



UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION II
245 PEACHTREE CENTER AVENUE N.E., SUITE 1200
ATLANTA, GEORGIA 30303-1200

November 30, 2022

Ronald Dailey
President
Nuclear Fuel Services, Inc.
P.O. Box 337
MS 123
Erwin, TN 37650-0337

SUBJECT: NUCLEAR FUEL SERVICES, INC. – SPECIAL INSPECTION REPORT
07000143/2022006

Dear Ronald Dailey:

On October 14, 2022, the U.S. Nuclear Regulatory Commission (NRC) completed its initial assessment of Event Notification 56149, dated October 6, 2022, regarding a plant configuration issue that potentially increased the likelihood of a high consequence event beyond the performance requirements in Title 10 of the Code of Federal Regulations, Part 70, Section 70.61 (10 CFR 70.61). Based on this initial assessment, on October 17, 2022, the NRC initiated a special inspection at Nuclear Fuel Services, Inc. to gather information on the circumstances surrounding the issue. The basis for initiating this special inspection is further discussed in the enclosed inspection report and attached Charter. On October 19, 2022, the NRC completed its special inspection and discussed the results with you and other members of your staff. The results of this inspection are documented in the enclosed report.

No violations of more than minor significance were identified during this inspection.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

A handwritten signature in black ink, appearing to read "R. Williams, Jr.", written over a light blue horizontal line.

Signed by Williams, Robert
on 11/30/22

Robert E. Williams, Jr., Chief
Projects Branch 1
Division of Fuel Facility Inspection

Docket No. 07000143
License No. SNM-124

Enclosure:
Special Inspection Report 07000143/2022006
Attachment: Special Inspection Charter

cc w/ encl: Distribution via LISTSERV

SUBJECT: NUCLEAR FUEL SERVICES, INC. – SPECIAL INSPECTION REPORT
07000143/2022006 dated November 30, 2022

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**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Number: 07000143

License Number: SNM-124

Report Number: 07000143/2022006

Enterprise Identifier: I-2022-006-0056

Licensee: Nuclear Fuel Services, Inc.

Facility: Nuclear Fuel Services, Inc.

Location: Erwin, TN

Inspection Dates: October 17 to 19, 2022

Inspectors: L. Harris, Senior Resident Inspector
J. Munson, Nuclear Process Engineer

Approved By: Robert E. Williams, Jr., Chief
Projects Branch 1
Division of Fuel Facility Inspection

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a Special Inspection at Nuclear Fuel Services, Inc., in accordance with the fuel cycle facility inspection program. This is the NRC's program for overseeing the safe operation of licensed fuel cycle facilities. Refer to <https://www.nrc.gov/materials/fuel-cycle-fac.html> for more information.

List of Violations

No violations of more than minor significance were identified.

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
URI	07000143/2022006-01	Management Measures for Crediting DRAIN-003 as an Item Relied on for Safety Post-Original Installation	88003	Open
URI	07000143/2022006-02	Effectiveness of Protection Index Assigned to DRAIN-002 in the Integrated Safety Analysis Summary	88003	Open
URI	07000143/2022006-03	Compliance of Building 302 Ventilation Drains with the Performance Requirements in 10 CFR 70.61(b)	88003	Open

INSPECTION SCOPE

On October 19, 2022, the NRC completed a special inspection at the Nuclear Fuel Services (NFS), Inc. facility in Erwin, TN. The purpose of the inspection was to review the circumstances surrounding a plant configuration issue reported to the NRC on October 6, 2022 (Event Notification 56149), that potentially increased the likelihood of a high consequence event beyond the performance requirements in Title 10 of the Code of Federal Regulations, Part 70, Section 70.61 (10 CFR 70.61). The inspection was conducted by a nuclear criticality safety subject matter expert from the NRC's Office of Nuclear Material Safety and Safeguards, Division of Fuel Management with assistance from Region II inspection staff using the guidance in NRC Inspection Procedures 88003, "Reactive Inspections for Events at Fuel Cycle Facilities" and 93812, "Special Inspection." The decision to conduct a special inspection was based on the guidance in NRC Management Directive (MD) 8.3, "NRC Incident Investigation Program," and Inspector Manual Chapter (IMC) 2601, "Reactive Inspection Decision Making Process for Fuel Facilities." The attachment to this report contains the Special Inspection Charter, dated October 14, 2022, which describes the scope of the special inspection as approved by NRC Management.

