes significant enforcement actions on its Web site at (<http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/>).

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

Sincerely,

/RA/

Luis A. Reyes
Regional Administrator

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

Enclosures: (See page 4)

S. Fuller

4

Enclosures:

1. Notice of Violation
2. Summary of NRC Conclusions

cc w/encls:

Scott Murray, Manager
Facility Licensing
Global Nuclear Fuel - 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:

W. Borchardt, OEDO
M. Weber, NMSS
C. Scott, OGC
R. Zimmerman, OE
E. Julian, SECY
B. Keeling, OCA
Enforcement Coordinators
RI, RIII, RIV
E. Hayden, OPA
C. McCrary, OI
H. Bell, OIG
J. Wray, OE
P. Silva, NMSS
P. Habighorst, NMSS
V. McCree, RII
J. Shea, RII
E. Cobey, RII
C. Evans, RII
S. Sparks, RII
D. Rich, RII
R. Gibson, RII
R. Hannah, RII
J. Ledford, RII
R. Trojanowski, RII
OEMAIL
PUBLIC

Normally, the NRC would propose that a civil penalty be assessed for this Severity Level III problem. However, upon reviewing this issue, the NRC found that during staff review and approval of the GNF-A ISA Summary, the NRC staff and the licensee did not share a common understanding of GNF-A's application of its ISA methodology to scenario evaluation and IROFS identification. Consequently, the staff did not previously identify during the ISA summary review and related inspection activities that GNF-A was not actually meeting regulatory requirements in all phases of the program associated with application of the approved ISA methodology, as set forth above. Global Nuclear Fuel – Americas stated at the PEC that it believed the NRC Staff was aware of the manner in which it was implementing its ISA methodology. In consideration of these factors, the NRC concluded that enforcement discretion to forego proposing a civil penalty is appropriate in this case. Therefore, I have been authorized, after consultation with the Director, Office of Enforcement, to exercise enforcement discretion in accordance with Section VII.B.6 of the Enforcement Policy, such that a civil penalty will not be assessed in this case. Please be advised that issuance of this Notice constitutes escalated enforcement action that may subject you to increased inspection effort.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

For administrative purposes, this letter is issued as NRC Inspection Report Number 70-1113/2010-003. Apparent Violations 70-1113/2009-010-01, 70-1113/2009-010-02, 70-1113/2009-203-01, 70-1113/2009-203-02, and 70-1113/2009-203-03 are closed. The following violations are open: Violation 70-1113/2010-003-01, the failure to identify credible accident scenarios as required by the license; Violation 70-1113/2010-003-02, failure to characterize criticality accident scenarios in the ISA as high consequence events as required by the license; and Violation 70-1113/2010-003-03, failure to designate engineered or administrative controls as items relied on for safety when necessary to comply with the performance requirements of 10 CFR 70.61(b)-(d), as required by 10 CFR 70.61(e).

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response 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>. The NRC also includes significant enforcement actions on its Web site at (<http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/>).

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

Sincerely,

/RA/

Luis A. Reyes
Regional Administrator

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

Enclosures: (See page 4)

PUBLICLY AVAILABLE NON-PUBLICLY AVAILABLE SENSITIVE NON-SENSITIVE

ADAMS: Yes ACCESSION NUMBER: ML _____

OFFICE	RII:DFFI	RII:EICS	OE	OGC	RII:DFFI	NMSS:FCSS	ORA
SIGNATURE	DR 6/2/10	CE 6/8/10	Email 5/29/10	Email 5/29/10	EC for 6///8/10	Email 5/28/10	
NAME	DRich	CEvans	JWray	CScott	JShea	DDorman	MCCREE
DATE							
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY

NOTICE OF VIOLATION

Global Nuclear Fuel - Americas, L.L.C.
Wilmington, NC

Docket No. 70-1113
License No. SNM-1097
EA-09-268

During NRC inspections conducted from November 7, 2008, through August 28, 2009, violations of NRC requirements were identified. In accordance with the NRC Enforcement Policy, the violations are set forth below:

1. Safety Condition No. S-1 of Special Nuclear Material License No.1097 requires that material be used in accordance with the statements, representations, and conditions of the application dated April 2, 2007 and supplements dated November 25, 2008; January 8, 2009; and February 24, 2009.

