



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

October 26, 2017

EA-16-173

Mr. Mike Annacone
Vice President, Columbia Fuel Operations and
Manager, Columbia Plant
Westinghouse Electric Company
5801 Bluff Road
Hopkins, SC 29061

**SUBJECT: WESTINGHOUSE ELECTRIC COMPANY – NUCLEAR REGULATORY
COMMISSION INTEGRATED INSPECTION REPORT NUMBER 70-1151/2017-004
AND NOTICE OF VIOLATION**

Dear Mr. Annacone:

This letter refers to an inspection conducted from July 1 through September 30, 2017, at the Westinghouse Columbia Fuel Fabrication Facility in Hopkins, SC. The purpose of this inspection was to determine whether activities authorized under the license were conducted safely and in accordance with U.S. Nuclear Regulatory Commission (NRC) requirements. The enclosed inspection report presents the results of this inspection. At the conclusion of this inspection, the inspectors discussed the findings with you and members of your staff at exit meetings held on September 21, October 12, and October 20, 2017.

The inspection examined activities conducted under your license as they relate to public health and safety, the common defense and security, and to confirm compliance with the Commission's rules, orders, and regulations and with the conditions of your license. Within these areas, the inspection consisted of a selected examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of this inspection, the NRC has determined that two Severity Level IV violations of NRC requirements occurred.

The violations were evaluated in accordance with the NRC Enforcement Policy. The current Enforcement Policy is included on the NRC's Web site at (<http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>). The violations are cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding them are described in detail in the subject inspection report. The violations are being cited in the Notice because these violations were not licensee identified as would be required for a non-cited violation per the NRC's Enforcement Policy, section 2.3.2.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. If you have additional information that you believe the NRC should consider, you may provide it in your response to the Notice. The NRC review of your response to the Notice will also determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice and Procedures," a copy of this letter, its enclosures, and your response, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy or proprietary information so that it can be made available to the Public without redaction.

If you have any questions, please contact Tom Vukovinsky of my staff at (404) 997-4622.

Sincerely,

/RA/

Eric C. Michel, Chief
Projects Branch 2
Division of Fuel Facility Inspection

Docket No. 70-1151
License No. SNM-1107

Enclosure:
NRC Inspection Report 70-1151/2017-004
w/Supplemental Information

cc: (See page 3)

cc:

John Howell
Manager
Environment, Health and Safety
Electronic Mail Distribution

Nancy Parr
Manager
Licensing
Electronic Mail Distribution

Christine Kneece
Manager
Industrial Safety
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Susan E. Jenkins
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SUBJECT: WESTINGHOUSE ELECTRIC COMPANY – NUCLEAR REGULATORY
 COMMISSION INTEGRATED INSPECTION REPORT NUMBER 70-1151/2017-004
 AND NOTICE OF VIOLATION

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 ADAMS: Yes ACCESSION NUMBER: ML17303
 A023 SUNSI REVIEW COMPLETE FORM 665 ATTACHED

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NAME	TVukovinsky	KKirchbaum	NPeterka				
DATE	10/25/2017	10/26/2017	10/26/2017				
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NOTICE OF VIOLATION

Westinghouse Electric Company
Hopkins, SC

Docket No. 70-1151
License No. SNM-1107

During an NRC inspection conducted September 18 through October 20, 2017, two violations of NRC requirements were identified. In accordance with the NRC Enforcement Policy, the violations are listed below:

- A. As stated, in part, by 10 Code of Federal Regulations (CFR) 70.61(e), The safety program established and maintained pursuant to 10 CFR 70.62 of this subpart, shall ensure that each item relied on for safety (IROFS) will be available and reliable to perform its intended function when needed and in the context of the performance requirements of this section.

As required by 10 CFR 70.62(d), each licensee shall establish management measures to ensure compliance with the performance requirements of 10 CFR 70.61. The management measures shall ensure that engineered and administrative controls and control systems that are identified as IROFS pursuant to 10 CFR 70.61(e) are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed, to comply with the performance requirements of 10 CFR 70.61.

Contrary to the above, the licensee failed to establish adequate management measures to ensure that two engineered controls identified as IROFS were designed and implemented such that they were available and reliable to perform their function. Specifically, the cyclone separator and the incinerator demister pads IROFS (VENT-CON-122 and VENT-INCIN-101) were not available to perform their intended function when needed, to comply with the performance requirements of 10 CFR 70.61. The design of the IROFS did not account for the increased flow rate which was possible during all aspects of operation of their respective systems. As a result, on August 16, VENT-CON-122 and on September 12, VENT-INCIN-101 were considered failed because an unacceptably large quantity of moderator (water) entered the ventilation ducting.

This is a Severity Level IV violation (Section 6.2.d.1 of the Enforcement Policy).

- B. As stated, in part, by 10 CFR 70.61(e), The safety program established and maintained pursuant to 10 CFR 70.62 of this subpart, shall ensure that each IROFS will be available and reliable to perform its intended function when needed and in the context of the performance requirements of this section.

As required by 10 CFR 70.62(d), each licensee shall establish management measures to ensure compliance with the performance requirements of 10 CFR 70.61. The management measures shall ensure that engineered and administrative controls and control systems that are identified as IROFS pursuant to 10 CFR 70.61(e) are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed, to comply with the performance requirements of 10 CFR 70.61.