OTHER AREAS

88003 - Reactive Inspection for Events at Fuel Cycle Facilities

Description of Event and Reactive Inspection Basis

Nuclear Fuel Services, Inc. is licensed to manufacture a variety of uranium products for commercial and defense purposes. In its 300 Complex, ventilation systems are equipped with drains credited as items relied on for safety (IROFS) to prevent the moderation of uranium-bearing solids entrained in the ventilation system ductwork (IROFS FPV-4). Moderation could credibly be present in the ventilation system due to the generation of condensation in upstream processes. Item relied on for safety FPV-4 consists of several drains including DRAINS -001, -002, and -003. Due to their physical configuration, DRAINS -002 and -003 are intended to act as redundant controls to one another, with DRAIN-002 providing risk reduction in the event that DRAIN-003 becomes unavailable or unreliable and vice versa.

On September 27, 2022, the licensee observed debris obstructing DRAIN-003. On October 2, 2022, during inspection and cleaning activities to address the obstruction in DRAIN-003, the licensee discovered that a protrusion existed in DRAIN-003 such that the drain was not flush with the process ventilation ductwork as assumed in the nuclear criticality safety evaluation (NCSE) and integrated safety analysis (ISA). The condition was entered into the licensee's Problem Identification, Resolution, and Correction System (PIRCS) as PIRCS 90559. The licensee determined that although DRAIN-003 was not available and reliable, DRAIN-002 remained available and reliable to perform its intended safety function and maintain the likelihood of inadvertent criticality as highly unlikely without the use of any compensatory measures. On October 5, 2022, as part of its extent-of-condition review, the licensee conducted a review of historical events in which DRAIN-002 was either failed or degraded and determined that the event (protrusion in DRAIN-003) was reportable to the NRC due to past events in which DRAIN-002 was discovered to be in a failed or degraded condition concurrent with the unreliable state of DRAIN-003. On October 6, 2022, the licensee submitted a 24-hour report to the NRC in accordance with Appendix A to 10 CFR Part 70.

The inspectors evaluated the reported event using the guidance in NRC MD 8.3 and IMC-2601 to determine the level of NRC response. Considering the applicable accident sequence and the credit given to DRAIN-002 and DRAIN-003 in the ISA Summary, the inspectors determined the instances in which both drains were concurrently not available and reliable to perform their safety function represented an increase in the likelihood of a high consequence event to the extent of potentially not meeting the performance requirements in 10 CFR 70.61. Therefore, the evaluation determined the issue of concern met the deterministic criteria for a reactive inspection because it involved “an event or condition such that the performance requirements of 10 CFR 70.61 were not met, as documented in the ISA Summary” and “repetitive failures or events with safety-related equipment.” While the licensee took prompt actions to stop fuel manufacturing processes and correct the drain configurations, the fact there were multiple occasions in which the facility was in a potentially high-risk condition, and that additional drains were found with the same problem across the plant, required further understanding to ensure the plant was in a safe configuration to resume normal operations. Accordingly, the NRC determined that a special inspection was an appropriate response to the event. The inspection activities completed for each item in the attached Special Inspection Charter are discussed below.

1) Assessment of Special Inspection Recommendation

On the first day of the inspection, the inspectors reviewed the known circumstances of the event to make a recommendation as to whether a special inspection was the appropriate NRC response or if an Augmented Inspection Team (AIT) was warranted.

Based on the safety significance and the licensee’s actions to manage the event, the inspectors determined that an AIT was not warranted and that a special inspection was the appropriate level of NRC response. Although the presence of uranium-bearing debris is common and the presence of moderation is credible in the affected system, the preliminary information gathered during the inspection showed that the mass of uranium present in the ventilation system had been historically low (much lower than a minimum critical mass) and no volume of moderation capable of challenging safety limits (i.e., greater than 1 inch) had ever been discovered.

2) Process Ventilation System Walk-down

The inspectors conducted walk-downs of all affected portions of the process ventilation system to assess material condition and current configuration. The inspectors performed walk-downs of all areas of the facility affected by the event, including Buildings 105, 301, 302, 303, and 333. The inspectors observed completed physical modifications to the ventilation system in Building 333 and ongoing activities to perform physical modifications to the ventilation system in other areas of the facility. The inspectors noted the licensee placed all affected areas of the facility in a safe shutdown state until corrective actions could be completed.