Section 3.3 of the License Application states that the focus of the Process Hazard Analysis (PHA), which is part of the Integrated Safety Analysis (ISA), is to (1) identify the hazards associated with the fuel manufacturing facility, (2) identify credible accident scenarios and their causes, and (3) determine the unmitigated risks of these hazards. Section 3.3 also states that the results of the PHA are documented in the ISA Reference Report.

Contrary to the above, on and before July 2, 2009, the licensee failed to identify the following credible accident scenarios and their causes during its PHA or document them in the ISA Reference Report:

- a. Operator removes a unicorn from a moderator restricted area (MRA), thus defeating all MRA controls;
 - b. Water leaks through roof and enters process equipment or spilled powder within an MRA;
 - c. Operator brings in more water than permitted in the MRA and spills onto process equipment or spilled powder; and
 - d. Moderator from process piping leaks through secondary pipe and enters process equipment or spilled fissile material in an MRA.
2. Safety Condition No. S-1 of Special Nuclear Material License No.1097 requires that material be used in accordance with the statements, representations, and conditions of the application dated April 2, 2007 and supplements dated November 25, 2008; January 8, 2009; and February 24, 2009.

Section 3.3.5 of the License Application states: "For each credible accident scenario identified, the ISA team assigned a severity rank for the consequences using the consequence severity rankings shown in Table 3.1 and documented the assigned severity rank in the GNF-A ISA database."

Table 3.1 of the License Application states that criticality accidents are assigned a severity rank of 3, which corresponds to a high consequence event.

Enclosure 1

Contrary to the above, on and before July 2, 2009, the licensee failed to identify nearly 300 criticality accident scenarios as high consequence when it assigned the scenarios a severity rank of 1 (i.e., low consequence).

3. 10 CFR 70.61(e) states that each engineered or administrative control or control system necessary to comply with the performance requirements in 10 CFR 70.61(b), (c), or (d) shall be designated as an item relied on for safety.

Contrary to the above:

- a. On and before July 2, 2009, the licensee failed to designate controls as items relied on for safety when they were necessary to meet the performance requirements of 10 CFR 70.61(b) and (d) for the following cases;
 - i. Gadolinia Vibro-mill, dry conversion, and other processes where criticality accidents are prevented by moderation controls associated with the Moderator Restricted Areas;
 - ii. Line 5 grinder and associated equipment;
 - iii. Primary HEPA filter system; and
 - iv. Outside Scrap Storage.
- b. On and before August 28, 2009, the licensee failed to designate controls as items relied on for safety when they were necessary to meet the performance requirements of 10 CFR 70.61(b). Specifically, Section 27 of the ISA Reference Report, "Reactor off-gas line, including hydrofluoric acid condensers," states, in part, that a large release of reactor off-gas to environment (between DCP and HF buildings), which is identified as a high consequence event, has an unmitigated likelihood of not credible and relies on the following administrative controls to reduce the likelihood of the event:
 - i. Shutdown of all DCP reactor lines if a high lift or crane is used outside near HF exhaust lines between buildings.
 - ii. Periodic visual inspection of the piping system.
- c. On and before July 30, 2009, the licensee failed to designate controls as items relied on for safety when they were necessary to meet the performance requirements of 10 CFR 70.61(b). Specifically, for accident sequences 1.4 and 110.7 of the ISA Reference Report, the licensee relied on engineered or administrative controls (e.g. control of combustibles and flammable materials) to reduce the likelihood of occurrence of a fire that could challenge the integrity of a UF₆ cylinder.

This is a Severity Level III problem (EA-09-268, Supplement VI).

Pursuant to the provisions of 10 CFR 2.201, Global Nuclear Fuel - Americas, L.L.C. (Licensee) is hereby required to submit a written statement or explanation to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, within 30 days of the date of this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation; (EA-09-268)" and should include for each alleged violation: (1) admission or denial of the alleged violation; (2) the reasons for the violation if admitted, and if denied, the basis for denying the validity of the violation; (3) the corrective steps that have been taken and the results achieved; (4) the corrective steps that will be taken to avoid further violations; and (5) the date when full compliance will be achieved.

