



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

August 29, 2014

EN 50208

Mr. Joel W. Duling
President
Nuclear Fuel Services, Inc.
P. O. Box 337, MS 123
Erwin, TN 37650

**SUBJECT: NUCLEAR REGULATORY COMMISSION SPECIAL INSPECTION REPORT
NUMBER 70-143/2014-006**

Dear Mr. Duling:

The Nuclear Regulatory Commission (NRC) conducted a special inspection from July 10 through July 17, 2014, at the Nuclear Fuel Services (NFS) facility in Erwin, Tennessee. The purpose of the special inspection was to inspect and assess the facts and circumstances surrounding an event which was reported by NFS as a failure to meet the performance requirements of Title 10 of the Code of Federal Regulations (10 CFR) Part 70.61 "Performance Requirements." The issue was reported to the NRC Operations Center on June 18, 2014 (EN 50208).

Based on NFS's identification of the initial issue, conservative decision making in response to the event, and the immediate corrective actions taken in response to the conditions identified, the NRC determined that the appropriate level of regulatory response was to conduct a Special Inspection (SI) (see Enclosure 2 charter). The SI objectives were to 1) develop a timeline of the event, 2) determine the actual and potential safety significance, 3) evaluate the adequacy of NFS's response including event reporting and immediate corrective actions, 4) assess the adequacy of NFS's evaluation of the applicable high consequence event and associated IROFS including management measures, 5) evaluate the adequacy of NFS's causal analysis, extent of condition, and extent of cause reviews, 6) evaluate the adequacy of NFS's planned long term actions to prevent recurrence, and 7) provide safety culture insights to assist in the development of the 2010 Confirmatory Order closeout inspection. The SI consisted of interviews with plant personnel, facility walk-downs, selective examinations of relevant procedures and records, review of the causal investigations and supplementary information, and plant observations. The enclosed report presents the results of the special inspection. At the conclusion of the SI, the inspection results were discussed with you and other members of your staff at an exit meeting held on July 17, 2014.

Based on the results of this inspection, the NRC identified one apparent violation of facility procedures and one Severity Level IV violation of NRC reporting requirements. The Severity Level IV violation is being treated as a Non-Cited Violation (NCV), consistent with Section 2.2.3 of the Enforcement Manual. The NCV is described in the subject inspection report. If you

contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to: (1) the Regional Administrator, Region II; (2) the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and (3) Charlie Stancil at the Nuclear Fuels Services facility.

The apparent violation (AV) is being considered for escalated enforcement action in accordance with the NRC Enforcement Policy. The AV is associated with the circumvention of safety related components. Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for this inspection finding at this time. In addition, please be advised that the characterization of the AV 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. No response regarding this apparent violation is required at this time.

In accordance with 10 CFR 2.390 of NRC's "Rules of Practice," a copy of this letter and its enclosures will be made available electronically for public inspection in the NRC Public Document Room, or from the NRC's Agency wide Documents Access and Management System (ADAMS), which is accessible from the NRC Website at <http://www.nrc.gov/reading-rm/adams.html>. If you have any questions, please call me at (404) 997-4629.

Sincerely,

/RA/

Anthony T. Gody, Director
Division of Fuel Facility Inspection

Docket No. 70-143
License No. SNM-124

Enclosures:

1. NRC Inspection Report No. 70-143/2014-006
w/Attachments 1, 2, 3, and 4
2. NFS SIT Charter

cc: (See page 3)

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☒ PUBLICLY AVAILABLE ☐ NON-PUBLICLY AVAILABLE ☐ SENSITIVE ☒ NON-SENSITIVE

ADAMS: ☒ Yes ACCESSION NUMBER: ML14241A553 ☒ SUNSI REVIEW COMPLETE ☒ FORM 665 ATTACHED

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Letter to Mr. Joel W. Duling from Anthony T. Gody dated August 29, 2014

SUBJECT: NUCLEAR REGULATORY COMMISSION SPECIAL INSPECTION REPORT
NUMBER 70-143/2014-006

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U.S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket No.: 70-143

License No.: SNM-124

Report No.: 70-143/2014-006

Licensee: Nuclear Fuel Services, Inc.

Location: Erwin, Tennessee 37650

Dates: July 10-17, 2014

Inspector: C. Stancil, Senior Resident Inspector

Approved by: Anthony T. Gody, Director
Division of Fuel Facility Inspection

Enclosure 1

EXECUTIVE SUMMARY

Nuclear Fuel Services, Inc.
NRC Special Inspection Report No. 70-143/2014-006
July 10-17, 2014

Nuclear Fuel Services (NFS), Inc. is authorized to receive, possess, use, store, and ship special nuclear material pursuant to 10 CFR Part 70. The primary activity on the NFS Erwin site is the production of fuel material containing highly enriched uranium. In addition, NFS recovers and purifies low-enriched and high-enriched uranium from process scrap generated either internally or at other facilities.

NFS, the licensee, is required by Title 10 of the Code of Federal Regulations Part 70.61(e) (10 CFR 70.61(e)) to ensure that each engineered or administrative control or control system necessary to comply with paragraphs (b), (c), or (d) of 10 CFR 70.61 be designated as an item relied on for safety (IROFS). The licensee's safety program, established and maintained pursuant to 10 CFR 70.62, shall also ensure that each IROFS is designed, implemented and maintained to ensure they are available and reliable to perform its function when needed and to comply with the performance requirements of 10 CFR 70.61.

The licensee periodically performs recovery operations in which reprocessed scrap material is reintroduced into the manufacturing process. Pure ammonium hydroxide is supplied from bulk tanks to Column 0B03 in Building 302, Area B (see Attachments 2 and 3). The licensee designated IROFS FAB-13, two spring return valves 302-BA-0B01 and 302-BA-0B85, as active engineered components to prevent Accident Scenario RS13, overflow of Column 0B03 and release of pure ammonium hydroxide to the floor. The valves were designed to be held open simultaneously by hand to fill Column 0B03 with pure ammonium hydroxide and to self-close by spring action once released. The chemical safety function is to isolate the column to prevent overflow and a chemical exposure hazard to personnel which was determined to be a high consequence event. The valves are the only IROFS for the high consequence chemical safety function.

