

# Pre-Decisional Enforcement Conference

NRC Region II  
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**Global Nuclear Fuel**

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A Joint Venture of GE, Toshiba, & Hitachi

# Agenda

- Introduction
- History and Regulatory Guidance
- Apparent Violation Discussion
- Contributing Factors
- Safety Assessment
- Assessing Significance
- Path Forward
- Conclusion

# Introduction

# History and Regulatory Guidance

# History and Regulatory Guidance

**1996 to 2000**

Even before Part 70 was issued, ISA summaries were developed and submitted in connection with a dry conversion license amendment and fuel facility license renewal. NRC representatives visited the facility and participated in these early ISA development activities.

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**2000 to 2002**

10CFR70 and NUREG 1513/1520 guidance is issued, NRC approves GNFA's ISA plan, and GNFA engages in multiple discussions with NRC on ISA definitions, methodologies, and level of detail.

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**2002 to 2008**

During this period, NRC issues multiple Interim Staff Guidance documents on Part 70. GNFA submits a revised ISA Summary (Rev 11) which is approved by the NRC.

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**2008 to 2009**

NRC inspections identify licensee implementation issues.

# Apparent Violation Discussion

# Apparent Violation Discussion

1. Failure to identify credible accident scenarios and their causes in the process hazard analysis or document them in the ISA report.
2. 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).
3. Failure to designate controls as IROFS when they were necessary to meet the performance requirements.
4. Failure to designate controls as IROFS when they were used to consider an accident scenario as not credible.
5. Failure to designate controls as IROFS when they were relied on to reduce the likelihood of occurrence of a high consequence event.

# Apparent Violation Discussion

## NRC Apparent Violation 1:

Failure to identify credible accident scenarios and their causes in the process hazard analysis or document them in the ISA report. Examples:

- a. *Operator removes a unicone 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;*
- d. *Non-carbon dioxide fire extinguisher is used in MRA and fissile material becomes moderated; and*
- e. *Moderator from process piping leaks through secondary pipe and enters process equipment or spilled fissile material in an MRA.*

# Apparent Violation Discussion

## NRC Apparent Violation 1:

1a. *Operator removes a unicone from a moderator restricted area (MRA), thus defeating all MRA controls.*

- Process deviation that consists of an accident sequence of many unlikely human actions or errors for which there is no reason or motive (not credible per GNFA Fuel facility license (SNM-1097) and ISA Summary).
- Operator would have to physically lift a unicone weighing up to 600 kg (~1400 lbs) without the use of a crane or pallet truck outside of the designated path (physical impossibility).
- There is no reason or motive for an operator to move a unicone outside the MRA or transfer corridor.
- The ISA analyzed accident scenarios that might occur in the transfer corridor, which is outside the MRA. It specifically analyzes the inadvertent introduction of moderator into a container while in the corridor. The ISA team evaluating this node concluded that this accident scenario was not credible.

# Apparent Violation Discussion

## NRC Apparent Violation 1:

1b. *Water leaks through roof and enters process equipment or spilled powder within an MRA.*

- ISG-01, “Qualitative Criteria for Evaluation of Likelihood” recognizes that “facility or process features...that can affect event likelihood may be identified as initial conditions or bounding assumptions” so long as they are identified and properly maintained.
- The double roof over the MRA is a design feature that GNFA treated as a bounding assumption in accordance with that principle and facility documentation. The roof is robustly designed with multiple features to prevent water leaks and to provide an early warning of potential degradation. The ISA team evaluating this scenario of roof leak concluded that a quantity of water sufficient to create a criticality hazard was not credible.
- Specifically discussed in ISA Summary (Sect. 3.2.3.1) as a part of facility design basis and approved in NRC staff SER on September 19, 2008. The SER specifically recognized the multiple protective features of the MRA.

# Apparent Violation Discussion

## NRC Apparent Violation 1:

*1c. Operator brings in more water than permitted in the MRA and spills onto process equipment or spilled powder*

- GNFA considers that this event would involve a process deviation that consists of many unlikely human actions for which there is no reason or motive and would therefore be not credible.
- There would be no reason or motive to bring a large volume of water (several gallons) into the MRA, open sealed process equipment and introduce the water into that equipment or introduce it into a sufficient quantity of spilled powder (greater than 36 kgs UO<sub>2</sub>).