Your response may reference or include previously docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, the NRC may issue an order or a Demand for Information requiring you to explain why your license should not be modified, suspended, or revoked or why the NRC should not take other action as may be proper. Consideration may be given to extending the response time for good cause shown.

The response noted above, i.e., Reply to Notice of Violation, should be addressed to: Roy Zimmerman, Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, One White Flint North, 11555 Rockville Pike, Rockville Pike, MD 20852-2738, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region II, and to the resident inspector at the facility that is subject to this Notice.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), to the extent possible, it should not include any personal privacy, proprietary, classified or safeguards information so that it can be made available to the public without redaction. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. 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 that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (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 this 9th day of June 2010

SUMMARY OF NRC CONCLUSIONS

GLOBAL NUCLEAR FUEL - AMERICAS, L.L.C. DOCKET 70-1113 EA-09-268

Introduction

During NRC inspections conducted at Global Nuclear Fuel – Americas (GNF-A), from November 7, 2008, through August 28, 2009, inspectors reviewed the Integrated Safety Analysis (ISA) to verify that credible accident scenarios were identified. As a result, the inspectors identified various examples of failure to implement the ISA Methodology as described in Section 3.3 of the License Application. These examples include the failure to identify credible accident scenarios and their causes during Process Hazard Analysis (PHA) and document them in the ISA Reference Report; the failure to identify nearly 300 criticality accident scenarios as high consequence when the licensee assigned the scenarios a low consequence severity rank of 1; and the failure to designate engineered and administrative controls as items relied on for safety (IROFS) when they were necessary to meet the performance requirements of 10 CFR 70.61(b), (c), or (d).

Discussion

1. The first violation involved the failure to comply with Safety Condition No. S-1 of Special Nuclear Material License No. 1097, which requires that material be used in accordance with the statements, representations, and conditions of the application dated April 2, 2007 and supplements dated November 25, 2008; January 8, 2009; and February 24, 2009. Section 3.3 of the License Application requires the identification of credible accident scenarios and their causes.

Section 3.3.3 of the License Application describes the procedure for determining credibility as follows:

In considering accident sequences at this facility, it is necessary to determine which ones will be considered not credible and which ones are credible. When conducting the process hazard analysis, the ISA team considered each accident scenario as credible, unless it could be determined to be not credible. Accident sequences that did not meet the definition of not credible were therefore considered credible and treated in accord with 10 CFR 70.61.

Section 3.3.3 also specifies that, for an accident sequence to be considered not credible, it must have the qualities associated with one or more of the following criteria:

- i. Represent an external event for which the frequency of occurrence can conservatively be estimated less than once in a million years;
- ii. Represent process deviations for which there is a sound argument, based on physical laws or sound engineering/technical data that the deviations are not possible, or are extremely unlikely. The validity of the argument must be independent of any feature, design, or materials controlled by a system of safeguards or IROFS, or of management measures;

- iii. Represent a process deviation that consists of an accident sequence of many unlikely human actions or errors for which there is no reason or motive. In determining that there is no reason for such actions, consideration must be given to a wide range of possible motives, without a show of intent to cause harm. Necessarily, no such accident sequence could ever have actually happened in any fuel cycle facility.

The NRC determined that the licensee failed to identify the following various credible accident scenarios and their causes in the PHA or document them in the ISA Reference Report.

- a. Operator removes a unicone from a moderator restricted area (MRA), thus defeating all MRA controls:

GNF-A determined that this accident sequence was not credible in that it would have required process deviations that consisted of many unlikely human actions or errors for which there was not a reason or motive. GNF-A stated that an operator would have to physically lift a unicone weighting up to 1,400 lbs without the use of a crane or pallet truck outside of the designated path. GNF-A also stated that there was no reason or motive for an operator to move a unicone outside the MRA.

NRC determined that unicones are removed from the MRA routinely to perform maintenance. Procedural controls are in place which requires unicones to be emptied of special nuclear material before they can be removed from the MRA. Failure to remove all special nuclear material from a unicone could result in the licensee leaving an unsafe mass of material (i.e., more than 36 kilograms) in the unicone. NRC determined that the licensee's credibility analysis was based on a system of administrative controls, and thus determined that the credibility analysis was not performed in the unmitigated condition. NRC determined that failure of the procedural controls would not require many unlikely human actions or errors for which there was no motive or reason. Therefore, NRC concludes that an operator removing a unicone from an MRA, thus defeating all MRA controls is a credible accident sequence.

