

## **SAFETY EVALUATION REPORT: Amendment to Chapter 3 of License SNM-1097**

**LICENSEE:** Global Nuclear Fuel – Americas, L.L.C., Wilmington, North Carolina  
**DOCKET NO.** 70-1113

### **BACKGROUND**

In a letter dated August 13, 2010, Global Nuclear Fuel – Americas, LLC, (GNF-A) submitted a request to amend Chapter 3 of the License Application for Materials License SNM-1097, which had been renewed on May 19, 2009. The version of chapters 3 and 11 of the renewal were Revision 1. On December 2, 2010, GNF-A provided revised pages of Chapters 3 and 11 (now revision 2) in their entirety with the response to a Request for Additional Information dated November 29, 2010.

### **REGULATORY REQUIREMENTS**

The regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) 70.62 require a licensee to establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. The safety program is required to contain an Integrated Safety Analysis (ISA), process safety information, and management measures. The ISA must be conducted and maintained by the licensee and must identify the following, in accordance with 10 CFR 70.62(c):

70.62(c)(1)(i): Radiological hazards related to possessing or processing licensed material at the facility;

70.62(c)(1)(ii): Chemical hazards of licensed material and hazardous chemicals produced from licensed material;

70.62(c)(1)(iii): Facility hazards that could affect the safety of licensed material and, thus, present an increased radiological risk;

70.62(c)(1)(iv): Potential accident sequences caused by process deviations or other events internal to the facility and credible external events, including natural phenomena;

70.62(c)(1)(v): Consequence and likelihood of concurrence of each potential accident sequence identified and the methods used to determine the consequences and likelihoods;

70.62(c)(1)(vi): Each items relied on for safety (IROFS) identified pursuant to 10 CFR 70.61(e), the characteristics of its preventative, mitigative, or other safety function, and the assumptions and conditions under which the item is relied upon to support compliance with the performance requirements of 10 CFR 70.61;

70.62(c)(2): The analysis must be performed by a team with expertise in engineering and process operations; and

70.62(d): The licensee must apply management measures to ensure that any controls identified as IROFSs are available and reliable to perform their safety function when called upon.

## **STAFF REVIEW AND ANALYSIS**

The staff reviewed the amended license application text to determine whether it demonstrates compliance with the requirements of 10 CFR 70.62, and that records documenting plant changes will be established and maintained.

### **FACILITY HAZARDS**

The regulations in 10 CFR 70.62(c)(1)(i), 70.62(c)(1)(ii), and 70.62(c)(1)(iii) require that the ISA identify potential accident sequences involving radiological, chemical, and other facility hazards, respectively. Section 3.0 of the amended License Application text includes the commitment to include these types of hazards in the ISA, and is therefore acceptable.

### **EXTERNAL HAZARDS**

The regulations in 10 CFR 70.62(c)(1)(iv) require that the ISA identify potential accident sequences caused by process deviations or other events internal to the facility and credible external events, including natural phenomena. Section 3.3.3 of the amended License Application includes the commitment to include external hazards in the ISA, and is therefore acceptable.

### **CONSEQUENCE AND LIKELIHOOD**

The regulations in 70.62(c)(1)(v) require determination of consequence and likelihood of each potential accident sequence identified and the methods used to determine them. The licensee's commitments to this regulation is provided in Sections 3.3.5, 3.3.6, and 3.3.7 of the amended License Application, and is discussed further below.

### **IROFS**

The regulations in 70.62(c)(1)(vi) require a description of each IROFS identified pursuant to 10 CFR 70.61(e) and its characteristics in the ISA. In Section 3.4.3 of the amended License Application, the licensee commits to provide this information in the ISA.

### **ISA TEAM QUALIFICATION**

The regulations in 10 CFR 70.62(c)(2) require that, to assure the adequacy of the ISA, the analysis must be performed by a team with expertise in engineering and process operations. The team must include at least one person who has experience and knowledge specific to each process being evaluated, and persons who have experience in nuclear criticality safety, radiation safety, fire safety, and chemical process safety. One member of the team must be knowledgeable in the specific ISA method being used.

In Section 3.5.2 of the amended License Application, the licensee stated that ISA Teams apply the ISA approach to the facility under the direction of the ISA Team Leader. Each team included members with experience in hazards related to: nuclear criticality, radiation safety, fire protection, chemical safety, and process/operations. The team leader is formally trained in ISA methods. Based on the above information, the staff finds that the ISA team and their qualifications are acceptable for meeting the requirements of 10 CFR 70.62(c)(2).

### **ISA METHODS**

Figure 3.1 of the amended License Application depicts the ISA method in the form of a flowchart. In Section 3.3.2 of the amended License Application text, the licensee stated that each facility/process is divided down to "nodes," which established the boundaries for the review

that the ISA team could efficiently and accurately analyze using an appropriate hazard identification methodology such as those described in the American Institute of Chemical Engineers (AIChE), "Guidelines for Hazard Evaluation Procedures" (AIChE 1992) including hazards operability (HAZOP) and "What-If"/checklist analyses. The method uses an interdisciplinary team to identify hazards, construct accident scenarios, assess consequences, and select IROFS. The licensee's method considered all modes of operations, including startup, normal operation, shutdown, and maintenance that could lead to undesirable consequences which do not meet the 10 CFR 70.61 performance requirements.