On June 17, 2014, an NFS operator was observed by a supervisor inappropriately operating the two spring return IROFS valves, 302-BA-0B01 and 302-BA-0B85. The valves were observed to be inappropriately operated by using a box end wrench wedged into the system structure on each valve, thus rendering the valves unable to perform their intended safety function. The operator was observed removing the wrenches as the supervisor and another operator approached the process area. The operation of the valves was contrary to Standard Operating Procedure (SOP) 401-22-302, "Building 302 Area B," Step 4.2.8 Note which stated that "toggle or self-closing valves must never be held open by any means other than an individual holding the valve handle." The licensee removed the operator from shift operation duties, placed associated processes in a safe condition, performed valve line-ups and testing of safety components related to the affected process, and reviewed other recent activities performed by the individual. On June 18, 2014, the licensee notified the NRC of the loss of IROFS FAB-13 (Event No. 50208), pursuant to the requirements in 10 CFR 70 Appendix A Reportable Safety Events, (a) One Hour Report (4)(i), in part:

An event such that no IROFS, as documented in the Integrated Safety Analysis (ISA) summary, remain available, in an accident sequence evaluated in the ISA, to perform their function in the context of the performance requirements in 10 CFR 70.61(b)(4) High Consequence Event – an acute chemical exposure to an individual from hazardous chemicals.

The NRC evaluated the event and initiated a special inspection (SI) to assess the facts and circumstances surrounding the event.

Actual and Potential Safety Significance

No spill of ammonium hydroxide occurred; therefore there was no actual safety consequence to the workers, public, or the environment. The potential health and safety consequence to the worker was an acute chemical exposure in the event an ammonium hydroxide overflow had occurred.

The inspector determined based on the licensee's ISA summary that the likelihood of a potential chemical accident sequence increased. This change in risk indicated a potential failure to meet the performance requirements of 10 CFR 70.61.

Evaluation of the Licensee's Response

Upon identification of the inappropriately operated valves, the Area B process was placed in a safe configuration. The licensee determined all IROFS for the specific chemical accident scenario were unavailable. The inspector determined that the licensee's response to the identification of the inappropriately operated valves and their immediate corrective actions were comprehensive and effective. However, the one-hour NRC notification per 10 CFR Part 70 Appendix A was delayed. Therefore, a non-cited violation (NCV 70-143/2014-006-02) was identified for the delayed reportability.

Evaluation of the Licensee's Establishment of Management Measures for These IROFS

The inspector determined that the licensee effectively established, implemented, and maintained adequate management measures to assure reliability of the IROFS, as required per 10 CFR 70.62 and License Application Chapter 11, Management Measures, to ensure that the performance requirements of 10 CFR 70.61 were maintained. The licensee concluded that the IROFS failure was caused by the operator's failure to follow the standard operating procedure controlling operation of the IROFS valves.

Evaluation of the Licensee's Causal Analysis and Extent of Condition

The inspector reviewed the licensee's causal analysis which included an operator culpability assessment, operational fact finding and restart review, and a safety culture impact review. The inspector determined that the planned corrective actions recommended in the Area B Loss of IROFS Investigation, dated August 1, 2014, were adequate to address the root cause.

Safety Culture Insights

The inspector determined that the licensee's organizational response to this event demonstrated the attributes and behaviors of a healthy safety culture. NFS identified learning opportunities for improvement which when addressed will strengthen the safety culture of the organization.

Attachments

Key Points of Contact
List of Items Opened, Closed, and Discussed
Inspection Procedures Used
Documents Reviewed
Spring Return Valve
Ammonium Hydroxide Flow Path
ISA Summary Table

REPORT DETAILS

1. Event Timeline

Between June 10, 2011, and April 2, 2012, the NFS corrective action program (CAP) documented four separate instances of decreased pure ammonium hydroxide flow from the bulk chemical supply lines to individual process areas. In November, 2011, the licensee determined that restricted flows were a result of degradation of an incompatible air diaphragm pump gasket that resulted in the gasket material being transported throughout the bulk supply system. In Building 302, Area B, this decreased flow resulted in operators having to hold open spring return valves much longer than the normal 30 seconds to obtain the desired batch volume, in some cases up to 25 minutes (combination of multiple fill periods). On December 10, 2012, NFS completed a modification to replace Area B process tubing and install an in-line strainer. Normal operations cleared other process lines.

- On June 11, 2014, a flow restriction requiring operators to hold open the Area B spring return valves for several minutes was documented in the CAP.
- On June 16, 2014, the Area B pure ammonium hydroxide supply line strainer was replaced, tested, and verified to fill one batch in 50 seconds.
- At approximately 1900 hours on June 17, 2014, the NFS operator was observed by a supervisor inappropriately operating the spring return valves 302-BA-0B01 and 302-BA-0B85. The valves were observed to be mechanically held open, thus rendered unable to perform their intended safety function. Upon discovery by the supervisor the valves were immediately closed.
- By 2120 on June 17, 2014, the operator was relieved of duty and all process areas that the operator was qualified to operate were placed in a safe condition.
- Between 1937 and 2323 on June 17, 2014, all NFS designated management notifications were completed.
- By 0715 on June 18, 2014, NFS management determined the event to not be reportable.
- At approximately 0910 on June 18, 2014, upon further review, the event was determined to be reportable and NFS completed the required one-hour NRC notification at 0958.
- Restart authorization for Areas A, B, C, and D were completed on June 19, 2014.
- NFS completed the Area B Loss of IROFS Event Investigation on August 1, 2014.

2. Analysis of the Actual and Potential Safety Significance

a. Scope and Observations

The inspector reviewed the associated Integrated Safety Analysis (ISA) analysis and evaluations to determine whether the licensee used appropriate assumptions and

reasonable scenarios to establish limits for the controlled parameters. The licensee performed ISA risk assessments using the risk indexing methodology in NFS-HS-A-68, "ISA Risk Assessment," which was applicable to the consequence-likelihood requirements specified in 10 CFR 70.61 and guidance provided in NUREG 1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility."