- b. Water leaks through the dry conversion building roof and enters process equipment or spilled powder within an MRA:

GNF-A stated that the double roof over the MRA is a design feature that is treated as a bounding assumption in accordance with Interim Staff Guidance (ISG)-01 criteria. GNF-A stated that the ISA team evaluating this scenario of a roof leak concluded that a quantity of water sufficient to create a criticality hazard was not credible. GNF-A also stated that the double roof design is discussed as a part of the facility design basis in the ISA Summary that was approved by NRC staff in the Technical Evaluation Report dated September 19, 2008.

ISG's are guidance documents and do not alter requirements described in a license or regulations. Under Safety Condition S-1 of its license, GNF-A is required to follow its NRC approved ISA methodology as described in its License Application. Although bounding assumptions are described in Section 5.4.5.5 of the License Application as a part of criticality safety analyses, the License Application does not describe the use of bounding assumptions as part of the ISA methodology. Similarly, there is no description of any use of bounding assumptions related to the MRA in the ISA Summary.

Although the double roof is described in the ISA Summary as part of the facility design basis, there is no exemption provided to the requirements of the License Application for determination of credibility of accident scenarios.

NRC notes that the MRA is discussed in Appendix A-2 of the ISA Summary as a "Generic and Inherent Safeguard." Generic and Inherent Safeguards are described in the ISA Summary as defense in depth measures which reduce the likelihood or severity of hazardous releases from process equipment. However, characterization of a system of controls, such as the MRA, as a Generic and Inherent Safeguard does not provide an exemption from license requirements for determination of credibility. Credibility determinations must adhere to the criteria specified in Section 3.3.3 of the License Application.

The NRC concluded that water leaking through a roof and entering process equipment or spilled powder within an MRA is a credible accident sequence for the following reasons:

- The sequence does not represent an external event with a frequency of less than once in a million years;
- The double roof is considered to be a feature, design, or materials controlled by a system of safeguards or IROFS, or of management measures and therefore cannot be used to argue that the sequence represents a process deviation that is not possible or extremely unlikely; and
- The sequence does not consist of many unlikely human actions or errors without reason or motive.

Therefore, the NRC concluded that the credibility analysis was not performed in accordance with Section 3.3.3 of the License Application.

- c. Operator brings in more moderator than permitted in the MRA and spills onto process equipment or spilled powder;

GNF-A determined that this accident sequence was not credible because it would have required process deviations that consisted of many unlikely human actions or errors for which there was not a reason or motive. GNF-A stated that there would be no reason or motive to bring a large volume of moderator (several gallons) into the MRA, open sealed process equipment and introduce the moderator into that equipment or introduce it into a sufficient quantity of spilled powder (greater than 36 kg UO₂).

NRC determined that moderator is routinely brought into MRAs for cleaning with the following limits: three liters per mop bucket; one liter per bottle of cleaning solution; and no more than nine liters at a time may be resident in specified areas inside the MRA. NRC concluded that GNF-A relies on administrative controls to limit the amount of moderator brought into the MRA. Bringing a large quantity of moderator into an MRA would involve violating an administrative control, but would not require many unlikely human actions. Inspection Report No. 70-1113/2007-201 describes an inspection observation where the total volume of cleaning solution bottles in an MRA was not controlled in accordance with licensee procedures. Routine cleaning is a sufficient motive for bringing an uncontrolled quantity of moderator into the MRA. Also, bringing in moderator for fire fighting is a sufficient motive, and is allowed in the ISA Summary. Process equipment may be opened for maintenance or may be damaged by fire, and

powder spills have occurred periodically during plant operations. Therefore, NRC determined that this scenario would not involve a process deviation that consists of many unlikely human actions for which there is no reason or motive, and therefore considers the accident scenario credible.

- d. Moderator from process piping leaks through secondary pipe and enters process equipment or spilled fissile material in an MRA.

