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March 15, 2017

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Center  
Washington, D.C. 20555-0001

References: 1) Docket No. 70-143; SNM License 124  
2) NRC Inspection Report No. 70-143/2016-005 and Apparent Violations, dated February 13, 2017

**Subject: Response to Apparent Violations in Inspection Report 070-143/2016-005;  
EA-17-005**

Gentlemen:

Pursuant to the requirements of 10 CFR 2.201, Nuclear Fuel Services, Inc. (NFS) hereby submits the attached response to the subject violations identified in the referenced NRC inspection report (Reference 2).

If you or your staff have any questions, require additional information, or wish to discuss this matter further, please contact me at (423) 743-1705, or Mr. Randy Shackelford, Nuclear Safety and Licensing Manager, at (423) 743-2504. Please reference our unique document identification number (21G-17-0061) in any correspondence concerning this letter.

Sincerely,

**NUCLEAR FUEL SERVICES, INC.**

*R. Shackelford / for*

Richard J. Freudenberger, Director  
Safety and Safeguards

WRS/pj

Attachment: NFS Response to Apparent Violations (VIO 070-143/2016-005-01 and VIO 070-143/2016-005-02)

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*NMSS01*  
*NMSS*

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***ATTACHMENT***

**NFS Response to Apparent Violations**

**VIO 070-143/2016-005-01**

**and**

**VIO 070-143/2016-005-02**

**(8 pages to follow)**

**NFS Response to Apparent Violations  
(VIO 070-143/2016-005-01 and 070-143/2016-005-02)**

**Updated Information Concerning Self-Monitoring Capability**

On November 9, 2016, after identification of the event, diagnostics on the speaker wire detected high resistance (700 k $\Omega$  versus 47 k $\Omega$  expected). In addition, the measured output voltage was low (due to the high resistance). The high resistance and low output voltage did not allow the speakers in Buildings 302, 303, and 306 West (the Affected Area) to function. Based on this initial troubleshooting, NFS identified the most probable cause for the loss of functionality of the self-monitoring feature to be a degraded circuit board contact or surge suppressor. NFS provided this probable cause to the NRC in the 30-day event follow-up report (EN 52358), on December 9, 2016.

On December 10, 2016, continuing diagnostics of the wire detected a short to a grounded shield (~15M $\Omega$ ). The short prevented the self-monitoring feature of the system to detect the fault. The faulty wire was subsequently isolated to a 20-foot section of wire. After replacement of the wire, the self-monitoring feature was restored. Additional diagnostics identified no issues with the electronic components associated with the self-monitoring feature. NFS is providing an update to the 30-day event report to reflect the new cause information from the completed investigation report.

**Restatement of Violations**

1. **Unavailability of Criticality Accident Alarm System Audibility**

10 CFR 70.24(a) states, in part, that “Each licensee shall maintain in each area in which such licensed special nuclear material is handled, used, or stored, a monitoring system meeting the requirements of either paragraph (a)(1) or (a)(2), as appropriate, and using gamma- or neutron-sensitive radiation detectors which will energize clearly audible alarm signals if accidental criticality occurs.”

Contrary to the above, on or before November 9, 2016, the licensee failed to maintain in each area in which such licensed SNM is handled, used, or stored, a monitoring system which will energize clearly audible alarms if accidental criticality occurs. Specifically, CAAS speakers within the B302, B303, and B306 West were unavailable for a substantial time period where HEU was being handled, used, and stored. This is an AV of NRC requirements and is documented as AV 70-143/2016-005-01, “Failure to Maintain CAAS Audibility.”

## 2. Failure of Self-Monitoring Feature to Detect System Fault

Safety Condition S-1 of Special Nuclear Material License SNM-124 requires that material be used in accordance with the statements, representations, and conditions in the application.

Section 4.7.12.4, "Criticality Detection System," of the License Application dated May 13, 2011, states "Detector or other electronic component failure will result in a warning signal. This signal will initiate contingency measures which may include evacuation of personnel, suspension of operations, deployment of auxiliary monitoring equipment, and/or immediate system repair."