Contrary to the above, for a minimum of three years prior to August 16, 2017, the licensee failed to establish adequate management measures to ensure that IROFS VENT-CON-107-2SA/B was maintained such that it was available and reliable to perform its intended safety function. Specifically, the annual inspections established as management measures for IROFS VENT-CON-107-2SA/B failed to identify severe corrosion of the galvanized ductwork including rusted through holes.

This is a Severity Level IV violation (Section 6.2.d.1 of the Enforcement Policy).

Pursuant to the provisions of 10 CFR 2.201, Westinghouse Electric Company is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, Region II, within 30 days of the date of the letter transmitting this Notice. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Your response will be made available electronically for public inspection in the NRC Public Document Room or in the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this NOV within two working days.

Dated this 26th day of October, 2017

U. S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket No.: 70-1151

License No.: SNM-1107

Report No.: 70-1151/2017-004

Licensee: Westinghouse Electric Company

Facility: Columbia Fuel Fabrication Facility

Location: Hopkins, SC 29061

Dates: July 1 through September 30, 2017

Inspectors: T. Vukovsky, Senior Fuel Facility Inspector
K. Kirchbaum, Fuel Facility Inspector
N. Peterka, Fuel Facility Inspector

Approved by: E. Michel, Chief
Projects Branch 2
Division of Fuel Facility Inspection

EXECUTIVE SUMMARY

Westinghouse Electric Company
Columbia Fuel Fabrication Facility
Nuclear Regulatory Commission Integrated Inspection Report 70-1151/2017-004
July 1 through September 30, 2017

The inspection was conducted by Nuclear Regulatory Commission (NRC) regional inspectors during normal shifts in areas of safety operations and facility support. The inspectors performed a selective examination of license activities that were accomplished by direct observation of safety-significant activities and equipment, tours of the facility, interviews and discussions with licensee personnel, and a review of facility records. Two violations of NRC requirements were identified.

Operational Safety

- In the area of Nuclear Criticality Safety, no violations of more than minor significance were identified. (Paragraph A.1)
- In the area of Operational Safety, two Severity Level IV violations of NRC requirements were identified. (Paragraph A.2)

Facility Support

- In the area of Plant Modifications, no violations of more than minor significance were identified. (Paragraph B.1)

Other Areas

- Review of completed Confirmatory Order commitments. (Paragraph C.2)

Attachments:

Key Points of Contact
List of Items Opened, Closed, and Discussed
Inspection Procedures Used
Documents Reviewed

REPORT DETAILS

Summary of Plant Status

The Westinghouse Facility converts uranium hexafluoride (UF₆) into uranium dioxide using a wet conversion process, and fabricates fuel assemblies for use in commercial nuclear power reactors. During the inspection period, normal production activities were ongoing.

A. Safety Operations

1. Criticality Safety (Inspection Procedure 88015)

a. Inspection Scope

Criticality Analysis

The inspectors reviewed the selected Criticality Safety Evaluations (CSEs) and associated assumptions and calculations to verify consistency with the commitments in the License Application, including the consideration of the Double Contingency Principle, assurance of subcriticality under normal and credible abnormal conditions with the use of subcritical margin, technical practices and methodologies, and treatment of nuclear criticality safety (NCS) parameters. The inspectors reviewed the selected CSEs to also determine whether approved CSEs were available, were of sufficient detail and clarity to permit independent review, and whether calculations were performed within the validated area of applicability and consistent with the validation report. The CSEs were selected based on factors such as risk-significance, if new or revised, the use of unusual control methods, and operating history. The CSEs reviewed included CSEs: CSE-1M, CSE-1G, CSE-1AI, CSE-1A, and CSE-1R, which covers various processes within the Conversion and Uranium Recycling and Recovery Services (URRSs) areas of the facility.

The inspectors reviewed the licensee's generation of accident sequences to verify whether the CSEs systematically identified normal and credible abnormal conditions for the analysis of process upsets in accordance with the commitments and methodologies in the License Application. This effort included the review of accident sequences that the licensee determined to be not credible in order to determine whether the bases for incredibility were consistent with the commitments, definitions, and methodologies in the License Application and were documented in sufficient detail to permit an independent assessment of credibility. This review was conducted for the following CSEs: CSE-1A, CSE-1AI, CSE-1G, CSE-1M, and CSE-1R.

Criticality Implementation

The inspectors performed walk-downs of the Conversion Torit systems, Bay 4 Ventilation Systems, and Incinerator Filter and Torit systems to determine whether existing plant configuration and operations were covered by, and consistent with, the process description and safety basis in the CSEs. The inspectors reviewed process and system descriptions and set point analyses to verify that engineered controls established in the CSEs were included. The inspectors reviewed operating procedures and postings to verify that selected administrative controls established in the CSEs were included. The inspectors interviewed operators and engineers to verify that administrative actions established in the CSEs were understood and implemented properly in the field.

Criticality Operational Oversight

The inspectors reviewed training records for recently hired licensee NCS staff. The inspectors verified that licensee NCS engineers were qualified in accordance with license commitments and that only qualified staff performed NCS-related audits. Additionally, the inspectors reviewed the qualifications per the license commitments for the new NCS Manager who had previously been in an acting position.

The inspectors accompanied licensee NCS engineers on a general walk-down of the facility to determine whether NCS staff routinely inspected fissile material operations to ascertain that criticality requirements were being satisfied. Additionally, the inspectors accompanied a NCS engineer on an audit of the Product Engineering Test Laboratory.