GNF-A determined that this accident sequence could not result in a criticality. GNF-A stated that the facility was designed to minimize process piping. For example, the only piping that contains sufficient quantities of liquids are unpressurized condensate return lines to the Dry Conversion Process (DCP) boilers. A leak from these lines would not result in water leaking into process equipment since there are limited piping runs in the MRA and they are routed away from equipment and containers with fissile material.

NRC determined that moderator leaking from process piping and entering process equipment or spilled fissile material in an MRA was a credible accident sequence. Piping containing water is available in MRAs and 20 liters of water is more than sufficient to pose a criticality hazard for the large quantities of material in DCP. Process steam lines could supply 20 liters of water. NRC has observed steam pipe leaks in the MRA at GNF-A and considers pipe leaks to be likely. Although process steam lines have multiple IROFS, the IROFS are for process parameters rather than detection or mitigation of leaks. NRC agreed that routing of process piping away from equipment is a feature of the facility. However, routing piping away from equipment does not preclude leaks from entering the equipment. NRC concluded that moderator leaking from process piping and entering process equipment or spilled fissile material in an in MRA is a credible accident sequence.

2. The second violation also involved the failure to meet the requirements of Safety Condition S-1 of the license. Section 3.3.5 of the License Application requires a severity ranking of 3 (corresponding to a high consequence event) be assigned for each criticality accident scenario identified. The NRC determined that on and before July 2, 2009, the licensee failed to identify nearly 300 criticality accident scenarios as high consequence when it assigned the scenarios a severity rank of 1 (i.e., low consequence).

GNF-A stated that the approved ISA methodology provides that any accident scenario that does not result in a criticality or specified radiological consequence be given a severity rank of 1 (i.e. low consequence). The licensee stated that a criticality or specified radiological consequence would not occur and therefore assigned a severity rank of 1.

As described in Section 3.3.5 of the License Application, GNF-A's approved ISA methodology requires that accident sequences leading to a criticality be assigned a severity rank of 3 (i.e. high consequence). Furthermore, GNF-A's approved ISA methodology requires that the likelihood of occurrence be evaluated assuming that none of the available safeguards or IROFS perform their intended safety function. NRC determined that the likelihood or credibility of occurrence of an accident does not alter its consequence, and that GNF-A failed to assign criticality accident scenarios a high consequence severity rank of 3. In addition, the GNF-A ISA methodology does not permit the use of any mitigating factors or controls to reduce the consequences of a criticality accident for the purpose of meeting the performance requirements.

3. The third violation involved the failure to meet 10 CFR 70.61(e). This regulation requires, in part, that each engineered or administrative control system necessary to comply with the performance requirements of 10 CFR 70.61(b), (c) or (d) be designated as an IROFS.

The NRC determined that the licensee failed to designate controls as IROFS when they were necessary to meet the performance requirements of 10 CFR 70.61(b), (c), or (d) for the following cases:

- a. On and before July 2, 2009, the licensee failed to designate controls as items relied on for safety when they were necessary to meet the performance requirements of 10 CFR 70.61(b) and (d) for the following cases:
 - i. Gadolinia Vibro-mill, dry conversion, and other processes where criticality accidents are prevented by moderation controls associated with the MRAs.

GNF-A stated that ISG-01 authorized reliance on bounding assumptions incorporated into the ISA Summary.

ISG's are guidance documents and do not alter requirements described in a license or regulations. In addition, ISG-01 does not endorse using bounding assumptions as a substitute for designating IROFS. Under Safety Condition S-1 of its license, GNF-A is required to follow its NRC approved ISA methodology as described in the License Application. As stated previously, the NRC has concluded that the accident sequences identified as examples in the first violation are credible. NRC concluded that GNF-A relied on a system of moderator controls associated with the MRA to ensure that processes will remain safely subcritical under all normal and credible abnormal conditions. These controls were relied on to meet performance requirements, and therefore were required to be designated as IROFS.

- ii. Line 5 grinder and associated equipment.