3) Sequence of Events

The inspectors reviewed the known circumstances leading up to the event to develop a “Sequence of Events” that included the instances where both drains were unavailable to perform their function. Through interviews with licensee personnel and review of licensee records, the inspectors developed the timeline shown below associated with the event. Based on information provided by the licensee, DRAIN-003 was installed sometime in the 1980s.

The exact date of installation and whether DRAIN-003 was initially credited as a safety-related control is unknown. The licensee was unable to produce documentation to indicate whether an initial, post-installation inspection of DRAIN-003 was performed to ensure that its physical configuration was aligned with the assumptions in the applicable safety analyses.

Sequence of Events

- *June 19, 1998* – NFS document 54X-97-0008, “Nuclear Criticality Safety Analysis for the 300 Complex Process and 105 Laboratory Exhaust Ventilation Systems (U),” Revision 0, was implemented. This is the first known date in which DRAIN-003 was credited as a safety-related control. The intended safety function of DRAIN-003 was to prevent the presence of moderation in the 300 Complex ventilation system, which could cause an inadvertent criticality if uranium-bearing debris were to become moderated in excess of a safe slab height (1 inch).
- *October 18, 2004* – The ISA was implemented in response to the addition of Subpart H to 10 CFR Part 70. The ISA credited DRAIN-003 as a part of an IROFS (FPV-4) to prevent the presence of moderation in the 300 Complex ventilation system.
- *December 17, 2009* – The licensee identified a failure of DRAIN-002 (PIRCS 22526). Corrective actions consisted of cleaning out the drain.
- *July 6, 2011* – The licensee identified a failure of DRAIN-002 (PIRCS 30556). Corrective actions consisted of cleaning out the drain.
- *August 11, 2011* – The licensee observed material accumulation in the 300 Complex ventilation system during a safety-related equipment (SRE) test of DRAIN-002. A review of the setpoint calculations for FPV-4 identified an issue with the assumptions used in the setpoint calculations for DRAIN-002 (PIRCS 31035); however, the licensee did not review the setpoint analyses for the other components of FPV-4: DRAINS -001 and -003.
- *October 11, 2011* – The licensee revised the SRE testing procedure for ventilation drains to include an inspection for mass accumulation and change the frequency of the test from annually to quarterly.
- *June 17, 2015* – The licensee identified degradation of DRAIN-002 (PIRCS 48896). Corrective actions consisted of cleaning out the drain.
- *July 4, 2015* – The licensee identified degradation of DRAIN-002 (PIRCS 49102). Corrective actions consisted of cleaning out the drain.
- *March 21, 2020* – The licensee identified degradation of DRAIN-002 (PIRCS 79001). Corrective actions consisted of cleaning out the drain.
- *August 8, 2020* – The licensee identified discovery of debris in DRAIN-002 (PIRCS 80212). Corrective actions consisted of cleaning out the drain.
- *July 25, 2022* – The licensee identified degradation of DRAIN-002 (PIRCS 88901). Corrective actions consisted of cleaning out the drain.

- *September 27, 2022* – During normal operations prior to a scheduled SRE test, the licensee observed a debris obstruction in DRAIN-003 (PIRCS 90498). The licensee determined that although DRAIN-003 was obstructed, DRAIN-002 remained available and reliable to perform its intended safety function and maintain the likelihood of inadvertent criticality as highly unlikely without the use of any compensatory measures. In accordance with Section 9 of NFS procedure NFS-GH-43, “Safety-Related Equipment Control Program,” the licensee continued to operate until the plant could be shut down and an SRE test and cleanout performed.
- *October 1, 2022* – The licensee shut down the 300 Complex ventilation system in order to perform an SRE test and cleanout of DRAIN-003. This affected Buildings 302, 303, and parts of 105.
- *October 2, 2022*
 - The 300 Complex ventilation system remained in shutdown and the accumulation was removed from DRAIN-003.
 - During inspection and cleaning activities to address PIRCS 90498, the licensee discovered that a protrusion existed in DRAIN-003 such that the drain was not flush with the process ventilation as assumed in the NCSE and ISA Summary. The condition was entered into the licensee’s PIRCS system as PIRCS 90559. The licensee determined that although DRAIN-003 was not available and reliable, DRAIN-002 remained available and reliable to perform its intended safety function and maintain the likelihood of inadvertent criticality as highly unlikely without the use of any compensatory measures.
- *October 4, 2022* – During evaluation of PIRCS 90559, the licensee discovered that some assumptions in the setpoint analysis for DRAIN-003 were not consistent with plant conditions. A “Conduct of Operations (ConOps)” Level II shutdown was initiated, which included Buildings 301 and 333.
- *October 5, 2022*
 - The ConOps Level II shutdown was finalized.
 - The licensee performed an extent-of-condition review and identified that ventilation drains for Buildings 301 and 333 were subject to similar protrusion issues. The ventilation drains in Buildings 301 and 333 were credited in the ISA and applicable NCSEs; however, additional controls (dual, independent non-destructive assay (NDA) scans, FPV-2) were credited to limit the risk of inadvertent criticality in these areas. The licensee determined that the condition in Buildings 301 and 333 was not reportable because the dual, independent NDA scans (FPV-2) remained available and reliable to perform their intended safety function and maintain the likelihood of criticality as highly unlikely without the use of any compensatory measures. This was entered into the licensee’s PIRCS system as PIRCS 90614.
 - During the licensee’s extent-of-condition review, the licensee discovered a small lip on DRAIN-001, which was less than a height of concern (i.e., less than one inch) but inconsistent with the DRAIN-001 setpoint analysis.