Contrary to the above, prior to November 9, 2016, the failure of a detector or other electronic component failed to result in a warning signal. Specifically, the wiring fault associated with the failure of the B302, B303, and B306 West speakers failed to result in a warning signal on the combined CMS/fire alarm control panel due to a separate failure of the self-monitoring feature. This is an AV of NRC requirements and is documented as AV 70-143/2016-005-02, "Failure of CAAS Self-Monitoring Feature."

### **The reason for each apparent violation, or if contested, the basis for disputing the apparent violation**

The reasons for the violations were: 1) a degraded speaker cable; and, 2) although NFS was performing routine functional tests of the annunciation portion of the system in areas where licensed SNM is handled, used, or stored, positive verification of CAAS audibility was not included in the testing.

### **The corrective steps that have been taken and the results achieved**

The following corrective steps were taken:

1. On November 9, 2016, a temporary repair to restore functionality of the speakers in the Affected Area was completed. In addition, functional tests of the speakers in the Affected Area were initiated on a daily (when operating) basis to confirm continued functionality of the speakers (documented in Investigation Report No. 21858).
2. On December 10, 2016, the degraded speaker cable for speakers in the Affected Area was replaced. This restored the supervisory capability for speakers in the Affected Area. The supervisory capability for all speaker zones was tested by temporarily removing the positive and negative leads and confirming a trouble signal was generated. In addition, end-of-line resistance readings were verified as normal (documented in Investigation Report No. 21858).

3. On January 25, 2017, expanded speaker operability testing was initiated. The interim periodicity of testing is once every two (2) weeks and is limited to areas where SNM is handled, used, or stored. This periodic testing provides positive verification of CAAS speaker audibility (documented in Investigation Report No. 21858).

As a result of these corrective steps, the supervisory function was restored. In addition, positive verification of CAAS alarm system audibility was initiated on a routine basis for those areas where licensed SNM is handled, used, or stored.

#### **The corrective steps that will be taken**

The following corrective steps will be taken and are documented in NFS' Corrective Action Program (CAP):

1. Formally implement documented speaker function tests with feedback and reporting mechanisms to demonstrate speaker audibility in areas where licensed SNM is handled, used, or stored and that contain SNM at quantities that require CAAS coverage. Describe testing protocols and implementing requirements in a new procedure (Reference Corrective Action C29408).
2. As an enhancement, design and install a replacement annunciation system for the CAAS in areas that contain SNM (Reference Corrective Action C29409).
3. Assign responsibility for maintaining the annunciation portion of the CAAS to a specific owner (Reference Corrective Action C29411).

#### **The date when full compliance will be achieved**

Full compliance was achieved on December 10, 2016, when the degraded speaker wire was replaced and the self-monitoring function was restored and verified to be functioning properly. In addition, on January 25, 2017, NFS implemented routine speaker functionality testing (i.e., positive feedback testing involving individuals stationed at specified locations during the tests and responding back indicating they did or did not hear the test) in areas where licensed SNM is handled, used, or stored.

### **Additional Information Concerning Apparent Violations:**

#### 1. Safety and Regulatory Significance:

As recognized in the Inspection Report, this event resulted in no actual safety consequences because no accidental criticality occurred during the time period that the CAAS speakers in the Affected Area were not functioning properly. During the time of the CAAS audibility issues, no events occurred that would have resulted in actuation of the speakers. No plant upset conditions or elevated radiation levels existed, and Nuclear Criticality Safety (NCS) controls remained intact.

NFS acknowledges that this event had potential safety consequences and regulatory significance. The CAAS is a foundational safety system that is essential to worker protection as well as an NRC requirement for continued operations. In the event of a criticality accident, the CAAS immediately alerts workers to evacuate the building in order to minimize radiation exposure. While the low probability of a criticality event does not eliminate the potential safety consequences or regulatory significance of CAAS audibility issues, NFS has undertaken significant effort to reduce the likelihood of a criticality event and provide additional safety margin to its operations beyond the requirement that criticality accident sequences satisfy the Double Contingency Principle and have a likelihood of at least "highly unlikely." The majority of criticality accident sequences at NFS have likelihoods that are beyond highly unlikely as a result of NFS' effort to implement additional Items Relied On For Safety (IROFS) to increase the safety margin. NFS incorporates additional IROFS such that the accident sequences remain highly unlikely even with a failure of an IROFS. This practice is documented in NFS' "Nuclear Criticality Safety Evaluation/Analysis Writer's Guide."