Criticality Programmatic Oversight

The inspectors reviewed the selected CSEs listed above to verify that they were performed in accordance with NCS program procedures and received appropriate independent review and approval. The inspectors conducted interviews and reviewed corrective action prevention and learning (CAPAL) system entries to verify that audit findings were being identified, entered, and tracked to resolution of the issue.

Criticality Incident Response and Corrective Action

The inspectors reviewed selected NCS-related CAPAL and Redbook entries to verify whether anomalous conditions were identified and entered into the CAPAL, whether proposed corrective actions were sufficiently broad, whether they were prioritized on a schedule commensurate with their significance, and whether they were completed as scheduled and addressed the problem identified.

b. Conclusion

No violations more than minor significance were identified.

2. Operational Safety (Inspection Procedure 88020)

a. Inspection Scope

The inspectors reviewed the licensee's Integrated Safety Analysis (ISA) Summary and ISA for the Conversion Torrits, Acid Scrubber S2A/2B, UF₆ Bay Dock 4 Ventilation, and the Incinerator Filter Housing systems. The inspectors walked down the systems, observed routine plant operations, shift turnovers, and housekeeping. The inspectors interviewed control room operators and attended a plan of the day meeting.

The inspectors reviewed the following CSEs to determine if the management measures described in the ISA for the applicable IROFS were being implemented as stated. The inspectors reviewed the preventative maintenance (PM) and operating maintenance (OM) for the associated IROFS in the selected CSEs.

- CSE-1-A, Incinerator Filter Housing
- CSE-1-AK, 1A/1B Filter Housings

- CSE-1-G, Acid Scrubber S-2A/2B
- CSE-1-M, ADU Conversion Line Torits
- CSE-1-R, Incinerator/ABF Torit

The inspectors reviewed operations procedures, functional test instructions, training and qualification records and others records associated with selected IROFS in the above mentioned areas. The selected controls are listed in the supplemental information section of this report. The inspectors reviewed these IROFS to determine if they were implemented as describe in the licensee's ISA summary. To complete this confirmation, the inspectors verified the physical presence of passive safety controls, evaluated the safety controls to determine their capability and operability, and reviewed the associated accident scenarios as described in the licensee's ISA.

The inspectors determined that the licensee's administrative controls were implemented and communicated. The inspectors noted that the required actions, as identified in the ISA Summary, have been correctly transcribed into written operating procedures. The inspectors evaluated the procedures' contents with respect to operator responses for upset conditions and noted that the interviewed operators were knowledgeable of the relevant actions to assure safety during normal and upset conditions.

The inspectors interviewed Conversion area engineers, control room operators, and area operators associated with the Conversion and URRS areas to verify that operators were implementing the required safety controls as described in the ISA. The inspectors reviewed training and qualifications records associated with the staff interviewed and validated their qualifications for their specific positions.

The inspectors reviewed the licensee's corrective action program (CAP) entries for the past 12 months and determined that deviations from procedures and unforeseen process changes affecting nuclear criticality, chemical, radiological, or fire safety were documented and investigated promptly. Also, the inspectors reviewed the audits and assessments performed in the area of safety operations to verify that they were conducted at a frequency consistent with license requirements and with appropriate breadth and depth. The inspectors observed shift turnover meetings in the Conversion area and attended the corrective action review board (CARB) for CAPAL 100488763. The inspectors inspected the licensee's CAPAL to verify that audit observations and findings were communicated to licensee management and were appropriately tracked to resolution.

b. Conclusion

Two Severity Level IV violations of NRC requirements were identified and are described below:

Failure to adequately design IROFS for system operation

Introduction: A self-revealing violation of 10 CFR 70.62(d), "Management Measures," was identified with two examples when water spilled from the S2A/B scrubber, and the incinerator ventilation ducting. This is a Severity Level (SL) IV Notice of Violation (NOV) in accordance with the NRC's Enforcement Policy.

Description: The violation described herein involves two separate operating systems which resulted in a failure of an IROFS due to a common cause. The two failures are described separately below:

- a. On August 15, 2017, control room operators were periodically experiencing low flow alarms associated with fan 961 which was in service providing exhaust flow for the S2A/B scrubber system. Fan 961, which normally operates in manual control at approximately 85%, was placed in automatic control. When placed in automatic, the fan increased speed to 100% due to a sensed low flow condition. At approximately 1:30 a.m. on August 16, 2017, maintenance was contacted to troubleshoot the low flow alarm. Maintenance personnel observed a low flow condition and that fan 961 was “surging” or “oscillating.” As part of the troubleshooting efforts, fan 961 was secured and fan 962 was started. While switching fans, no air flow in the scrubber system occurred for approximately 25 minutes. Around 2:45 a.m., operators observed approximately 50-70 gallons of water spilling from the S2A/B ventilation ductwork in Conversion. The water came out of the ductwork due to a degraded condition of the ductwork.

The main function of the S2A/2B scrubber system is to ventilate the non-ammonia service vessels in both the conversion area and URRS and remove acidic vapor from the effluent air streams prior to discharge from the plant. The ventilation gas stream goes through a venturi scrubber where “scrubbing water” is injected to remove contaminants from the gas stream. The gas stream then goes through a cyclone separator to remove entrained water droplets prior to entering the ventilation ductwork and the HEPA filter houses prior to discharge to the atmosphere. The S2A/2B scrubber process is equipped with a cyclone separator (one for each scrubber) prior to the in-line heater for the filter housing and is designated as IROFS VENT-CON-122. IROFS VENT-CON-122 is intended to prevent an unacceptably large quantity of moderator from entering the ductwork, where it could mix with uranium and produce a criticality concern.