- During a review of historical events in which DRAIN-002 was either failed or degraded, the licensee determined that the event (protrusion in DRAIN-003) was reportable to the NRC due to past events in which DRAIN-002 was discovered to be in a failed or degraded condition concurrent with the unreliable state of DRAIN-003. The licensee identified seven past events from December 2009 to July 2022 in which DRAIN-002 was either failed or degraded.
- *October 6, 2022*
 - The licensee submitted a 24-hour report to the NRC in accordance with Appendix A to 10 CFR Part 70.
 - Operations in Buildings 303, 306, and 307 were allowed to restart as the ventilation system in those areas was not affected by the event. As a compensatory measure, LOA-2375D-032, "Process Ventilation Restart," was implemented to allow the restart of certain operations in Building 302, but operations were restricted to those that would not provide a credible source of moderation to the ventilation system. Compensatory measures restricted heated processes and processes involving liquids and required daily inspections of DRAIN-002.

4) Licensee Corrective Actions for the Event

The inspectors reviewed and evaluated the licensee's completed and planned corrective actions, extent-of-condition reviews, and compensatory measures to determine if these were consistent with plant procedures for resumption of normal operations.

The licensee entered the event into its corrective action program (PIRCS 90559), initiated a ConOps Level II shutdown, performed an extent-of-condition review in accordance with NFS procedure NFS-CAP-006, and initiated a root cause investigation (PIRCS 33014) using a Small Team Root Cause Investigation. The licensee implemented actions to maintain the affected areas of the plant in a safe shutdown condition until corrective actions were implemented, with the exception of operations allowed to restart under LOA-2375D-032.

The licensee also implemented a number of corrective actions, including: 1) physical modifications to the ventilation drains in Buildings 301 and 333 (i.e., ground flush) to align their physical configuration with the assumptions in the ISA and applicable NCSEs; 2) engineering change request (ECR) package ECR-20221190 was developed to replace DRAINS -001, -002, and -003 with dual, independent drains (for a total of six drains) and add uncredited knockout columns; and 3) a revision to the NCSE and ISA Summary's accident sequence tables for the 300 Complex ventilation system was initiated to credit the dual, independent NDA scans (FPV-2) similar to how they are credited in the NCSE and ISA Summary tables for Buildings 301 and 333.

Additionally, the licensee added a separate PIRCS entry (PIRCS 43022) to ensure that lessons learned from the event were appropriately captured in its operating experience (OpE) program.

The inspectors determined that the licensee's actions selected for review, including completed and planned corrective actions, extent-of-condition-review, and compensatory measures, were consistent with NFS internal procedures and its approved ISA methodology for resumption of normal operations.

At the close of the inspection, the licensee's root cause investigation had not been completed. As a result, the licensee may identify additional corrective actions, if necessary, based on the results of its root cause investigation.

5) Configuration Management Activities

The inspectors reviewed and evaluated the licensee's implementation of configuration management activities for plant modifications established to correct the drain configuration issues.