#### 2. Grouping of Violations

The NRC should group the failure to maintain CAAS audibility and the failure of the self-monitoring feature of the CAAS into a single violation. The NRC Enforcement Manual (Revision 9, Updated December 10, 2015), Part 1, Section 1.3.5, "Documenting Related Violations," indicates that grouping is used "to appropriately characterize the significance of the event or incident" and to "inform[ ] the licensee and the public that NRC is aware that the violations are closely related and are not separate regulatory breakdowns." The NRC Enforcement Manual states further:

When dispositioning violations as a problem, the staff should only group violations that are closely related, such as having a cause and effect relationship or directly related to the same event (e.g., failure to perform adequate testing that results in a piece of inoperable equipment, loss of material and failure to report the loss).

The same underlying wiring fault caused both the inaudibility of the speakers (the first AV) and the failure of the self-monitoring feature to detect the system fault (the second AV). Had it not been for the simultaneous presence of a high resistance and a short to a grounded shield in the same cable, it is extremely likely that this event would have been detected by the self-monitoring feature of the system or the speakers would have remained functional. Because both AVs resulted from the same equipment fault, they are causally related and are appropriate for grouping under the guidance contained in the NRC Enforcement Manual.

### 3. Duration of Speaker Outage

In determining the duration of the speaker outage for enforcement purposes, the NRC should consider the available circumstantial evidence. The Inspection Report states that there was an “indeterminate failure duration” and concludes that the speakers were unavailable for a “substantial time period,” noting that NFS’ procedure did not require a positive check of speaker function or separate testing of the self-monitoring system. As part of the corrective action from this event, NFS has implemented a positive speaker function check to prevent recurrence; however, the duration for which the speaker was inaudible can be bounded by observation and reporting of personnel who were present in the Affected Area during announcements.

NFS performed an annual criticality evacuation alarm drill on September 20, 2016, (50 days prior to discovering the speaker inaudibility). Two individuals who were present in the Affected Area during the drill have confirmed that they heard the criticality alarm. On the basis of this confirmation, NFS concludes that the CAAS speakers were audible at this time and the duration of the speaker unavailability was not indeterminate.

For enforcement purposes, it is reasonable to assume that the speakers were audible on October 19, 2016, (21 days prior to discovering the speaker inaudibility), because NFS had initiated a “stop movement” to support a CAAS detector replacement in another portion of the facility. The “stop movement” was communicated to personnel site-wide via the Public Address (PA) system. The “stop movement” was also communicated to operations during morning meetings. When testing of the CAAS alarms was complete and the “stop movement” was lifted, no workers reported that the speakers in the Affected Area were not functioning properly. Because of the “stop movement,” workers in the Affected Area were generally expecting to hear the alarms prior to the lifting of the “stop movement.” It is NFS’ training and culture to report speaker or audibility issues. For example, NFS identified approximately 109 CAP entries during the previous five (5) years associated with speaker, audibility, and alarm issues. Based on NFS’ training and culture that all personnel report speaker faults, the speakers were likely functional at that time based on the absence of reports concerning their inaudibility from personnel who were present. Notably, NFS workers discovered and reported the speaker inaudibility during a similar “stop movement” announcement on November 9, 2016. Therefore, there is reasonable assurance that NFS employees would have reported speaker audibility issues on October 19, 2016, had the speakers in the Affected Area not been functioning. Based on the information above, NFS concludes that the duration of the CAAS speaker unavailability was likely no more than 21 days.



NFS has not located NRC precedent or guidance providing a definition of “substantial time period” in this context; however, ANSI/ANS-8.3-1997 (“Criticality Accident Alarm System”), which the NRC endorses (with exceptions) in Regulatory Guide 3.71 (December 2010), indicates that the alarm system should be tested periodically and response to radiation tests should be performed at least monthly. Specifically, the ANSI/ANS-8.3-1997 standard states the following:

**6.3 Response to Radiation.** System response to radiation shall be measured periodically to confirm continuing instrument performance. The test interval should be determined on the basis of experience. In the absence of experience, tests should be performed at least monthly. Records of tests shall be maintained. System designs may incorporate self-checking features to automate portions of this testing.