There were two high consequence accident sequences of concern associated with overfilling Area B, Column 0B03: chemical exposure and nuclear criticality. The spring return valves, 302-BA-0B01 and 302-BA-0B85, were active engineered controls applied to limit the risk of both accident sequences. Both valves (IROFS FAB-13) were Safety Related Equipment (SRE) and required periodic testing. The valves were designed to be held open simultaneously by hand to fill Column 0B03 with pure ammonium hydroxide solution and to automatically close when released. The licensee assigned each valve an IROFS effectiveness of protection index number of "-2."

Accordingly the June 17, 2014 event involved only a chemical hazard. The chemical exposure accident sequence was defined in the licensee's ISA Summary, "300 Complex Recovery, Chemical Safety Risk Analysis Summary (Occupational) Table 4-13, Scenario RS13, Release of 30% Ammonia Solution at Ambient Temperature to the 302/303 Floor (302 Area B)." The chemical safety function of the spring return valves was to isolate the column to prevent overflow to the area floor and subsequent chemical exposure to personnel. The consequence of concern was the inhalation of the pure ammonium hydroxide by personnel in the area once the chemical became airborne. The valves were the only IROFS established to reduce the risk of the high consequence chemical exposure accident sequence.

The licensee identified the initiating event for the chemical exposure accident sequence as spring return valves 302-BA-0B01 and 302-BA-0B85 failing open. The licensee assigned "0" as the initiating event failure frequency index number, "-1" as the enabling event index number for the area operator being incapacitated, and "-1" as the second enabling event index number for personnel not evacuating the area upon sight or smell of the ammonium hydroxide spill. The uncontrolled (because of the failed IROFS) likelihood index was the sum of the event index numbers, "-2," which resulted in an increased likelihood category and an unacceptable risk (see Attachment 4).

The nuclear criticality accident sequence was defined in the licensee's Nuclear Criticality Safety Evaluation for Area B (Building 302 and Building 303) of the Production Fuel Facility, 54X-12-0014, Section 4.1.1.a and Table 5 (Scenario 4.1.1.a). The nuclear criticality safety function of the spring return valves was to isolate the bulk chemical supply to prevent material from back-flowing into the supply lines and possible unsafe geometry. The consequence of concern was a criticality accident. The loss of both spring return valves reduced nuclear criticality safety barriers but the event remained improbable by other IROFS meeting the performance requirements of 10 CFR 70.61, specifically column overflow capability and the lack of motive force and loss of supply pressure events.

The inspector independently evaluated and verified the calculation for the two accident sequences using the licensee's ISA documentation, and validated the licensee's calculations.

Actual condition

The inspector determined that IROFS FAB-13, Spring Return Valves 302-BA-0B01 and 302-BA-0B85, were rendered inoperable due to defeating the active engineered controls by wedging open the valves such that pure ammonium hydroxide flow would not be isolated upon the operator releasing the valve handles. With IROFS FAB-13 being the only IROFS associated with the chemical exposure accident sequence, the inspector determined that, with the failure of all IROFS associated with this accident sequence, the licensee failed to meet the performance requirement that the high consequence event be improbable. However, the valves were wedged open for less than three minutes and other operators were in the vicinity of Column 0B03. These other operators would most likely see and smell the spillage of ammonium hydroxide (Area B is located immediately adjacent and over the only normal entrance to the radiological controlled area). The inspector concluded that at least two additional upsets would have had to occur before personnel would be acutely exposed to the chemical. There was no actual safety consequence as no chemical spill occurred.

Potential condition

Without physical isolation of the ammonium hydroxide flow due to the failure of IROFS FAB-13, Column 0B03 could have overflowed to two additional columns and eventually to the floor without operator intervention. The ammonium hydroxide spillage could become airborne in the building forced ventilation and, once inhaled, could have caused acute chemical exposure to the respiratory tracts of personnel in the building. Several other barriers were present that could have potentially prevented a high consequence personnel chemical exposure: normal chemical batch fill less than a minute, continued flow of the chemical required for at least 4.5 minutes prior to spillage to the floor, approximately 2000 liters of chemical spillage required for a high consequence event (10 hours for the spill to reach this volume), personnel sensitivity to ammonia, two required roving patrols and a normal complement of operators available to identify the spill, routine supervisor oversight in the field, and multiple emergency exits for personnel to evacuate away from the spill.

Based on the licensee's Integrated Safety Analysis (ISA), the loss of IROFS FAB-13 for the chemical exposure accident sequence increased the likelihood category of scenario RS13.

Introduction: The inspector identified an apparent violation (AV) of the licensee's Standard Operating Procedure (SOP) 401-22-302, Building 302 Area B, for an operator holding open safety related self-closing valves with means other than physically holding the valve handles. Defeating the spring return closed function of the valves resulted in unavailability of IROFS for a potential high consequence chemical exposure event.

Description: At approximately 1900, on June 17, 2014, a nuclear process operator, in Area B of Building 302, held open two self-closing spring return valves, 302-BA-0B01 and 302-BA-0B85, by means other than holding the valve handles with his hands. The two valves were sequentially located in a chemical supply line in the recovery stream of the manufacturing process. They were designed as spring-loaded isolation valves to be held open simultaneously by hand to fill a column with pure ammonium hydroxide. Both valves were designated by the licensee as IROFS and Safety Related Equipment (SRE). The IROFS valves provided a safety function to prevent or mitigate a potential chemical exposure accident at the facility. As SRE valves, they were periodically tested to ensure availability and reliability. The chemical safety function was to isolate the column to prevent overflow and a chemical exposure hazard to personnel. The operator inappropriately

operated the two valves simultaneously by mechanically holding open each of the valve handles with box end wrenches wedged into the system structure, one for each valve. The operator was observed removing the wrenches as his supervisor and another operator approached the process area. Once the wrenches were removed, the valves functioned as designed by immediately self-closing. The supervisor subsequently reported the incident to plant management.