The inspectors reviewed NFS procedures NFS-OPS-001, "Conduct of Operations," and NFS-GH-43, "Safety-Related Equipment Control Program;" and change package ECR-20221190. The licensee initiated ECR-20221190 to modify the design of DRAINS -002 and -003. On the basis of the licensee actions selected for review, the inspectors determined that completed and planned corrective actions were consistent with NFS procedures and its configuration management program as described in Chapter 11 of the facility's license application.

6) Management Measures History

The inspectors reviewed the historical management measures (e.g., inspections, audits, etc.) applied to the affected process ventilation drains to evaluate whether the licensee had reasonable opportunities to identify the drain configuration issue earlier.

The inspectors reviewed SRE testing procedures and records and relevant PIRCS entries dating back to the genesis of the licensee's PIRCS in 2003. The inspectors determined that routine SRE tests would not have necessarily provided an opportunity to identify a protrusion into the ventilation system or other similar issues with the drains' installed physical configuration because the ventilation system is enclosed and not viewable unless a section of the ventilation is removed.

The licensee was unable to provide information related to any initial, post-installation inspection performed for DRAIN-003 when it was originally installed sometime in the 1980s. Similarly, the licensee was unable to provide information related to any initial inspection performed prior to crediting DRAIN-003 as an IROFS in the ISA Summary to ensure that its physical configuration was aligned with the assumptions in the ISA Summary and applicable NCSE. Although DRAIN-003 was installed sometime in the 1980s prior to the incorporation of ISA Summary requirements in 10 CFR 70, the requirements of 10 CFR 70.62(d) would have required the implementation of management measures when crediting DRAIN-003 as an IROFS initially. Because the licensee's root cause investigation had not yet been completed by the close of the inspection, the inspectors determined that additional information regarding initial management measures for DRAIN-003 (e.g., visual inspection, configuration control, etc.) is needed to determine whether the licensee met the regulatory requirements in 10 CFR 70.62(d). This issue is being tracked as unresolved item (URI) 2022006-001, "Management Measures for Crediting DRAIN-003 as an Item Relied on for Safety Post-Original Installation."

On August 11, 2011, accumulation was observed in the 300 Complex ventilation system during an SRE test of DRAIN-002. At that time, the SRE tests did not include an inspection for mass accumulation; therefore, effective October 11, 2011, the licensee revised the SRE testing procedure to include an inspection for mass accumulation and

change the frequency of the test from annually to quarterly. A licensee's review of the setpoint calculations for FPV-4 identified an issue with the setpoint calculations for DRAIN-002 (PIRCS 31035); however, the licensee did not review the setpoint analyses for the other components of FPV-4, DRAINS -001 and -003. Although a review of the setpoint analyses for DRAINS -001 and -003 would not have necessarily identified the protrusion in DRAIN-003, the inspectors noted that the licensee's decision for not conducting an extent-of-condition review to include DRAINS -001 and -003 represented a potential missed opportunity to identify the issues with the setpoint analyses for DRAINS -001 and -003 later identified on October 5, 2022, and October 4, 2022, respectively.

In response to the June 17, 2015, degradation of DRAIN-002 (PIRCS 48896), the licensee initiated an ECR to replace DRAIN-002 with a larger diameter drain to better mitigate entrainment of debris. However, this change was never performed. As discussed in Item 3 above, seven past events were identified in which DRAIN-002 was discovered to be obstructed, four of which took place after June 17, 2015. The inspectors noted that the licensee's decision to not perform the change request represented a potential missed opportunity to reduce the number of historical degradations and failures of DRAIN-002.

7) Historical Performance of Process Ventilation Drains and Effectiveness Protection Index

The inspectors reviewed the historical performance of process ventilation system drains credited as IROFS, particularly for DRAIN-002, to evaluate the circumstances and corrective actions for previous obstructions preventing the drain from performing its function. Additionally, the inspectors evaluated whether the repetitive failures of DRAIN-002 were consistent with the failure frequency assigned in the ISA Summary for this type of IROFS.

The inspectors reviewed SRE testing records and relevant PIRCS entries dating back to the genesis of the licensee's PIRCS in 2003. Seven degradations or failures of DRAIN-002 were identified in which DRAIN-002 was not available or reliable to perform its intended safety function concurrent with the unreliability of DRAIN-003 over the span of approximately 20 years. The inspectors observed that the licensee's corrective actions to address the past instances of obstruction in DRAIN-002 were to clean out the drain and remove the debris. As discussed in Item 6 above, the licensee initiated an ECR in June 2015 to replace DRAIN-002 with a larger diameter drain to better mitigate entrainment of debris; however, this change was never performed. The inspectors determined that the use of a larger diameter drain for DRAIN-002 would have likely provided better mitigation for the entrainment of debris and potentially resulted in fewer historical degradations or failures.