# Apparent Violation Discussion

## NRC Apparent Violation 1:

1d. *Non-carbon dioxide fire extinguisher is used in MRA and fissile material becomes moderated.*

- GNFA considers this event to be non credible because it would involve a process deviation that consists of many unlikely human actions for which there is no reason or motive. Specifically, only CO<sub>2</sub> extinguishers are available in the MRA and are distinct from typical extinguishers that utilize water or other moderating material. There is no reason or motive for a person to bring a non-CO<sub>2</sub> extinguisher into the MRA.
- There would be no reason or motive to open sealed process equipment and introduce moderating media into that equipment or introduce it into a sufficient quantity of spilled powder (greater than 36 kgs UO<sub>2</sub>).
- The Facility Safety Basis (Section 3.2.5.1) of the GNFA ISA Summary states that CO<sub>2</sub> fire extinguishers are used in the MRA areas of the DCP building. The NRC's SER acknowledges (Section 2.5.3) that CO<sub>2</sub> fire extinguishers are used in all cases except under special provision.

# Apparent Violation Discussion

## NRC Apparent Violation 1:

1e. *Moderator from process piping leaks through secondary pipe and enters process equipment or spilled fissile material in an MRA.*

- GNFA does not believe that this represents a credible accident sequence that could result in a criticality.
- Other than process steam (which has multiple IROFS), we have specifically designed this facility to minimize process piping. For example, the only piping that contains sufficient quantities of liquids are unpressurized condensate return lines to the 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.

Note: The ISA Summary refers to jacketed piping in the MRA. In fact, there is no jacketed piping in the MRA and thus the ISA Summary will be revised in the next update.

# Apparent Violation Discussion

## NRC Apparent Violation 1 - Summary:

- GNFA believes the examples discussed above are not credible accident sequences. As such, they were not documented in the ISA.
- GNFA acknowledges that use of bounding assumptions needs to be resolved.

# Apparent Violation Discussion

## NRC Apparent Violation 2:

*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 methodology described in the GNFA ISA Summary provides that any accident scenario that does not result in a criticality or specified radiological consequence be given a severity ranking of 1.
- GNFA believes the ISA team concluded that, for these accident scenarios, a criticality or specified radiological consequence would not occur and therefore assigned a severity of 1.

# Apparent Violation Discussion

## NRC Apparent Violation 2:

### Facility Consequence Severity Categories

Severity Ranking	Consequence Description		
	Workers	Offsite Public	Environment
3	<ul style="list-style-type: none"> <li>▪ Radiological dose greater than 1 Sv (100 rem) ▪ 75 mg soluble uranium intake ▪ Chemical exposure greater than AEGL-3 ▪ A criticality accident occurs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Radiological dose greater than 0.25 Sv (25 rem) ▪ 30 mg soluble uranium intake ▪ Chemical exposure greater than AEGL-2 ▪ A criticality accident occurs</li> </ul>	<ul style="list-style-type: none"> <li>▪ A criticality accident occurs</li> </ul>
2	<ul style="list-style-type: none"> <li>▪ Radiological dose greater than 0.25 Sv (25 rem) but less than or equal to 1 Sv (100 rem) ▪ Chemical exposure greater than AEGL-2 but less than or equal to AEGL-3</li> </ul>	<ul style="list-style-type: none"> <li>▪ Radiological dose greater than 0.05 Sv (5 rem) but less than or equal to 0.25 Sv (25 rem) ▪ Chemical exposure greater than AEGL-1 but less than or equal to AEGL-2</li> </ul>	<ul style="list-style-type: none"> <li>▪ Radioactive release greater than 5,000 times Table 2 Appendix B of 10 CFR Part 20</li> </ul>
1	Accidents with radiological and/or chemical exposures to workers less than those above	Accidents with radiological and/or chemical exposures to the public less than those above	Radioactive releases to the environment producing effects less than those specified above

\*Where Sv = Sieverts; AEGL = acute exposure guideline levels.