The two fans (only one runs at a time) for the S2A/2B were oversized for the current operating design of the system. Previously, the system contained a ventilation flow path from the Vaporization area that was disconnected in 2009. To prevent overwhelming the cyclone separator, the variable speed fan (961) was placed in manual at approximately 85% speed. The fixed speed fan (962) had an inlet damper throttled to limit flow to approximately 85% of system design.

Investigation into the event determined that when fan 961 was placed in automatic, the flowrate in the system increased approximately 4,000 cubic feet per minute (cfm) above the design of the cyclone separator. This overwhelmed the cyclone separator's total design flow rate, causing water to be entrained in the gas stream and carried into the ventilation ductwork. When fan 961 was secured, and fan 962 started, the entrained water accumulated in a low point of the ventilation system and subsequently released into Conversion through the degraded ductwork. IROFS VENT-CON-122 was considered failed because moderator (water) successfully entered the ventilation ducting.

- b. At approximately 4:00 p.m. on September 11, 2017, the duct heater for the incinerator ventilation system lost power. At approximately 2:35 a.m. on September 12, power was restored to the duct heater. Maintenance later reported steam coming out of the offline fan casing. It was determined that several gallons of water had accumulated in the incinerator ventilation ducting.

When operating, gases and fly ash coming from the incinerator are cooled in quench towers and then drawn through a venture scrubber and then a packed scrubber column, where scrubber solution falls through the column packing counter-current to the gas flow. The off-gas then passes through three demister pads to remove any entrained moisture in the off-gas ventilation stream. The gas stream then passes through a duct heater, HEPA filter housing, and then out to the atmosphere. The running exhaust fan varies its speed to maintain a specified vacuum in the incinerator. When the incinerator charge door is opened to load or rake the incinerator, or if the vacuum lowers for any reason, the exhaust fan will increase speed, which in turn, increases the air flow going through the scrubber system.

The incinerator process is equipped with three parallel demister pads downstream of the quench columns but upstream of the in-line heater for the filter housing, and is designated as IROFS VENT-INCIN-101. IROFS VENT-INCIN-101 is intended to prevent the introduction of an unacceptably large quantity of moderator (water) into the ventilation ducting. During the event on 9/11/17, air velocity across the demisters had increased to the point that they had been overwhelmed drawing excessive moisture into the filter housing and ductwork. VENT-INCIN-101 was considered failed because a large amount of moderator (water) successfully entered the ventilation ducting.

The inspectors reviewed previous Redbook entries which described similar events over the past several years. In each case, the demister pads were overwhelmed by system flow rate due to normal design operation of the system. The review included Redbooks 67929, 70092, 70663, and 70985.

Analysis: Both VENT-CON-122 and VENT-INCIN-101 are credited to prevent the introduction of an unacceptably large quantity of moderator from entering the system ventilation ductwork and filter housing. In each event described above, the IROFS failed due to operation of the exhaust fan in manner which resulted in overwhelming the IROFS and introducing moderator into the ductwork. In both cases, the design of the IROFS were not adequate for the operating parameters of the system.

In both examples, there was no actual safety significance due to the remaining uranium mass controls in place and the absence of any significant amount of uranium accumulation in the ventilation ductwork. However, there was a potential safety significance due to the loss of one leg of contingency (moderator control) as described in CSE-1-AK and CSE-1-A.

Both examples of this violation align with a more than minor violation as described in IMC 0616, "Fuel Cycle Safety and Safeguards Inspection Reports" ISA screening question #6 in which the failure of the management measure to identify design deficiencies in the ventilation ductwork resulted in IROFS which would not be available or reliable to perform their intended safety function when needed as required by 10 CFR 70.61(e) and 10 CFR 70.62(d), and are considered risk significant as described in the following paragraphs.

For the S2A/2B system, the two remaining IROFS in this accident sequence, VENT-901 and VENT-CON-123, were functional and each was credited with a frequency and derived probability of 1.00E-02. The failure of VENT-CON-122 resulted in a change of likelihood for the accident sequence from 1.00E-7 to 1.00E-4. The net result was an accident sequence with an overall likelihood of 1.00E-04 which meets the performance requirements as described in the License Application for a high consequence event (potential criticality) remaining highly unlikely ($\geq 1.00E-4$), however the change in likelihood is considered risk significant.

For the incinerator system, the two remaining IROFS in this accident sequence, VENT-INCIN-901 and VENT-INCIN-902, were functional and each was credited with a frequency and derived probability of 1.00E-02. The failure of VENT-INCIN-101 resulted in a change of likelihood for the accident sequence from 1.00E-7 to 1.00E-4. The net result was an accident sequence with an overall likelihood of 1.00E-04 which meets the performance requirements as described in the License Application for a high consequence event (potential criticality) remaining highly unlikely ($\geq 1.00E-4$), however the change in likelihood is considered risk significant.

In accordance with Section 6.2.d.1 of the NRC Enforcement Policy, the violation meets the threshold for a Severity Level IV (SLIV) violation. Specifically, under 10 CFR Part 70, Subpart H, the licensee failed to meet the requirements of 10 CFR 70.61, "Performance Requirements," or Appendix A, "Reportable Safety Events," to 10 CFR Part 70, and the failure did not result in a SL I, II, or III violation.