NUREG-1513, "Integrated Safety Analysis Guidance Document," identifies the HAZOP and "What-If"/checklist techniques as acceptable approaches. Therefore, the staff concludes that the process hazard analysis methods used by the licensee are acceptable for the identification of potential radiological, chemical and facility hazards, and potential accident sequences caused by process deviations; or other events internal to the facility and credible external events. Based on the above information, the staff finds that the methods used to perform the ISA are acceptable.

#### Credible Sequences

In Section 3.3.3 of the amended License Application, the licensee listed three different definitions of *not credible* and commits that sequences determined to be *not credible* will be documented in the ISA. As stated in Section 3.3.3 of the amended License Application text, the hazard identification process used by the licensee documented credible accident scenarios or sequences, usually with single initiating events consisting of process deviations, human errors, internal facility events, and credible external events. Hazards were assessed individually for the potential impact on the process systems.

#### Consequences

In Section 3.3.5 of the amended License Application, the licensee listed three different severity rankings based on the consequences resulting from exposure to chemical, criticality, or radiological hazards for workers, members of the public, and the environment. They are shown in Table 3.1 of the amended License Application.

Rankings 2 and 3 correspond to those listed in 10 CFR 70.61 for intermediate- and high-consequence events, respectively, and include the consequence definitions from 10 CFR 70.61, as well as corresponding Acute Exposure Guideline Level (AEGL) thresholds in Table 3.2 for chemical releases of uranium hexafluoride, soluble uranium, and hydrogen fluoride. The NRC staff reviewed the licensee's criteria for determining whether an accident is classified in 10 CFR 70.61 to be a high- or intermediate-consequence event and determined that the criteria are in conformance with 10 CFR 70.61(b)(1)-(4) and (c)(1)-(4) and are acceptable.

All criticality events are assigned a consequence category of 3 – "high consequence."

#### Criticality Controls

In response to an RAI, the licensee clarified that a number of controls are identified in the criticality safety analyses in order to meet the double contingency principle per 10 CFR 70.64(a)(9) and provide defense-in-depth per 10 CFR 70.64(b). Each engineered or administrative control required to meet the requirements of 10 CFR 70.61(b) and those required to assure all nuclear processes are subcritical at credible normal and abnormal conditions per 10 CFR 70.61(d) will be credited as IROFS. Other controls will provide defense-in-depth.

Enabling Conditions and Conditional Events

In Section 3.4.2 of the amended License Application, the licensee introduces a new term “enabling events,” which do not cause the sequence, but must be present for the initiating event to proceed. Later in Section 3.4.2 of the amended License Application, the licensee introduces a new term “conditional events,” which do not credit controls, but affect the overall likelihood of the accident sequence. For example, if an accident sequence involves a personnel injury, at least one worker must be present at the time of the event for the injury to occur.

Overall Risk

The overall risk category of each accident sequence is determined using the consequence category and likelihood (as determined above) for the sequence in the Risk Matrix.

In the licensee’s Risk Matrix, an accident sequence with an overall risk index (likelihood x consequence) greater than 4 does not meet the Part 70 performance requirements; and the application of IROFS to mitigate the consequence or reduce the likelihood is required.

Determine Unmitigated Likelihood

The unmitigated likelihood for each accident sequence is determined as described in Section 3.3.6. Scenarios with no quantitative assessment are automatically assigned an unmitigated category of “not unlikely,” which is intended to provide a level of conservatism.

Table 3-3 in the amended License Application presents the following categories:

Unmitigated Likelihood Category Definitions		
Not unlikely	3	more than or equal to $10^{-3}$ per event per year
Unlikely	2	between $10^{-3}$ and $10^{-4}$ per event per year
Highly unlikely	1	less than or equal to $10^{-4}$ per event per year

Determine Unmitigated Risk

In Section 3.3.7 of the amended License Application, the licensee provides an unmitigated risk assignment matrix, which presents the risk category as the product of unmitigated likelihood and consequence categories. The risk matrix and computed index values are shown in Table 3-4 of the amended License Application with the likelihood categories across the top and the consequence categories along the left side. The risk matrix shows the combinations of likelihood and consequence that are unacceptable. In Section 3.4 of the amended License Application, the licensee commits that sequences falling into these combinations will be mitigated or prevented with IROFS.