# Apparent Violation Discussion

## NRC Apparent Violation 2 - Summary:

- GNFA believes that the consequence severity determinations made were performed in a manner consistent in the approved ISA Summary.
- GNFA will re-examine all S=1 accident sequences to determine if criticality could credibly occur. Where criticality is credible, the accident will be ranked as S=3, and IROFS applied as needed to meet performance requirements.

# Apparent Violation Discussion

## NRC Apparent Violation 3:

*Failure to designate controls as IROFS when they were necessary to meet the performance requirements of 10 CFR 70.61(b).*

*Examples:*

- a. Gadolinia vibro-mill, dry conversion, and other processes where criticality accidents are prevented by moderation controls associated with moderator restricted area*
- b. Line 5 grinder and associated equipment*
- c. Primary high efficiency particulate air filter system*
- d. Outside scrap storage*

# Apparent Violation Discussion

## NRC Apparent Violation 3:

*3a. Gadolinia vibro-mill, dry conversion, and other processes where criticality accidents are prevented by moderation controls associated with moderator restricted area.*

- As discussed in Apparent Violation #1, GNFA believes that ISG-01 authorized reliance on bounding assumptions incorporated into the ISA Summary.

# Apparent Violation Discussion

## NRC Apparent Violation 3:

### *3b. Line 5 grinder and associated equipment*

- GNFA believes the team concluded that, for these accident scenarios, a criticality or specified radiological consequence would not occur and therefore assigned a severity ranking of 1.

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- In November 2009, GNFA initiated reviews of the PHA and the accident sequences associated with the grinder. It was observed that there was no accident sequence involving external moderator intrusion. In performing an extent of condition analysis, it was determined that there were other areas missing this scenario. All affected equipment was promptly shut down and an investigation was begun. The condition was reported within 24 hours to the NRC. Following the approved ISA methodology, this resulted in a high-consequence (severity ranking of 3) event requiring 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.

# Apparent Violation Discussion

## NRC Apparent Violation 3:

*3c. Primary high efficiency particulate air filter system*

*3d. Outside scrap storage*

- GNFA believes the team concluded that, for these accident scenarios, either a severity of 1 was appropriate or that the unmitigated likelihood was zero (not credible) but the basis for these determinations is not clear.
- An initial review has confirmed that adequate controls exist to maintain Double Contingency.

# Apparent Violation Discussion

## NRC Apparent Violation 3 - Summary:

- With respect to example 3a, GNFA believes that reliance on bounding assumptions is authorized in the ISG and incorporated in the ISA Summary.
- With respect to example 3b, GNFA believes that the S=1 determinations were made consistent with the consequence severity table in the ISA Summary.
- With respect to examples 3c & d, GNFA will re-examine all accident sequences in these areas to determine if criticality could credibly occur. Where criticality is credible, the accident will be ranked as S=3, and IROFS applied as needed to meet performance requirements.

# Apparent Violation Discussion

## NRC Apparent Violation 4:

*Failure to designate as items relied on for safety when they were used to consider an accident scenario as not credible (e.g., HF exhaust lines).*

- Initially, no IROFS was associated with the Monel pipe HF exhaust line, but GNFA declared the Monel pipe an IROFS in July 2008 as a conservative measure. The quantitative analysis performed for an accidental release from this pipe concluded that this accident was highly unlikely.
- GNFA removed the IROFS designation from the Monel pipe later in 2008 and notified NRC.
- GNFA believes the initial classification of the exhaust pipe was appropriate as a design feature / bounding assumption, and as such does not need to be declared IROFS.
- The administrative safeguard requiring process shutdown during crane activity was added as a conservative measure.
- GNFA will quantitatively reexamine these accident sequences and evaluate the risks associated with this pipe to determine if IROFS are necessary.