Enforcement: 10 CFR 70.61(e) states, in part, the safety program established in 70.62 of this subpart, shall ensure that each item relied on for safety (IROFS) will be available and reliable to perform its intended function when needed and in the context of the performance requirements of this section.

10 CFR 70.62(d) requires, in part, that each licensee shall establish management measures to ensure compliance with the performance requirements. These measures shall ensure that IROFS will be available and reliable to perform its intended function when needed in order to comply with performance requirements.

Contrary to the above, established management measures did not ensure the cyclone separator and the incinerator demister pads (IROFS VENT-CON-122 and VENT-INCIN-101 respectively) were available to perform their intended function when needed, to comply with the performance requirements of 10 CFR 70.61. This is a violation 10 CFR 70.62(d).

For the Incinerator system, immediate corrective action was to shut down the incinerator and place a stop work order on the incinerator to prevent operation of the machine. This stop work order will be in place until a redesign of the system ventilation has been completed. Corrective actions for the incinerator have been entered into the licensee's CAP and are being tracked under CAPAL 100493778.

For the S2A/2B system, immediate corrective action taken was to shut down the system to preclude any possibility of uranium being transported into the ventilation ductwork. Inspections of the S2A/B ventilation system and filter housing were conducted and samples of the spilled liquid were made for uranium concentration. No accumulation of uranium was identified in the ventilation ductwork and filter housing, and the liquid

uranium concentration sample results were well below established action levels described in COP-814325, "Scrubbers 2A & 2B." In addition, the variable frequency drive and controller were reprogrammed with an output limit on the fan's maximum speed to prevent running the machine outside of the cyclone separator's design capacity regardless of the position of the controller mode (i.e., manual or automatic). This issue was entered in the licensee's CAP as item 100488763 and an apparent cause analysis was initiated.

This violation will be tracked as VIO 70-1151/2017-004-01, "Failure to adequately design IROFS for system operation." This is a violation 10 CFR 70.62(d).

Failure to properly implement Management Measures for the S2A/2B Scrubber

Introduction: A self-revealing violation of 10 CFR 70.62(d), "Management Measures," was identified when approximately 50-70 gallons of water spilled from the 2A/2B scrubber ventilation ducting. This is a Severity Level (SL) IV Notice of Violation (NOV) in accordance with the NRC's Enforcement Policy.

Description: On August 16, 2017, approximately 50-70 gallons of water spilled from the scrubber S2A/2B ventilation ductwork in Conversion. The water leaked from the ductwork due to its degraded condition. The presence of water in the S2A/2B ducting was described in the previous violation.

The Criticality Safety Evaluation (CSE) for the 1A/1B Filter Housing associated with the S2A/2B scrubber system (CSE-1-AK, Revision (Rev.) 4) details the safety controls in place to prevent an unacceptably large quantity of moderator from entering the ductwork. One source of water which could be introduced into the equipment is through a breach in the suction piping or the equipment itself. The structural integrity of the suction piping and equipment is credited against such an introduction. IROFS VENT-CON-107-S2A/B is the control that was in place which credits the structural integrity of the piping and equipment in the S2A/2B scrubbing system which prevents liquids from being pulled into the system.

VENT-CON-107-S2A/B has management measures applied in the form of annual inspections of the ductwork in accordance with PM 20315 and OM 81230. These inspections check the equipment and associated ductwork for loose bolts, cracks, holes, etc. The inspectors reviewed the three previous year's inspection results and noted that the inspections failed to identify the degraded condition of the ductwork. A review of the ductwork following the event indicated severe corrosion of the galvanized ductwork including rusted through holes. In addition, the inspectors noted that portions of the ventilation ductwork was covered in insulation which would preclude a visual inspection of the ductwork itself. VENT-CON-107-S2A/B was considered failed as indicated by water in the ductwork escaping through a hole(s) in the ductwork.

Analysis: This violation aligns with a more than minor violation as described in IMC 0616, "Fuel Cycle Safety and Safeguards Inspection Reports" ISA screening question #6 in which the failure of the management measure to identify discrepancies in the ventilation ductwork resulted in an IROFS which would not be available or reliable to perform its intended safety function when needed as required by 10 CFR 70.61(e) and 10 CFR 70.62(d). The failure of the IROFS resulted in a change in likelihood from 1.00E-7 to 1.00E-4, and there was no remaining risk margin above the performance requirements, and is considered risk significant as described in the following paragraph.

IROFS VENT-CON-107-S2A/B was credited in the licensee's ISA with a frequency and derived probability of 1.00E-03. The two remaining IROFS in this accident sequence, VENT-901 and VENT-CON-123, were functional and each was credited with a frequency and derived probability of 1.00E-02. The failure of VENT-CON-107-S2A/B resulted in a change of likelihood for the accident sequence from 1.00E-7 to 1.00E-4. The net result was an accident sequence with an overall likelihood of 1.00E-04 which meets the performance requirements as described in the License Application for a high consequence event (potential criticality) remaining highly unlikely ($\geq 1.00E-4$), however the change in likelihood is considered risk significant.

There was no actual safety significance because other uranium mass controls remained functional and there was no significant uranium accumulation in the ventilation ductwork. There was a potential safety significance due to the loss of one leg of contingency (moderator control) as described in CSE-1-AK.