According to NFS's ISA Summary methodology, an Effectiveness of Protection Index (EPI) is assigned to each type of IROFS based on its design. The EPI is an index assigned to qualitatively envelop the protection afforded by an IROFS to prevent or mitigate an accident sequence with the required management measures applied ensuring the IROFS is reliable and available to perform its function upon demand. The index is assigned to each IROFS based on industry accepted values, past experience, engineering judgment, analytical data, and/or any other applicable information. For ventilation DRAINS-002 and -003, the licensee assigned an EPI of -3 to each drain which corresponds to an IROFS that is functionally tested with management

measures applied to ensure availability and reliability.

Given the number of degradations and failures of DRAIN-002 since 2003, the inspectors determined that additional information is needed to determine whether the credit applied to DRAIN-002 in the ISA Summary (i.e., 10^{-3}) is statistically representative of its actual observed failure frequency. Because the licensee's root cause investigation, which was not reviewed by the inspectors because it had not yet been completed by the close of the inspection, may identify additional information related to the historical degradations and failures of DRAIN-002, this issue is being tracked as URI 2022006-002, "Effectiveness of Protection Index Assigned to DRAIN-002 in the Integrated Safety Analysis Summary."

8) Inspection and Cleaning Activities for IROFS FPV-2

The inspectors reviewed ductwork inspection and cleaning activities for IROFS FPV-2 and evaluated whether the frequency and mass threshold used had any correlation with previous instances of obstruction in DRAIN-002.

The inspectors reviewed the procedure for performing the dual, independent NDA scans (FPV-2), SOP-401-11, "[Fuel Manufacturing Facility], Monitoring and Servicing of Area Process Ventilation Systems (U)," as well as the NCSE for the 300 Complex ventilation system, 54X-97-0008, "Nuclear Criticality Safety Analysis for the 300 Complex Process and 105 Laboratory Exhaust Ventilation Systems (U)," to establish the basis for the frequency and mass threshold used for IROFS FPV-2. The inspectors determined that the frequency and mass threshold used for IROFS FPV-2 was consistent and supported by the NCSE. The inspectors determined that the established mass thresholds were bound by conservative assumptions in the NCSE based on optimally-moderated material in the ventilation system. Additionally, the inspectors determined that the established frequency of NDA scans was reasonably justified in the NCSE based on material throughput and historical data. The inspectors determined that the current mass thresholds and frequency of IROFS FPV-2 supported identification of material accumulation in the ventilation system prior to achieving an unsafe mass, even if moderation were to collect in the ventilation system due to an obstruction of DRAIN-002.

9) Licensee's Causal Investigation

The inspectors reviewed licensee's corrective actions to determine whether the licensee's causal investigation for the event was being conducted at an appropriate level in accordance with procedures and commensurate with the safety significance of the event.

The inspectors reviewed NFS procedures NFS-CAP-009-01, "Corrective Action Program (CAP) Screening Process" and NFS-CAP-009, "The NFS Corrective Action Program," to identify the licensee's expectations to characterize and evaluate the event. The licensee characterized the event as a Condition Adverse to Safety (CAS) based on its determination that additional, but uncredited IROFS (FPV-2) were both applicable to the affected ISA sequences and available and reliable to perform their intended safety function.

Based on the event characterization, the licensee initiated a Small Team Root Cause Investigation, which was ongoing at the time of this inspection. The inspectors

determined that the licensee's root cause investigation was being conducted at a level consistent with procedures and commensurate with the safety significance of the event.

10) Additional Safety Controls for Ventilation System

The inspectors gathered information on other IROFS controls that could reasonably be credited for the applicable ISA accident sequences to meet the requirements in 10 CFR 70.61, specifically the requirements of 10 CFR 70.61(b) to maintain the likelihood of occurrence of each credible high consequence event (i.e., criticality) as highly unlikely. The licensee provided information to the inspectors identifying IROFS FPV-2 as a safety control that could potentially be credited for the applicable accident sequences. This IROFS consists of a dual, independent NDA scans to identify accumulation at a frequency established to prevent the accumulation of an unsafe mass. However, the cause investigation and ISA revisions to incorporate other applicable safety controls were still in-progress at the time of the inspection.