The valves were the only IROFS credited in the ISA for the high consequence event. The circumvention of the self-closing isolation function of both IROFS valves by the operator resulted in no IROFS remaining available in the chemical exposure accident sequence as evaluated in the licensee's ISA. The operator was relieved of shift operation responsibilities. The issue was entered into the licensee's corrective action program as PIRCS 44298 and reported to the NRC in a one hour safety event report (Event number (EN) 50208). Additional corrective actions performed by the licensee included immediate shutdown and review of the operator's cognizant process areas, operational fact finding, valve lineups, selected SRE testing, site communications, and initiation of a human performance investigation and a safety culture review.

Analysis: The operator simultaneously inappropriately operated the handles for spring return valves 302-BA-0B01 and 302-BA-0B85 with box end wrenches wedged into the system structure, one for each valve. The inappropriate operation of these valves was contrary to the Note in Step 4.2.8 in licensee procedure SOP 401-22-302, Building 302 Area B, which states, "self-closing valves must never be held open by any means other than an individual holding the valve handle." With the self-closing isolation function of both valves defeated, IROFS FAB-13 was non-functional. There were no remaining IROFS available to prevent or mitigate a potential high consequence chemical exposure event.

The AV was determined to be more than minor because the consequence of the procedure violation was similar to an example in the Enforcement Policy, Section 6.2.b.1, for the unavailability of IROFS for a high consequence chemical event based on the licensee's ISA.

Enforcement: The inspector determined the circumvention of the self-closing isolation function of both IROFS valves by the operator was an AV of NFS Special Nuclear Materials License SNM-124, Safety Condition S-1, which requires, in part, that procedures are used in accordance with the statements, representations, and conditions in the application.

Chapter 11 of the license application, Management Measures, Section 11.4, "Procedure Development and Implementation," requires, in part, that activities involving the handling of SNM and IROFS are conducted in accordance with written procedures as defined in Section 11.4.1, "Operating Procedures." Section 11.4.1, Operating Procedures, defines, in part, operating procedures as documents written to authorize the processing of radioactive material; and within these documents, detailed instructions for limits and controls established for safety purposes, including IROFS, are identified.

Licensee procedure SOP 401-22-302, Building 302 Area B, Step 4.2.8, Note states "self-closing valves must never be held open by any means other than an individual holding the valve handle."

Contrary to the above NFS license requirements, the operator violated licensee procedure SOP 401-22-302, Building 302 Area B, Step 4.2.8, Note, when he held open both IROFS valves by means other than holding the valve handle. The circumvention of the self-closing

isolation function of both valves resulted in unavailability of IROFS for a potential high consequence chemical exposure event. This AV will be documented as AV 70-143/2014-006-01, Circumvention of Safety Related Components.

b. Conclusion

An AV was identified for failing to follow the station procedures, and as a result, a circumvention of safety related Components occurred. This AV will be documented as AV 70-143/2014-006-01, Circumvention of Safety Related Components.

3. Response to the Failed IROFS

a. Scope and Observations

Immediately following the supervisor's observation of the mechanically held open spring return valves at approximately 1900 on June 17, 2014, the wrenches were removed and valves automatically returned to their normal closed safety position. Following the supervisor's report to plant management, Area B, including Building 303, and three other potentially affected processes (Areas A, C, and D), were placed in a safe condition and the operator was removed from shift operations responsibilities. In addition, NFS performed system valve line-ups and testing of selected safety components related to the potentially affected processes and reviewed other recent activities performed by the operator. No other anomalies were discovered.

On the evening of June 17, 2014, all NFS designated management notifications by phone and/or e-mail were completed by the Plant Shift Superintendent (PSS). However, although NFS determined there was a failure of SRE components, there was limited consideration for NRC reportability due to an organizational focus on criticality safety function redundancy and, therefore, a lack of discussion on other aspects of the ISA (e.g. the chemical safety function). By 0715 on June 18, 2014, NFS management determined the event to not be reportable based on performance requirements being met without IROFS FAB-13 for nuclear criticality accident sequences. At this point, chemical accident sequences had not been considered. At approximately 0910 on June 18, 2014, following further review of all pertinent accident scenarios by the ISA organization, the event was determined to be reportable. NFS completed the required one-hour report to the NRC Operations Center at 0958 on June 18, 2014 (EN 50208), as required by 10 CFR Part 70 Appendix A (a)(4) for IROFS not available and reliable in an accident scenario evaluated in the ISA, resulting in the failure to meet the performance requirements of 10 CFR 70.61.

The event was entered into the licensee's CAP as PIRCS 44298 on June 18, 2014. Additional corrective actions performed by the licensee included operational fact finding, site communications, and initiation of investigations associated with human performance and safety culture.

The inspector concluded that NFS's response to the identification of the mechanically held open valves and their immediate corrective actions were comprehensive and effective. However, the one-hour NRC notification per 10 CFR Part 70 Appendix A was delayed.

Introduction: The licensee identified a Severity Level (SL) IV Non-Cited Violation (NCV) of 10 CFR 70 Appendix A (a)(4) for the failure to notify the NRC within one hour commensurate with the safety significance of an event such that no IROFS, as evaluated in the ISA accident sequence and documented in the ISA summary, remained available and reliable to perform their function.

Description: At approximately 1900, on June 17, 2014, an operator violated an operating procedure when he inappropriately operated two self-closing spring return IROFS valves by means other than holding the valve handles. The self-closing isolation functions of these valves were the only IROFS for a high consequence chemical accident. The circumvention of the valve functions by the operator resulted in no IROFS remaining available in the chemical exposure accident sequence as evaluated in the licensee's ISA. NFS determined there was a failure of IROFS; however, there was limited consideration for NRC reportability due to an organizational focus on the criticality safety function. NFS had not discussed other aspects of the ISA such as the chemical safety function. After further review the following morning, June 18, 2014, the licensee determined that the event was one hour reportable at 0910 and made the report to the NRC at 0958. Upon determination of reportability, NFS identified and discussed the lack of timeliness of reporting within their organization for this event, and subsequently implemented immediate interim and long term corrective actions to provide management guidance. NFS entered PIRCS 44321 into their CAP.