**6.4 Periodic Tests.** The entire alarm system shall be tested periodically. Each signal generator should be tested at least annually. Field observations shall establish that criticality alarm signals are functional throughout all areas where personnel could be subject to an excessive radiation dose. All personnel in affected areas shall be notified before testing of the criticality alarm signals.

Although the word “should” is defined as a recommendation (as opposed to a requirement) in the standard, it is reasonable to conclude that a period of less than 30 days is not a “substantial time period” based on the ANSI/ANS-8.3-1997 guidance concerning testing periodicity.

Based on the above information, NFS does not believe that the speakers in the Affected Area were inaudible for an indeterminate period of time. In addition, NFS believes that the duration was not substantial.

4. Licensee Identification of Event:

NFS should receive credit for identification of this event.

This event should be categorized as licensee-identified under the NRC Enforcement Policy (November 1, 2016). Most importantly, as recognized in the Inspection Report, NFS employees identified the audibility issues with the speakers during a routine “Stop Movement” announcement that was independent of the annunciation of the CAAS. Based on their training and recognition of the implication of this issue for the CAAS and other systems, these personnel raised this issue to supervision. Management promptly reported this issue to the NRC and took immediate corrective action. NFS acknowledges that its procedures did not previously require active checking of speaker audibility, and NFS is modifying its procedures to prevent recurrence of this issue; however, the CAAS audibility issue was revealed through the diligence of NFS workers raising issues to supervision (in accordance with NFS expectations) following a PA system announcement.

The NRC Enforcement Policy considers several factors in determining whether the licensee should receive credit for identifying the event. These factors include: "... the ease of discovery, whether the event occurred as the result of a licensee's self-monitoring effort (i.e., whether the licensee was "looking for the problem"), the degree of licensee initiative in identifying the problem or problems requiring corrective action, and whether prior opportunities existed to identify the problem." These factors favor crediting NFS with identification of the event for the following reasons:

- The issue was not easily discoverable because it resulted from a latent equipment issue (i.e., degraded cable) that was difficult to detect. The system has "self-monitoring" or "supervisory" capability such that system faults would be identified and alarmed by the system. The "self-monitoring" or "supervisory" feature associated with the system (for the Affected Area) was not able to detect the wiring fault. It was later determined that this was also caused by the degraded cable.
- As an additional "self-monitoring" feature, NFS continually "looks for problems" associated with the CAAS speakers and alarms. The PA system and CAAS alarms are sounded and tested periodically to verify functionality. Employees are trained to notify their supervision and identify the problem in the CAP when they are not able to hear announcements or alarms. Actions are then taken to immediately investigate and reestablish alarm capability if necessary.
- NFS employees identified the speaker inaudibility through a questioning attitude during a routine announcement. Upon recognizing the inaudibility of the speakers, the employees notified supervision and identified the problem in the CAP that they did not hear announcements/alarms in the area. NFS promptly investigated this report and, through timely testing, identified that the CAAS alarm was inaudible in certain areas. Then, NFS took immediate compensatory actions, notified the NRC, and initiated an investigation.

Accordingly, NFS believes that credit for identification is appropriate in this case.

##### 5. Prompt and Comprehensive Corrective Actions

NFS employees identified the speaker inaudibility through a questioning attitude during a routine announcement. Upon recognizing the inaudibility of the speakers, the employees notified supervision and identified the problem in the CAP that they did not hear announcements/alarms in the area. NFS promptly investigated this report and, through timely testing, identified that the CAAS alarm was inaudible in certain areas. Then, NFS took immediate compensatory actions, notified the NRC, and initiated an investigation. NFS conducted an extensive investigation that looked broadly at the CAAS to ensure other vulnerabilities did not exist.

6. Conclusion:

NFS requests that the NRC consider these factors in NRC's deliberations and the application of discretion relative to this enforcement action:

- The above-cited apparent violations meet NRC criteria for grouping as a single violation because they are closely related and stem from the failure of the same component.
- For enforcement purposes, the NRC should credit the circumstantial evidence that the speakers were functioning on October 19, 2016, and the duration of the speaker audibility issue is therefore less than the duration necessary to be considered "substantial."
- If the NRC concludes that escalated enforcement is warranted, NFS should receive credit both for identification and for prompt and comprehensive corrective action for the reasons stated above.