At the Predecisional Enforcement Conference, GNF-A stated that, for these accident scenarios, a criticality or specified radiological consequence would not occur and therefore assigned a severity ranking of 1. However, in November 2009, GNF-A initiated reviews of the PHA and the accident sequences associated with the grinder. The licensee found that the PHA had not included accident sequences involving external moderator intrusion, and that there were other areas also missing this scenario. All affected equipment was promptly shut down and an investigation was conducted. The condition was reported within 24 hours to the NRC. An analysis conducted in accordance with the approved ISA methodology indicated that a high-consequence (severity ranking of 3) event was possible, which required an overall likelihood calculation to determine if the existing criticality controls needed to be designated as IROFS to meet the performance requirements. An ISA review was performed for the Line 5 grinder (and associated equipment) and additional IROFS were designated.

NRC determined that an accidental criticality in the Line 5 grinder and associated equipment was a credible event, in that the licensee's nuclear criticality safety (NCS) analysis for the Line 5 grinder assumed that criticality was credible and assigned controls for double contingency. GNF-A's approved ISA methodology requires that accident sequences leading to a criticality be assigned a severity rank of 3 (i.e. high

consequence). NRC concluded that the licensee relied on criticality controls to meet performance requirements and those controls are required to be designated as IROFS as required by 10 CFR 70.61(e).

iii. Primary HEPA filter system.

GNF-A stated that for this accident scenario, either a severity of 1 (low consequence) was appropriate or that the unmitigated likelihood was zero (not credible) but the licensee stated that the basis for these determinations is not clear.

NRC determined that an accidental criticality in the primary HEPA filter system was a credible event. The licensee's NCS analysis assumed that a criticality in these filter systems was credible and assigned controls for double contingency. GNF-A has had events in the last ten years involving accumulation of enriched uranium in the primary HEPA filter system. Therefore, the licensee cannot claim that criticality is not credible unless that claim is based on those controls, which is not in compliance with the approved ISA methodology. NRC concluded that the licensee relied on criticality controls, such as differential pressure limits on the primary HEPA filter system, to meet performance requirements and those controls are required to be designated as IROFS as specified by 10 CFR 70.61(e).

iv. Outside Scrap Storage.

GNF-A concluded that for this accident scenario, either a severity of 1 was appropriate or that the unmitigated likelihood was zero (not credible) but the basis for this determinations is not clear.

NRC determined that a criticality accident in outside scrap storage is a credible event. GNF-A's NCS analysis assumed that a criticality accident in outside scrap storage is credible and assigned controls for double contingency. GNF-A failed to designate all controls relied on to meet the performance requirements for the outside scrap storage as IROFS. GNF-A had controls such as grid spacers in place in these storage areas to prevent what the NCS analysis describes as a credible risk of criticality. Therefore, the ISA team cannot claim that criticality is not credible unless that claim is based on those controls, which is not in compliance with the approved ISA methodology. NRC concluded that criticality controls, such as grid spacers, that are required by NCS analyses, are relied on to meet performance requirements and must be designated as an IROFS as required by 10 CFR 70.61(e).

- b. On and before August 28, 2009, the licensee failed to designate controls as IROFS when they were relied on to meet the performance requirements of 10 CFR 70.61 (b). Specifically, Section 27 of the ISA Reference Report, "Reactor off-gas line, including hydrofluoric acid condensers," states, in part, that a large release of reactor off-gas to the environment (between DCP and HF buildings), which is identified as a high consequence event, has an unmitigated likelihood of zero, or not credible, and lists safeguards, such as material of construction, and administrative controls, such as visual inspections and process shutdown if a high lift or crane is used in the vicinity of the piping.

The licensee stated that they determined this accident scenario to be highly unlikely. However, the NRC notes the ISA Reference Report lists the unmitigated likelihood as zero, or not credible. The NRC determined the licensee did not adhere to the approved ISA methodology for determination of unmitigated likelihood, as described in Table 3.3 in the License Application. The approved ISA methodology describes a zero (0) unmitigated likelihood as incredible, or not highly unlikely, and specifies a ranking of one (1), as the next lowest likelihood category. No allowance is described for approximating, rounding off, or adjusting an unmitigated likelihood determination of highly unlikely to incredible. Therefore, the NRC concluded the accident scenario should be assigned an unmitigated likelihood ranking of 1. The ISA methodology requires IROFS be designated for a high consequence accident scenario with an unmitigated likelihood of 1.

The NRC concluded that the licensee failed to designate controls as IROFS where required by the approved ISA methodology in order to meet performance requirements, and therefore those controls were not designated as IROFS in accordance with 10 CFR 70.61(e).