Analysis: The inspector determined the failure of NFS to notify the NRC within one hour on June 17, 2014, of the loss of IROFS FAB-13 for an ammonium hydroxide spill, was not commensurate with the safety significance of the event. The loss of all IROFS for the chemical exposure Accident Sequence RS13 occurred at approximately 1900 on June 17, 2014. The licensee completed the report per 10 CFR Part 70 Appendix A at 0958 on June 18, 2014, approximately 15 hours later.

NFS self-identified the lack of timeliness for reporting the safety event and entered it into their CAP. Also, NFS immediately implemented interim corrective actions and committed within their CAP to evaluate long term actions. While there had been at least one docketed NRC reporting issue associated with interpretation of reporting criteria in the last two years, there were no docketed occurrences of delayed reporting. Furthermore, the reason for NFS's delay in reporting the safety event was not intentional, but a lack of an immediate and complete discussion of the ISA impact commensurate with the safety significance of the event. The delay in reporting the safety event to the NRC delayed the implementation of NRC's incident response process including initial evaluation of the event and subsequent supplemental inspection.

The violation was determined to be more than minor because the delayed licensee reporting impacted the regulatory process and was similar to a SL IV example of very low safety significance in the Enforcement Policy, Section 6.9.d.5, for a licensee's failure to make a report.

Enforcement: 10 CFR 70 Appendix A (a)(4), in part, requires the licensee to notify the NRC within one hour of a safety event such that no IROFS, as documented in the ISA summary, remains available, in an accident sequence evaluated in the ISA analysis, to perform their function. Contrary to 10 CFR 70 Appendix A (a)(4), NFS failed to notify the NRC within one hour on June 17, 2014, of the loss of all IROFS and the failure to perform their function for Accident Sequence RS13. This non-repetitive, licensee-identified and corrected violation is

being treated as an NCV, consistent with Section 2.2.3 of the NRC Enforcement Manual, and is documented as NCV 70-143/2014-006-02, Failure to Make a Report Required by 10 CFR 70 Appendix A (a)(4).

b. Conclusion

An NCV was identified for the failure to Make a Report Required by 10 CFR 70 Appendix A (a)(4). This violation will be documented as NCV 70-143/2014-006-02, Failure to Make a Report Required by 10 CFR 70 Appendix A (a)(4).

4. Establishment of Management Measures for IROFS

a. Scope and Observations

The inspector evaluated the measures credited for ensuring the reliability of each IROFS to determine effectiveness. The licensee's evaluation of the high consequence chemical exposure and nuclear criticality accident sequences associated with IROFS FAB-13 and the establishment of other IROFS associated with the nuclear criticality accident sequence was adequate with regards to safety margin and common cause failure.

Aspects of the measures applied to the subject IROFS described in Special Nuclear Materials License SNM-124, Chapter 11, "Management Measures," were assessed by the inspector to ensure NFS provided reasonable assurance that IROFS remained available and able to perform their functions when needed. These measures included: configuration management including design and function; maintenance including testing; training and qualification; procedure development and implementation; and, the corrective action program including the subject causal analysis and corrective actions. "300 Complex Recovery ISA Summary," Tables 6-1 and 6-2, for criticality and chemical occupational safety IROFS prescribed Level A management measures to ensure a high level of risk reduction for a high level of reliability. NFS Site ISA Summary Table 4-1, "Management Measures for IROFS," detailed the applicable measures.

b. Conclusion

No findings of significance were identified.

5. Causal Analysis and Extent of Condition

a. Scope and Observations

NFS initiated a causal investigation to review the events surrounding the failure to meet the performance requirements of 10 CFR 70.61. The investigation was documented in "Area B Loss of IROFS Investigation," dated August 1, 2014, and was a consolidation of three separate investigative efforts: the operator culpability assessment led by the NFS Legal Manager, operational fact finding and restart assessment led by the Operations Manager, and a safety culture impact review led by the Safety Culture Improvement Section Manager.

The licensee determined the primary cause of this event was the operator's failure to follow procedure requirements for the proper operation of the safety related valves. NFS identified a number of opportunities for improvement with scheduled corrective actions.

One short term completed corrective action was an organizational event debrief that included solicitation of beneficial feedback regarding other instances of SRE misuse. The extent of condition review determined that inappropriate valve operation was isolated to the one operator. A small population of other valves was found to have been modified with plastic pipe or tape around the handles or operated with leveraging devices to ergonomically assist operators. These safety-related and non-safety-related valves were evaluated and verified functional.

The inspector reviewed and evaluated the licensee's causal investigation to determine the adequacy of the causal analysis and the extent of condition.

b. Conclusion

No findings of significance were identified.

6. Planned Long Term Corrective Actions

a. Scope and Observations

NFS defined long term corrective actions as actions projected to exceed 180 days. The majority of corrective actions generated by the causal investigation were scheduled to be completed before the end of 2014. The remaining long term actions were associated with procedure enhancements scheduled to be completed by the middle of 2015. The inspector noted that there was an investigation in progress associated with reportability timeliness that may result in further corrective actions.

b. Conclusion

No findings of significance were identified.

7. Safety Culture Insights

a. Scope and Observations

NFS documented that their organizational response to restricted Area B pure ammonium hydroxide flows in 2011 and 2012, was not timely, but noted improvement in a recent response for the exact same flow restriction in Area B. The inspector observed this recent licensee response to the flow restriction on June 11, 2014, and found the response to be both timely and effective. The corrective maintenance on June 16, 2014, replaced the in-line strainer (as designed) on the pure ammonium hydroxide supply line upstream of the IROFS spring return valves. Subsequent operations indicated an improved Column 0B03 batch fill time of approximately 50 seconds. This was completed one day prior to the operator defeating the associated IROFS FAB-13.