In accordance with Section 6.2.d.1 of the NRC Enforcement Policy, the violation meets the threshold for a SL IV violation. Specifically, under 10 CFR Part 70, Subpart H, the licensee failed to meet the requirements of 10 CFR 70.61, "Performance Requirements," or Appendix A, "Reportable Safety Events," to 10 CFR Part 70, and the failure did not result in a SL I, II, or III violation.

Enforcement: 10 CFR 70.61(e) states, in part, the safety program established in 10 CFR 70.62 of this subpart, shall ensure that each IROFS will be available and reliable to perform its intended function when needed and in the context of the performance requirements of this section.

10 CFR 70.62(d) requires, in part, that each licensee shall establish management measures to ensure compliance with the performance requirements. These measures shall ensure that IROFS will be available and reliable to perform its intended function when needed in order to comply with performance requirements of 10 CFR 70.61.

Contrary to the above, for a minimum of three years prior to August 16, 2017, established management measures failed to ensure IROFS VENT-CON-107-2SA/B was available and reliable to perform its intended function when needed in order to comply with the performance requirements of 10 CFR 70.61. This is a violation 10 CFR 70.62(d).

Immediate corrective action was taken to shut down the system to preclude any possibility of uranium being transported into the ventilation ductwork. Inspections of the S2A/B ventilation system and filter housing were conducted and samples of the spilled liquid were evaluated for uranium concentration. No significant accumulation of uranium was identified in the ventilation ductwork and filter housing, and the liquid uranium concentration sample results were well below established action levels described in COP-814325, "Scrubbers 2A & 2B." In addition, the degraded piece of ventilation ductwork was replaced prior to return of the system to service. This issue was entered in the licensee's CAP item 100488763 and an apparent cause analysis was initiated.

This violation will be tracked as VIO 70-1151/2017-004-02, "Failure to maintain the structural integrity of the S2A/B ventilation ductwork." This is a violation 10 CFR 70.62(d).

B. Facility Support

1. Plant Modifications (Inspection Procedure 88070)

a. Inspection Scope and Observations

The inspectors interviewed managers, supervisors, and staff to verify that the licensee has established an effective configuration management system in accordance with license requirements to evaluate, implement, and track permanent and temporary plant modifications to the site that could affect safety. The inspectors evaluated configuration control procedure changes since the last plant modifications inspection to verify that the changes were consistent with license requirements, including specific requirements related to configuration management. The inspectors observed Risk Assessment Board (RAB) review meetings in which the licensee safety discipline representatives performed preliminary reviews and challenges to plant modifications early in the planning phase. This meeting was developed and implemented as a part of the latest revision of TA-500, Columbia Manufacturing Plant Configuration Control, Rev. 33.

The inspectors verified that the licensee's configuration control program had provisions to ensure the adequate pre-job planning and preparation of plant modification design packages. The configuration control program had adequate provisions to ensure that plant modifications did not degrade the performance capabilities of IROFS or other safety controls that are part of the safety design basis.

The inspectors reviewed samples of plant modification design packages since the last plant modifications inspection. The inspectors reviewed these packages, and interviewed licensee staff to verify that the change packages were prepared, reviewed, and completed by the licensee in accordance approved plant procedures. Selected change packages were reviewed and field inspected to verify that applicable post maintenance installation and testing requirements were identified and appropriately implemented. Completed modifications were adequately reviewed prior to implementation and before returning affected equipment to service. Projects inspected included; Scrubber S-958 Process Water Air Gap & Level Control, Scrap Cage Blue M Oven #1 and #2 Filter Pressure Monitoring, V-412 Surge Tank replacement, replacement of IROFS flow control valves in the recovery areas, and modification to components in the RH-1070 Hood and Extension Hood.

The inspectors verified that the licensee addressed the impacts of modifications to the ISA, ISA Summary, and other safety program information developed in accordance with 10 CFR 70.62. The inspectors also verified that the reviewed plant modifications complied with the requirements of 10 CFR 70.72.

b. Conclusion

No violations of more than minor significance were identified.

C. Other Areas

1. Review of Confirmatory Order (CO) commitments

- a. In accordance the NRC CO EA-16-173 (ML17221A103) Section V.1, Westinghouse submitted a written statement (ML17251A992) to the NRC in response to the four

violations identified in Inspection Report (IR) 2017-007 (ML17058A448). The licensee's reply for each violation included: (1) the reason for the violation; (2) the corrective steps that have been taken to restore compliance; and (3) additional corrective actions and enhancements taken to preclude recurrence.

The inspectors had previously reviewed the corrective actions to restore compliance and documented the inspection results in IR 2016-007 (ML16301A001), IR 2016-008 (ML16323A011), and IR 2017-007 (ML17058A448). Long term corrective actions are being tracked in the licensee's CAP under issue number 100397353. Inspections of the licensee's long term corrective actions will be documented in future NRC quarterly integrated inspection reports.