- c. On and before July 30, 2009, for accident sequences 1.4 and 110.7 of the ISA Reference Report, GNF-A relied on engineered or administrative controls to reduce the likelihood of occurrence of a fire that could challenge the integrity of a UF₆ cylinder, but did not designate these controls as IROFS.

GNF-A assigned an unmitigated likelihood of 0 to the accident sequences involving the rupture of a UF₆ cylinder due to a fire. Table 3.3 ("Unmitigated Likelihood Categories") of the License Application defines an unmitigated likelihood of 0 as having a frequency of incredible and the likelihood is indistinguishable from zero. Using the criteria in Section 3.3.3 of the License Application, NRC determined that a fire capable of rupturing an UF₆ cylinder was a credible accident sequence. NRC determined that there was no sound argument, based on engineering or technical data, that such a fire was a process deviation which was not possible. NRC used NUREG/CR-6850, *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities* (Sept. 2005) to conservatively estimate the ignition frequency of fires in the Fuel Manufacturing Operations UF₆ cylinder storage area. NRC used transient fires caused by welding and cutting activities and fire initiated by transient combustibles/flammable materials to conservatively estimate the fire ignition frequency, and concluded that a fire could be expected to occur within the estimated facility lifetime.

NRC inspectors determined that in the fuel manufacturing areas at GNF-A, there was enough combustible/flammable material (e.g. diesel fuel, pallet loads of cardboard, cartons of high-density plastic stored on wood pallets, fuel assembly wood storage containers) to fuel a fire which could challenge the integrity of a UF₆ cylinder. For example, in the FMO storage area, the NRC observed a storage area containing approximately 29 pallets loads of cardboard cartons of high-density plastic parts on wood pallets on the floor to a maximum height of 6 feet. There were approximately 700 cartons, of 16" x 16" x 18" size, on the pallets, and the floor area was approximately 500 ft². This storage area was kept approximately 20 feet from the UF₆ cylinders.

Based on the analysis performed by W. Reid Williams, Oak Ridge National Lab, "Investigation of UF₆ Behavior in a Fire," Conf-880558-11, under contract with U.S. Nuclear Regulatory Commission (undated), and heat of combustion data for plastics obtained from NUREG-1805, "Fire Dynamics Tools: Quantitative Fire Hazard Analysis

Method for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program,” Oct. 2004, the NRC determined that only 18 to 30 pounds of this material would be needed to generate an unmitigated fire that could challenge the integrity of a UF₆ cylinder. NRC determined that there could be process deviations that are possible, and not extremely unlikely that could cause a fire capable of rupturing an UF₆ cylinder. Therefore, NRC concluded that the licensee relied on controls in order to meet the performance requirements, and those controls were not designated as IROFS in accordance with 10 CFR 70.61(e).

Conclusion

NRC determined that three violations with multiple examples occurred. The first violation involved the licensee’s failure to identify credible accident scenarios and their causes during its Process Hazards Analysis or document them in the ISA Reference Report. The second violation involved the failure to identify nearly 300 criticality accident scenarios as high consequence when it assigned the scenarios a severity rank of 1 (i.e., low consequence). The third violation involved the failure to designate controls as items relied on for safety when they were necessary to meet the performance requirements of 10 CFR 70.61(b), (c), or (d), as required by 10 CFR 70.61(e).

GNF-A relied upon controls or systems of controls to conclude that accident sequences were not credible when this practice was not consistent with the criteria specified in the License Application. As a result of its failure to properly characterize these accidents as credible, GNF also failed to identify controls necessary to meet the performance requirements as items relied on for safety.

GNF-A incorrectly concluded that criticality accidents were low consequence events when they had a small likelihood of occurrence. The GNF License Application requires all criticality accidents be considered as high consequence events and does not provide any exception based upon the likelihood or credibility of occurrence. GNF relied upon controls or systems of controls to make some of these conclusions, and as a result it also failed to identify controls necessary to meet the performance requirements as items relied on for safety.

In addition to the above, the NRC identified other accident sequences where GNF relied upon controls or systems of controls to meet the performance requirements without designating them as items relied on for safety.