The inspector noted that during conversations with plant personnel they occasionally did not fully understand why this event was so significant, because there was no consequence. Those observations were isolated and not representative of the larger organizational culture. Licensee management invited plant personnel, including union leadership to attend the NRC exit meeting. The inspector and NRC management communicated the significance of the event including how peer to peer accountability impacts safety culture. The message was well received by all.

b. Conclusion

The inspector determined that NFS's organizational response to this event (see Section 3 above) demonstrated the attributes and behaviors of a healthy safety culture. NFS identified learning opportunities for improvement which when addressed will strengthen the safety culture of the organization.

8. Exit Meeting

The inspection scope and results were presented to members of the licensee's staff on July 17, 2014. No dissenting comments were received from the licensee. Proprietary information was discussed but not included in the report.

SUPPLEMENTAL INFORMATION

1. List of Persons Contacted

<u>Name</u>	<u>Title</u>
N. Brown	NCS Department Section Manager
N. Depew	Supervisor Level 4
J. Duling	President
R. Freudenberger	Safety & Safeguards Director
N. Kenner	Safety Culture Improvement Section Manager
F. Kerns	Plant Superintendent Manager
R. King	Legal Manager
M. McKinnon	Operations Director
B. Norton	Plant Superintendent
J. Quillen	Process Engineering Section Manager
A. Sabisch	Licensing and ISA Manager
S. Sanders	Training Manager
R. Shackelford	Nuclear Safety & Licensing Section Manager
M. Watts	Supervisor Level 4
M. Woodall	Supervisor Level 2

Other licensee employees contacted included engineers, technicians, production staff, and office personnel.

2. List of Items Opened, Closed, and Discussed

Opened	AV 2014-006-01	Circumvention of Safety Related Components (Section 2)
Opened/Closed	NCV 2014-006-02	Failure to Make a Report Required by 10 CFR 70 Appendix A (a)(4) (Section 3)

3. Inspection Procedures Used

IP 88003, Reactive Inspection for Events at Fuel Cycle Facilities Program
IP 88020, Operational Safety
IP 88025, Maintenance and Surveillance of Safety Controls
IP 93812, Special Inspection

4. Documents Reviewed

Procedures:

NFS-GH-43, SRE Control Program, Rev. (Rev.) 23
NFS-GH-56, Management Measures Identification and Implementation for IROFS
NFS-GH-948, Ergonomics Program, Rev. 0
NFS-HR-08-001-A, Fitness for Duty Program, Rev. 19
NFS-HS-A-50, Guidelines for Government Agency Notification, Rev. 20
NFS-HS-A-68, ISA Risk Assessment Procedure, Rev. 5
NFS-HS-A-79, Identification and Control of Items Relied on for Safety (IROFS), Rev. 10
NFS-OPS-1, Conduct of Operations, Rev. 5
SOP 401-22-302, Building 302 Area B, Rev. 24

Records:

30-Day Notification of Reportable Event (NRC Event No. 50208), dated July 18, 2014
 300 Complex Recovery ISA Summary, 21X-14-0002, Rev. 10, dated January 2014
 Area B Loss of IROFS Event Investigation, dated August 1, 2014
 Area B, Runsheet 22A, dated June 17, 2014
 Assessment of Change in Risk at Nuclear Fuel Services (NFS) Resulting from the June 17, 2014 Event, Rev. 1
 Behavioral Observation Form (Attachment F), dated June 17, 2014
 Conduct of Operations Restart Authorization (Level 2), dated June 19, 2014
 Employee Performance Problem Checklist (Attachment E), dated June 17, 2014
 Individual Qualifications for Operator on July 7, 2014 14:59
 Initial Observation Form (Attachment G), Operator 1, dated June 17, 2014
 Initial Observation Form (Attachment H), Operator 2, dated June 17, 2014
 Initial Observation Form (Attachment I), Supervisor 1, dated June 17, 2014
 John F. Kramer e-mail, Ergonomics in Our Engineering Design Process, dated May 9, 2014
 JULTBOX-14, July Toolbox – Procedure Use and Adherence, dated June 12, 2014
 Michael W. McKinnon e-mail, ConOps Level 2 Restart Meeting for Areas A, B, C, and D, dated June 19, 2014
 NFS Site ISA Summary, Rev. 11, dated January 2014
 NFS Slide Presentation, Safety Related Equipment (SRE) Disabled (P44298)
 NFS Training Department Lesson Plan OT1013-07, 302 Area D Training
 Nuclear Criticality Safety Evaluation for Area B (Building 302 and Building 303) of the Production Fuel Facility, 54X-12-0014, Rev. 4, dated October 15, 2012
 Operations Department PIRCS 44298 Timeline, e-mail receipt dated August 13, 2014
 Plant Superintendent's Summary Report (Attachment J), dated June 17, 2014
 Quantitative Assessment of June 17, 2014 Event Involving Misoperation of IROFS in Building 302 (21T-14-0871), Rev. 1
 Query Job Assignments Report, 302 from January 1, 2014 22:30 to June 18, 2014 09:34
 Return to Work following the Summer Outage, 21T-14-0753, dated July, 2014
 Special Nuclear Materials License SNM-124, Amendment 3, dated July 10, 2014
 SRE Test N302VALVEBA0B85, dated June 18, 2014
 SRE Test N302VALVEBA0B01, dated June 18, 2014
 Toolbox Training, FM-TRN-018, Spring Loaded Valves Event, Rev. 3
 R. S. Mauer Memo to W. R. Shackleford, Inspection of Safety Related Equipment (SRE) Isolation Valves, dated July 15, 2014

Drawing:

302-F0055-D, Area A/B P&ID, Sheet 2, dated January 2, 2014

Corrective Action Program PIRCS:

30274, Unable to Obtain Ammonia from Bulk Chemical
 32302, Problems with Filling Column 0B03
 33461, Unable to Process Area B due to Lack of Ammonia Flow
 33984, Operation of Ammonia Valves Difficult
 43773, Ergonomic Evaluation of Ammonia Valves
 44203, Flow to Column 0B03 Restricted
 44564, Area 600 Spring-Return Valves Identified with PVC Over Handles
 44591, Use of Leveraging Devices on Spring Loaded Valves
 44640, Flow to COL-0B03 is Restricted