- b. In accordance the NRC CO EA-16-173 Section V.10.a, Westinghouse completed implementation of five of their corrective actions to prevent recurrence (CAPR) as identified in the root cause analysis (RCA).
 - i. CAPR1: TA-500, "Columbia Manufacturing Plant Configuration Control," was revised to require an up-front planning meeting between the Project Engineer, Area Engineer, and Environmental Health and Safety (EH&S) Criticality Safety Engineer for proposed plant equipment or system changes. The purpose of the meeting was to evaluate proposed changes to plant equipment or systems and obtain consensus grading potential impact on the safety basis of the system. The inspectors reviewed the revised procedures and noted that the procedure changes are in accordance with the requirements of the CAPR. The inspectors reviewed the change to TA-500 and noted that the meetings were being documented on a checklist, independently reviewed, and that the checklist obtained approvals by the Technical Services Manager and the Criticality Safety Manager. The inspectors also noted that RA-134, "Regulatory Review of Configuration Change Authorizations," was revised to provide detailed instructions for completed the checklist, including justification for any "yes" responses. The inspectors reviewed a sampling of training records for individuals involved with the revised TA-500 and noted no discrepancies. The NRC's review of CAPR1 was completed.
 - ii. CAPR2: CA-002, "Columbia Plant Electronic Training and Procedure System (ETAPS)," was revised to implement a formal review for process changes with impact to safety aspects, as defined in 10 CFR 70.72. For changes other than administrative procedure changes, a procedure change review form will be implemented by the respective Environmental Health & Safety (EH&S) Engineer to assess the potential impact of the change to their respective safety basis. Any questions between the requestor and the EH&S Engineer regarding the scope of change will be required to be addressed. The inspectors reviewed the revised procedures and noted that the procedure changes are in accordance with the requirements of the CAPR. Inspectors reviewed samples of the new procedure change form and noted that the forms were being completed as required by CA-002. The NRC's review of CAPR2 was completed.
 - iii. CAPR3: TA-500 and FA-114, "Independent Technical Review," were revised to require an independent technical review if a system or component was modified that is described in a CSE. In addition, FAF-114-1, Independent

Technical Review Checklist,” was revised to add questions to require an evaluation on how the CSE is affected and the actions that must be taken to ensure the CFFF Configuration Management Program was used to maintain CSEs current as required by Westinghouse’s license, SNM-1107. The inspectors reviewed the revised procedures and noted that the procedure changes are in accordance with the requirements of the CAPR. The inspectors reviewed a sampling of FAF-114-1 forms and noted that the new requirements of TA-500 and FA-114 were being met. The NRC’s review of CAPR3 was completed.

- iv. CAPR4: Westinghouse conducted a performance-based assessment to evaluate necessary improvements as follows: (1) Using recommendations in Institute of Nuclear Power Operations (INPO) 10-005, “Principles for Maintaining an Effective Technical Conscience,” and INPO IER L1-14-20, “Integrated Risk – Healthy Technical Conscience,” that are applicable to a Part 70 fuel facility, identify needed improvements in configuration management processes; (2) Assess the CFFF engineering design and calculation processes to ensure the proper designation of the use of independent verifications, disposition of assumptions in calculations and other typically accepted reviews/verifications to ensure technical rigor as specified in Westinghouse Level 2 engineering procedures. Perform the assessment per W2-5.1-301, “Self-Assessments,” to identify needed improvements in design calculations and design packages.

The inspectors reviewed the focused self-assessment, CSA-17-001, “Columbia Fuel Fabrication Facility (CFFF) Engineering Design and Calculation Processes.” The objective of the self-assessment was to identify CFFF gaps and inconsistencies relative to Westinghouse global design procedures, the 10 CFR Part 70 US NRC license (SNM-1107), Westinghouse business requirements, and other fuel manufacturing facility and design organization benchmarks. The inspectors noted that the self-assessment team identified seven primary gaps with a total of 25 recommendations for management consideration. These gaps were entered into the licensee’s CAP for resolution as items 100465870 -100465876. The NRC’s review of CAPR4 was completed.

- v. CAPR5: COP-815021, “S-1030 Inspection and Clean Out,” and associated PM/OM work instructions were revised to clearly specify the recording of data needed to confirm the effectiveness of IROFS in maintaining uranium mass below the limits. The inspectors noted that the revision also provided clear instructions for timely review and evaluation of the data to ensure any issues are promptly identified and reported to management. The revision to comply with CAPR5 was Rev. 10, and the revision used during the last cleanout in August was Rev. 16. The inspectors have noted that the procedure is a “living document” and it has been revised multiple times following the 6-week and 13-week cleanouts based on improvements identified by the maintenance and operations personnel. In each case, the revision to the procedure enhanced the procedure and provided more concise guidance to the workers. Over the last year, the inspectors noted that COP-815021 has been implemented multiple times and the mass limited described in CSE-1-E has not been exceeded. The NRC’s review of CAPR5 was completed.

D. Exit Meeting

The inspection scope and results were presented to members of the licensee's staff at various meetings throughout the inspection period and were summarized on September 21, October 12, and October 20, 2017, to M. Annacone and staff. No dissenting comments were received from the licensee. Proprietary information was discussed but not included in the report.

SUPPLEMENTAL INFORMATION

1. KEY POINTS OF CONTACT

<u>Name</u>	<u>Title</u>
M. Annacone	VP, Columbia Fuel Operations and Manager, CFFF
A. Batten	Engineering
R. Bates	Maintenance Supervisor
P. Bartman	QA Manager
G. Byrd	Licensing Engineer
R. Byrd	I&C Manager
J. Howell	Environmental, Health and Safety (EH&S) Manager
C. Miller	NCS manager
A. McGehee	Senior NCS Engineer
N. Parr	Licensing Manager
R. Stutts	Engineering Manager
M. Trayers	Maintenance Engineering Manager
J. Vining	Senior NCS Engineer
T. Wells	Manager of Work Management
E. Wills	Recovery Leader

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

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

70-1151/2017-004-01	VIO	Failure to adequately design IROFS for system operation.
70-1151/2017-004-02	VIO	Failure to maintain the structural integrity of the S2A/B ventilation ductwork.