Given the unreliability of DRAIN-003 due to its previous physical configuration (i.e., protrusion), each historical occurrence in which DRAIN-002 was either degraded or failed resulted in criticality accident sequences potentially not being highly unlikely based on the licensee's ISA. Because the licensee's root cause investigation and long-term corrective actions had not yet been completed by the close of the inspection, which may identify new information related to other IROFS and compliance with the performance requirements in 10 CFR 70, the inspectors determined that additional information is needed to determine whether the requirements of 10 CFR 70.61(b) were met in those instances that DRAIN-002 was degraded or failed. This issue is being tracked as URI 2022006-003, "Compliance of Building 302 Ventilation Drains with the Performance Requirements in 10 CFR 70.61(b)."

INSPECTION RESULTS

Unresolved Item (Open)	Management Measures for Crediting DRAIN-003 as an Item Relied on for Safety Post-Original Installation URI 07000143/2022006-01	88003
<p><u>Description:</u> During the inspection, the licensee was unable to provide information related to any initial, post-installation inspection performed for DRAIN-003 when it was originally installed sometime in the 1980s. Similarly, the licensee was unable to provide information related to any initial inspection performed prior to crediting DRAIN-003 as an IROFS in the ISA Summary to ensure that its physical configuration was aligned with the assumptions in the ISA Summary and applicable NCSE. Although DRAIN-003 was installed sometime in the 1980s prior to the incorporation of ISA Summary requirements in 10 CFR 70, the requirements of 10 CFR 70.62(d) would have required the implementation of management measures when crediting DRAIN-003 as an IROFS initially. Because the licensee's root cause investigation had not yet been completed by the close of the inspection, the inspectors determined that additional information regarding initial management measures for DRAIN-003 (e.g., visual inspection, configuration control, etc.) is needed to determine whether the licensee met the regulatory requirements in 10 CFR 70.62(d). This issue is being tracked as URI 2022006-001, "Management Measures for Crediting DRAIN-003 as an Item Relied on for Safety Post-Original Installation."</p>		
<p><u>Planned Closure Actions:</u> Regional inspectors intend to review the results of the licensee's cause investigation and long term corrective actions for the event. In order to resolve this URI, the licensee will need to provide information confirming the initial actions taken to credit</p>		

DRAIN-003 as an IROFS. The inspectors will need to review the information and determine whether the licensee implemented management measures in compliance with 10 CFR 70.62(d).

Licensee Actions: This URI does not represent an immediate safety concern. The licensee implemented modifications to the affected ventilation system drains to restore and improve functionality of the drains in accordance with design specifications.

Corrective Action References: The licensee is tracking all actions associated with this event under PIRCS 90559.

Unresolved Item (Open)	Effectiveness of Protection Index Assumed for DRAIN-002 in the Integrated Safety Analysis Summary URI 07000143/2022006-02	88003
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Description: According to NFS's ISA Summary methodology, an EPI is assigned to each type of IROFS based on its design. The EPI is an index assigned to qualitatively envelop the protection afforded by an IROFS to prevent or mitigate an accident sequence with the required management measures applied ensuring the IROFS is reliable and available to perform its function upon demand. The index is assigned to each IROFS based on industry accepted values, past experience, engineering judgment, analytical data, and/or any other applicable information. For the ventilation DRAINS-002 and -003, the licensee assigned an EPI of -3 with corresponds to an IROFS that is functionally tested with management measures applied to ensure availability and reliability.

Based on the licensee's extent-of-condition review, the inspectors noted that DRAIN-002 had been found in a failed or degraded state for at least seven instances since 2003. Given this number of degradations or failures, the inspectors determined that additional information was needed to determine whether the EPI applied to DRAIN-002 in the ISA Summary is statistically representative of its actual observed failure frequency. Because the licensee's root cause investigation had not yet been completed by the close of the inspection, which may identify additional information related to the historical degradations and failures of DRAIN-002, the inspectors determined that additional information was needed to determine whether the licensee implemented its ISA methodology consistent with 10 CFR 70 and the statements and representations in Chapter 3 of the license application. This issue is being tracked as URI 2022006-002, "Effectiveness Protection Index Assumed for DRAIN-002 in the Integrated Safety Analysis Summary."