44667, Use of Leveraging Devices Identified
44690, Use of Extension/Leverage Pipes by Maintenance
44720, Use of Metal Bar to Operate Cooling Water Valve

PIRCS Written as a Result of or Related to Inspection:

44298, SRE Components Circumvented
44321, Timeliness of Reporting Loss of IROFS to NRC
44325, ISA Summary Errors
44617, Evaluate FFD Thresholds
44623, Procedure Actions (Open, Close) As Expected Component Configurations

Spring Return Valve (0B01/0B85 w/ Box End Wrench)



Ammonium Hydroxide Flow Path

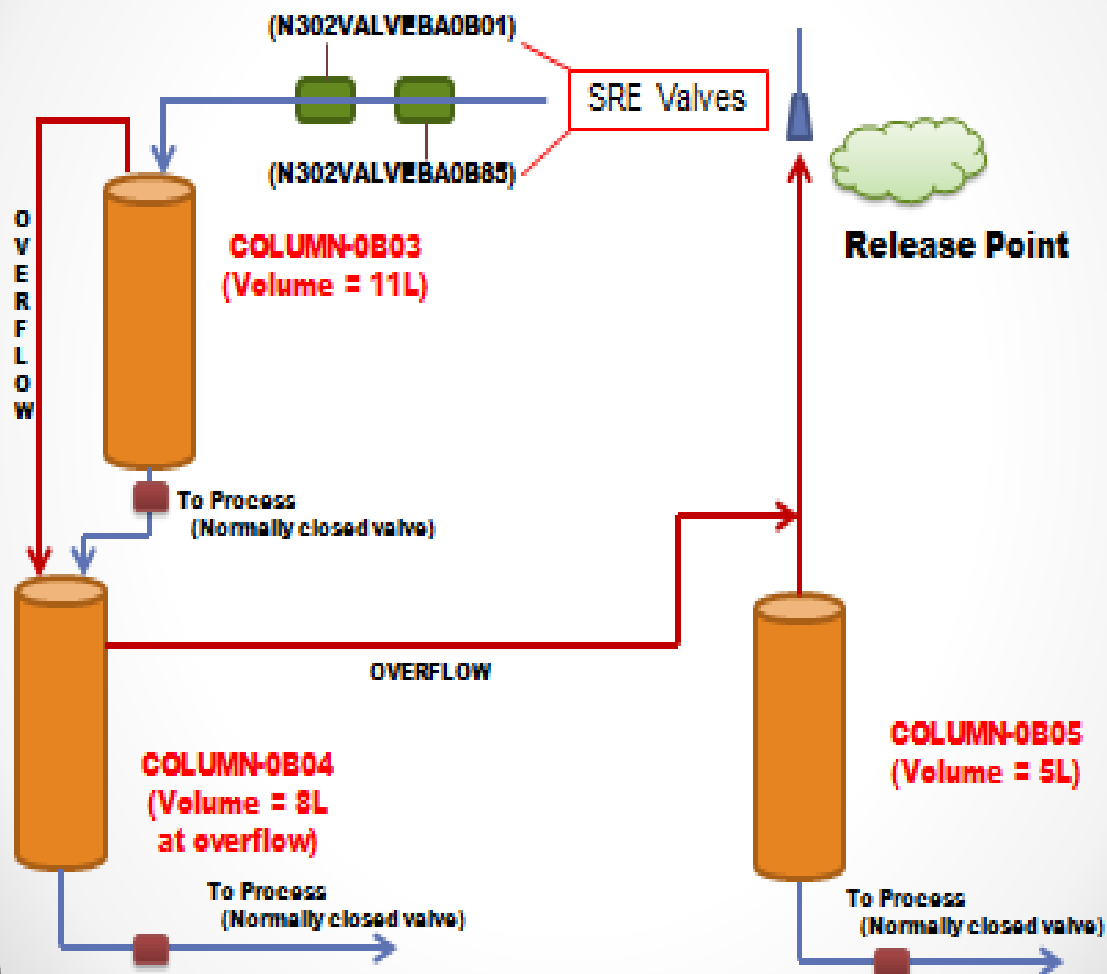


Table 4-13 Chemical Safety Risk Analysis Summary (Occupational)													
Item	What if...?	Cause	Initiating Event Failure Frequency	Mitigative/ Preventive IROFS1 or IROFS failure	Mitigative/ Preventive IROFS2 and IROFS failure	IROFS1 Protection Index	IROFS2 Effectiveness of Protection Index	U/C	Likelihood Index T	Likelihood Category	Consequence Category	Risk Index	Controls (Defense in Depth)
High Consequence													
Scenario RS13. Release of 30% ammonia solution at ambient temperature to the 302/303 floor (302 Area B)													
B-046	Column 0B03 overflows (302)	Human error Mechanical failure	IE=0 Valve BA-0B85 fails open EE=-1 Personnel do not prevent an overflow of column (Dwg. 302-F0055-D)	FAB-13: Active Engineered Control: Spring return valve 302- BA-0B01 closes upon operator release. To automatically isolate bulk ammonium hydroxide flow to Column 0B03 upon operator release of the spring return valve preventing an overflow of column (Dwg. 302-F0055-D)	FAB-13: Active Engineered Control: Spring return valve 302- BA-0B85 closes upon operator release. To automatically isolate bulk ammonium hydroxide flow to Column 0B03 upon operator release of the spring return valve preventing an overflow of column. (Dwg. 302- F0055-D)	-2	-2	U C	-1 -5 3 3	3 1 3 3	3 3 3 3	9 3 3 3	Procedures Training Clear column 0B03
IROFS failure B-049	FAB-13 Valve BA-0B01 does not spring return shut upon operator release or valve leaks when bulk ammonium hydroxide system is pressurized up to this valve	Human error Mechanical failure		FAB-13 Valve BA-0B01 does not spring return shut upon operator release or valve leaks when bulk ammonium hydroxide system is pressurized up to this valve	FAB-13 Valve BA-0B85 does not spring return shut upon operator release or valve leaks when bulk ammonium hydroxide system is pressurized up to this valve	-2	-2 dur=-2	U C	-2 -6 3 3	3 1 3 3	3 3 3 3	9 3 3 3	
IROFS failure B-048	FAB-13 Valve BA-0B85 does not spring return shut upon operator release or valve leaks when bulk ammonium hydroxide system is pressurized up to this valve	Human error Mechanical failure		FAB-13 Valve BA-0B85 does not spring return shut upon operator release or valve leaks when bulk ammonium hydroxide system is pressurized up to this valve	FAB-13 Valve BA-0B01 does not spring return shut upon operator release or valve leaks when bulk ammonium hydroxide system is pressurized up to this valve	-2	-2 dur=-2	U C	-2 -6 3 3	3 1 3 3	3 3 3 3	9 3 3 3	