3. INSPECTION PROCEDURES USED

IP 88015, Nuclear Criticality Safety
IP 88020, Operational Safety
IP 88070, Plant Modifications

4. DOCUMENTS REVIEWED

Records:

CN-CRI-08-33, 2x2 HEPA Filter Houses, Rev. 47, May 20, 2009
CN-SB-08-08, ADU Conversion Lines 1-5 Torit Ventilation Systems Criticality Accident Potential, Rev. 2, September 28, 2014
CRI-05-27, Incinerator Filter Housing, Rev. 0
CSE-1-A, Incinerator Filter Housing CSE, Rev. 4, dated March 22, 2016
CSE-1-AI, UF6 Bay Dock 4 Ventilation, Rev. 1, dated January 25, 2011

CSE-1-G, Acid Scrubber S-2A/2B, Rev. 8, dated October 17, 2016
 CSE-1-M, ADU Conversion Line Torits, Rev. 5, dated October 15, 2016
 CSE-1-R, Incinerator/ABF Torit, Rev. 4, dated January 25, 2011
 CCF 15214, Optional Modification to Conversion Area Calciner Off-Gas Scrubber
 Crossover Piping
 CCF 15432, Fire Tank #2 Auto Maintain Fill Loop
 CCF 15520, Replace BPCS float switch on Wash Tanks with Vibratory Probes
 CCF 15568, Install V-412 Surge Tank in Conversion
 CCF 15581, Replace XV-1087A and XV-1087B Automatic Valves and Actuators
 CCF 15618, Re-route tubing to PT-S-941E
 CCF 15640, Modification to Vaporizer V-401B to Address Steam Leak
 CCF 15652, Install Leak Testing Port in UN line From FL-748A/B in URRS
 CCF 15653, Upgrade XV-S-748A and XV-S-748B to Align with Recommended Plant
 Standards
 CCF 16083, Install a Fire Barrier Between the Wall and the Thermal Enclosure at
 Process Air Heater H-1411 in Cylinder Recertification
 CCF 16099, Install port to facilitate leak testing of ADU waste valves.
 CCF 16215, Change Material of Construction for Vaporizer Hold Down Bolt Washers to
 Grade 8 Steel
 CCF 16317, Replace PRV in hot oil system
 CCF 16345, Installation of UPS Power Feed for ADU Sintering Furnace PLC Room
 CCF 16427, Ventilation System for ECG Machine
 CCF 16523, Allow modification to components in the RH-1070 Hood and Extension
 Hood
 CCF 16563, S-958 Process Water Air Gap & Level Control
 CCF 16687, Scrap Cage Blue M Oven #1 Filter Pressure Monitoring
 CCF 16690, Scrap Cage Blue M Oven #2 Filter Pressure Monitoring
 CCF 17230, HF Tank (T-1174/1191) Replacement - Mechanical Scope
 CCF 17240, Install HF T-1174 Electrical Controls

Procedures:

RAF-104-3, Nuclear Criticality Safety Review Guidelines for Configuration Control
 Change Packages, Rev. 10, dated March 30, 2017
 RAF-314-1, Criticality Safety Evaluation Implementation Plan, Rev. 15, dated March 30,
 2017
 ROP-05-062, Radiation Survey of Ventilation Equipment, Rev. 19, dated April 27, 2017
 TA-500, Columbia Manufacturing Plant Configuration Control, Revs. 33, 32, and 28D
 RA-126, Layers of Protection Analysis (LOPA), Rev. 12
 RA-104, Regulatory Review of Configuration Change Authorization, Rev. 29
 RA-108-9, Ventilation & Scrubbing Safety Significant Controls, Rev. 77
 COP-815021, S-1030 Inspection and Clean Out, multiple revisions
 COP-836030, Ultrasonic Cleaning Station for Metallic Parts Free Release or Reuse,
 Rev. 9
 SYP-309, Safe Use of Scaffolds, Rev. 8
 MCP-203516, Verification of Interlocks UN-101 (Dissolver Gamma Monitors A & B),
 Rev. 2
 MCP-203517, Verification of Interlocks UN-102 (SOLX I Gamma Monitors A & B), Rev. 2
 FA-105, Planning and Implementation of Plant Projects, Rev. 16
 FA-106, Installation Instructions, Rev. 18
 FA-114, dependent Technical Reviews, Rev. 7
 FA-120, Design Reviews, Rev. 4

Condition Reports Written as a Result of the Inspection:

CAPAL 10094041, 480V Electric Panel Door Propped Open, dated September 21, 2017

Other Documents:

EHS-AUDIT-17-14, EHS Audit for the Nuclear Criticality Safety Program, dated September 18, 2017

TAF-500-10, Risk Assessment Board Collaborative Review, Rev. 10

CSE-1-H, Criticality Safety Evaluation (CSE) for the S-958 Solvent Extraction Scrubber, Rev. 7

CSE-3-E, Criticality Safety Evaluation (CSE) for the Conversion Line Decanter System and Associated Vessels, Revision 10

CSA-17-001, Columbia Fuel Fabrication Facility (CFFF) Engineering Design and Calculation Processes

Redbook Corrective Action Entries:

67929, 70092, 70663, and 70985