Unmitigated Risk Matrix			
Severity	Likelihood Category 1 Highly Unlikely	Likelihood Category 2 Unlikely	Likelihood Category 3 Not Unlikely
Consequence Category 3 High	Acceptable Risk 3	Unacceptable Risk 6	Unacceptable Risk 9
Consequence Category 2 Intermediate	Acceptable Risk 2	Acceptable Risk 4	Unacceptable Risk 6
Consequence Category 1 Low	Acceptable Risk 1	Acceptable Risk 2	Acceptable Risk 3

### Perform Quantitative Risk Analysis

In Section 3.4 of the amended License Application, the licensee commits to analyzing each accident sequence, initiating and contributing conditions, and preventive and mitigating controls. For each scenario, the licensee commits to determine and document the mitigated likelihood in a quantitative risk assessment (QRA) report, which provides sufficient information about the process, accident, and undesirable consequences. The mitigated likelihood (or mitigated consequence) with the IROFS applied must meet the performance requirements in 10 CFR 70.61 that high-consequence accident sequences are highly unlikely and intermediate-consequence accident sequences are unlikely.

### MANAGEMENT MEASURES

The regulations in 70.62(d) require the licensee to apply management measures to IROFS to ensure that they are available and reliable to perform their safety function when called upon. The evaluation in each node analysis includes a description of the management measures which are applied to each IROFS for each scenario. In Section 3.5.3 of the revised application, the licensee describes a graded approach for assigning management measures to different categories of IROFSs, based on a number of criteria. In addition, the licensee repeated the commitment to the specific management measures for criticality controls contained in Chapter 5 of the License Application, whether they are IROFS or not.

Although not revised by this amendment request, in Section 3.5.1 of the License Application the licensee commits to maintaining records of changes required by 10 CFR 70.72(f). Additional commitments to records of plant changes related to the ISA are contained in Section 11.2.1 of the License Application. These commitments remained unchanged by this amendment request.

### TRANSITION FROM OLD TO NEW METHODOLOGY

In the amendment request, the licensee requested insertion of a new license condition S-4, which would allow GNF-A to conduct licensed activities and maintain records in accordance with the renewal License Application Chapter 3, (Revision 1), including commitments to criticality event reporting requested under EA-09-268, and until completion of the ISA Project. The corrective actions and supplemental information described by GNF-A in response to the violations in EA-09-268 were found to be acceptable by Region II as stated a letter dated August 20, 2010 (ML102350073). Specifically, if a condition was identified in which criticality controls required to meet double contingency were not maintained or available, the NRC would be notified within 24 hours. If necessary, actions would be taken to maintain safety. Such actions may include shutting down equipment.

The staff noted that the revised methodology is being applied to the existing site, processes, systems, equipment, and activities. No new processes or systems are being installed as a result of this request. Therefore, the staff does not expect any new types of sequences to be identified which do not meet the criteria in 10 CFR 70.72(c)(1) and would have to be submitted as an amendment. Sequences identified by the revised methodology and which were not described in the existing ISA Summary under the exiting methodology and which do not meet the performance criteria in 70.61 would be subject to 24-hour reporting under 10 CFR Part 70, Appendix A(b)(1). The staff noted that the reporting criteria includes these "and" clauses, so the number of sequences to be reported is expected to be small. The 24-hour reporting deadline

would start when the QRA determined that the performance requirements were not met. This approach was found to be acceptable.

## **FINDINGS/CONCLUSIONS**

The methodology presented by the licensee was found to be consistent with the guidance in NUREG-1513, "Integrated Safety Analysis Guidance Document," and Appendix A of NUREG-1520, "Standard Review Plan for the review of a License Application for a Fuel Cycle Facility," including the hazard evaluation method, consequence severity categories, likelihood categories, risk matrix and index values. The staff determined that the amended license application text meets the requirements in 10 CFR 70.62(c).

## **RECOMMENDATION**

The staff recommends approval of this amendment, as well as the corresponding license condition. Staff recommends that the following condition be added to the license to document the commitments to the new methodology and the schedule for completion of the items in the ISA Action Plan:

S-4: Global Nuclear Fuel – Americas (GNF-A) may continue to conduct license activities and maintain records in accordance with the approved SNM-1097 Revision 1 of Chapter 3 "Integrated Safety Analysis," and Revision 1 of Chapter 11 "Management Measures" subject to GNF-A's commitments in GNF-A's reply to Notice of Violation (EA-090268) dated July 23, 2010, including but not limited to: (1) its commitment regarding criticality control-related event reporting; and (2) until completion of the actions set forth in its Integrated Safety Analysis Action Plan and Schedule maintained in Attachment 2 to the July 23, 2010, reply to Notice of Violation.

## **ENVIRONMENTAL REVIEW**

According to 10 CFR 51.22(c)(11), the issuance of amendments to licenses for fuel cycle plants which are administrative, organizational, or procedural in nature—or which result in a change in process operations or equipment are eligible for categorical exclusion provided that:

- (i) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.
- (ii) There is no significant increase in individual or cumulative occupational radiation exposure.
- (iii) There is no significant construction impact.
- (iv) There is no significant increase in the potential for or consequences from radiological accidents.

The changes in this amendment do not affect the scope or nature of the licensed activity and are administrative in nature, so they will not result in a significant change in the types or amounts of effluents released offsite. There will not be any significant increase in individual or cumulative occupational radiation exposure, and there will not be any significant increase in the potential or consequences from radiological accidents. There is no construction associated with these changes, so there will not be any impact from construction.

## **PRINCIPAL CONTRIBUTORS**

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