Potential Initiating and Enabling Events for Event P44298. Results in controlled Likelihood Index = -2, Likelihood Category = 3, Risk Index = 9 (unacceptable risk for High Consequence)

Initiating Event: Valves BA-0B85 and BA-0B01 fail open. IE = 0

Enabling Event: Operator manning the area evacuates or is incapacitated. EE = -1

Enabling Event: Personnel do not evacuate upon chemical overflow (sight or smell). EE = -1

UNCLASSIFIED

Reviewed by
Authorized classifier
Nuclear Fuel Services, Inc.

June 30, 2014

MEMORANDUM TO: Charles R. Stancil, Team Leader
Nuclear Fuel Services Inc., Special Inspection

FROM: Victor M. McCree /RA/
Regional Administrator

SUBJECT: SPECIAL INSPECTION TEAM CHARTER FOR NUCLEAR FUEL
SERVICES INC, DOCKET NO. 70-143 (INSPECTION REPORT 70-
143/2014-006)

This memorandum confirms the establishment of a Special Inspection Team (SIT) at Nuclear Fuel Services Inc. (NFS) to inspect and assess the facts and circumstances surrounding the failure to meet the performance requirements of 10 CFR 70.61 due to the unavailability of all items relied on for safety (IROFS) for a high consequence event. The issue was reported to the NRC Operations Center on June 18, 2014 (Event # 50208), as a 1-hour reportable event. You are the inspection leader and should report your status directly to me. The onsite inspection can begin as early as July 10, 2014, however, it must be coordinated with the planned Office of Investigations (OI) investigation.

Regional Office Instruction No. 0704, "Documenting Management Directive 8.3, NRC Incident Investigation Program, Reactive Team Inspection Decisions in the Division of Fuel Facility Inspection," Rev. 3, was used to evaluate the level of Nuclear Regulatory Commission (NRC) response for this operational event. Based on the deterministic criteria, the staff concluded that this issue involved an event or condition in which no IROFS, as documented in the ISA summary, remained available and reliable, in an evaluated accident sequence with a high consequence (chemical safety). The NRC determined that the appropriate level of response was to conduct a Special Inspection based on the licensee's identification of the initial issue, conservative decision making in response to the event, and the immediate corrective actions taken in response to the conditions identified.

The inspection will be performed in accordance with the guidance of Inspection Procedure (IP) 88003, "Reactive Inspection for Events at Fuel Cycle Facilities," and the applicable provisions of IP 93812, "Special Inspection." The report will be issued within 45 days of the completion of the inspection.

CONTACTS: James A. Hickey, RII/DFFI
404-997-4628

Anthony T. Gody, RII/DFFI
404-997-4700

Enclosure 2

A copy of the Charter is enclosed for your use. The objectives of the inspection are to gather information and make appropriate findings and conclusions in the areas listed in the Charter. These results will 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 immediate corrective actions for the issues which resulted in the event.

The team should notify Region II management of any potential generic issues identified as a result of this event for discussion with the Office of Nuclear Material Safety and Safeguards. Safety or security concerns identified that are not directly related to the event should be reported to the Region II office for appropriate action.

This Charter may be modified should you develop significant new information that warrants review.

Enclosure: SIT Charter

**Special Inspection Team Charter
Nuclear Fuel Services Incorporated
Failure of All Items Relied on for Safety for a High Consequence Scenario**

Event

At approximately 1900 hours on June 17, 2014, an employee was observed by a supervisor inappropriately operating two spring return to close valves identified as an item relied on for safety (IROFS). The valves were observed to be propped open, thus rendered unable to perform their intended safety function. The valves were intended to be manually operated to prevent ammonia hydroxide solution from overfilling a column, spilling on the floor, and causing an acute chemical exposure. There was no actual safety consequence as no spill occurred. Although the operator was monitoring the filling of the column, the inappropriate operation of the valves involved apparent wrongdoing. The licensee immediately placed the operation in a safe condition and initiated an investigation.

Objectives

The objectives of the inspection are to: 1) review the facts surrounding the failure to maintain the IROFS available and reliable; 2) assess the licensee's response to the failures; 3) evaluate the licensee's immediate and planned long term corrective actions to prevent recurrence; and 4) coordinate with the Office of Investigations to ensure the special inspection does not impact the planned investigation. To accomplish these objectives, the following tasks will be completed:

1. Develop a timeline of the licensee's actions leading up to and following the determination of the failed IROFS.
2. Determine the actual and potential safety significance.
3. Evaluate the adequacy of the licensee's response to the failed IROFS, including immediate corrective actions and timeliness of the licensee's report to the NRC Operations Center.
4. Assess the adequacy of the licensee's evaluation of the applicable high consequence event including the establishment of IROFS (e.g., safety margin and common cause failures) and management measures for those IROFS, including their design, function, maintenance and testing effectiveness.
5. Evaluate the adequacy of the licensee's causal analysis, extent of condition, and extent of cause review.
6. Evaluate the adequacy of the licensee's planned long term corrective actions to prevent recurrence.
7. Provide any safety culture insights to assist in development of the 2010 Confirmatory Order closeout inspection.

Documentation

Document the inspection findings and conclusions in an inspection report within 45 days of the completion of the inspection.