Planned Closure Actions: Regional inspectors intend to review the results of the licensee's root cause investigation and long-term corrective actions for the event. In order to resolve this URI, the licensee will need to provide information demonstrating that the EPI assigned to DRAIN-002 in the ISA Summary remained valid despite the multiple times DRAIN-002 was found in a degraded or failed state. The inspectors will need to review the information to determine whether the licensee implemented its ISA methodology consistent with 10 CFR 70 and the statements and representations in Chapter 3 of the license application.

Licensee Actions: This URI does not represent an immediate safety concern. The licensee implemented modifications to the affected ventilation system drains to restore and improve functionality of the drains in accordance with design specifications.

Corrective Action References: The licensee is tracking all actions associated with this event under PIRCS 90559.

Unresolved Item (Open)	Compliance of Building 302 Ventilation Drains with the Performance Requirements in 10 CFR 70.61(b) URI 07000143/2022006-03	88003
<p><u>Description:</u> The requirements of 10 CFR 70.61(b) necessitate that the likelihood of occurrence of each credible high consequence event (e.g., criticality) be highly unlikely. Given the unreliability of DRAIN-003 due to its previous physical configuration (i.e., protrusion), each historical occurrence in which DRAIN-002 was either degraded or failed resulted in criticality accident sequences potentially not being highly unlikely based on the licensee's ISA. Because the licensee's root cause investigation and long-term corrective actions had not yet been completed by the close of the inspection, which may identify new information related to compliance with performance requirements in 10 CFR 70, the inspectors determined that additional information is needed to determine whether the requirements of 10 CFR 70.61(b) were met in those instances that DRAIN-002 was degraded or failed. This issue is being tracked as URI 2022006-003, "Compliance of Building 302 Ventilation Drains with the Performance Requirements in 10 CFR 70.61(b).</p> <p><u>Planned Closure Actions:</u> Regional inspectors intend to review the results of the licensee's root cause investigation and long term corrective actions for the event. In order to resolve this URI, the licensee will need to provide information demonstrating that the performance requirements of 10 CFR 70.61(b) were met despite the multiple times that DRAIN-002 was found in a degraded or failed state in conjunction with the configuration problem (i.e., protrusion) of DRAIN-003. The inspectors will need to review the information and determine whether the licensee met the performance requirements in 10 CFR 70.61.</p> <p><u>Licensee Actions:</u> This URI does not represent an immediate safety concern. The licensee implemented modifications to the affected ventilation system drains to restore and improve functionality of the drains in accordance with design specifications.</p> <p><u>Corrective Action References:</u> The licensee is tracking all actions associated with this event under PIRCS 90559.</p>		

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

On October 19, 2022, the inspectors presented this special inspection results to Ronald Dailey and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
88003	Corrective Action Documents	PIRCS 90498, 90559, 22526, 30556, 25948, 49102, 53076, 64586, 79001, 80212, 88901, 31035, 90672, 48896, 90614, 90584	PIRCS entries associated with historical performance of ventilation system drains	
88003	Engineering Changes	ECR-20221190	Change Control Package for Drain Modifications in Building 302	
88003	Engineering Evaluations	54X-97-0008	Nuclear Criticality Safety Analysis for the 300 Complex Process and 105 Laboratory Exhaust Ventilation Systems (U)	Rev. 0 (6/19/98) and Rev. 6 (11/16/07)
88003	Miscellaneous	NFS-ACC-062	Procedure for NDA of the 300 Complex Scrubber System, WD01/WD02, Fenton's WF Tanks, and the Process Off-Gas Ductwork	Rev. 23
88003	Procedures	IROFS 300-UPVENT	SRE Test Procedure	Rev. 0, 1, and 2
88003	Procedures	LOA-2375D-032	Procedure Authorization for Process Ventilation Restart	Effective Date 10/6/2022
88003	Procedures	NFS-CAP-009	The NFS Corrective Action Program	Rev. 10
88003	Procedures	NFS-CAP-009-01	Corrective Action Program (CAP) Screening Process	Rev. 6
88003	Procedures	NFS-GH-43	Safety-Related Equipment Control Program	Rev. 33
88003	Procedures	NFS-OPS-001	Conduct of Operations	Rev. 17
88003	Procedures	SOP-401-11	FMF, Monitoring and Servicing of Area Process Ventilation Systems (U)	Rev. 26