# Apparent Violation Discussion

## NRC Apparent Violation 5:

*Failure to designate as items relied on for safety when they were relied on to reduce the likelihood of occurrence of a high consequence event (e.g., UF<sub>6</sub> cylinder)*

- Our ISA team evaluations qualitatively determined that a fire capable of rupturing a UF<sub>6</sub> cylinder is a high severity consequence that had a non-credible unmitigated likelihood of occurrence.
- In an August 17, 2007, NRC RAI response, GNFA explained that no credible scenario could be conceived for the rupture of a UF<sub>6</sub> cylinder in outside storage due to lack of fuel necessary to result in a cylinder rupture. GNFA is not aware of any large fire that has ruptured a UF<sub>6</sub> cylinder. Such an event has not occurred at a fuel cycle facility.
- GNFA is currently reviewing this accident scenario. Global Laser Enrichment, LLC also evaluated a similar accident sequence, determined it as credible, and declared IROFS based on a more conservative assumption of the frequency of a large fire. GNFA will quantitatively reexamine UF<sub>6</sub> cylinder fire scenarios, and evaluate the risks to determine if IROFS are necessary.

# Contributing Factors

# Contributing Factors

- Early GNFA action and evolution of the regulatory framework contributed to current issues.
- Site visits and RAIs did not flush out these issues.
- Ambiguity in regulatory terms and concepts:
  - Initial starting conditions
  - Concept of unmitigated
  - Use of bounding assumptions/design features
  - Application of double-contingency principles to meet performance requirements.
- Difficulty with the concept of unmitigated and distinction between likelihood and severity.
- GNFA believed our ISA approach met regulatory requirements.

# Safety Assessment

# Safety Assessment

## Nuclear Criticality/Radiological Safety

- Double Contingency basis of safety:
  - Confirmed current criticality safety analyses exist for all fissile material processes,
  - Facility walk-down to verify selected criticality controls in place,
  - Defense-in-depth approach.
- Verified every Active Engineered Control (AEC) has had a timely functional test and designed to be failsafe.
- GNFA applies Management Measures to all criticality controls regardless of whether they are declared as IROFS as required by our license, to provide reasonable assurance that such controls remain available and reliable
- Routine audits, inspections, configuration management program, 24/7 facility operational surveillances and periodic maintenance provide additional assurance.

# Current Basis of Safety

## Chemical/Fire/Environmental Safety

- A review of environmental, fire, and chemical accident sequences in the PHA was completed (101 chemical consequences, 94 fire consequences, and 58 environmental consequences at multiple node locations).
- Those consequences with severity rankings of 3 were evaluated and safeguards verified to ensure presence. In addition, nodes with both a severity ranking of 2 and likelihood rankings of 0 (non-credible) were also evaluated.
- Based on the review completed of the fire, chemical, and environmental consequences, there were no consequences identified without adequate safeguards verified in place to prevent or mitigate high and intermediate consequences.

# Assessing Significance

# Assessing Significance

NRC Enforcement Policy lists criteria for assessing the significance of each violation:

- No actual safety consequences.
- Limited potential safety consequences based on safety assessment.
- No adverse impact on the regulatory process.
- No evidence of willfulness.

# Path Forward

# Path Forward

- Assemble dedicated team to review and revise the ISA as necessary:
  - Full-time team including Project Manager,
  - Include outside consultants with ISA expertise.
- Ensure consistency with regulations and NRC guidance:
  - Definitions of unmitigated, initial conditions, bounding assumptions, and design features,
  - Every credible potential criticality accident sequence initially will be screened as S=3,
  - Re-analyze all accident scenarios in PHA, with emphasis on criticality accident sequences ranked S=1 and UL=0,
  - Risk ranking matrix.
- Review and revise ISA procedures and seek license amendment as necessary.
- In order to ensure consistency with NRC expectations, GNFA requests that NRC work with GNFA for the issuance of a Confirmatory Action Letter.

# Conclusion

# Conclusion

- GNFA recognizes the seriousness of the issues and is committed to resolving them.
- GNFA is committed to reviewing and revising the ISA as necessary.
- GNFA has confirmed current operations are safe.
- Under the circumstances, GNFA submits that issuance of Notices of Violations is not the best approach to resolving these issues.
- GNFA recommends a Confirmatory Action Letter to address these issues.