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

December 22, 2017

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 INSPECTION REPORT NO. 70-1151/2017-009

Dear Mr. Annacone:

The Nuclear Regulatory Commission (NRC) conducted an announced inspection November 27 through November 30, 2017, at the Westinghouse Columbia Fuel Fabrication Facility (CFFF) in Hopkins, SC. The purpose of this inspection was to assess completion of commitments made in the Confirmatory Order (CO) dated August 09, 2017 (ML17221A112), and the first Area Needing Improvement (ANI) Inspection for a weakness identified in CFFF's management measures and the assumptions made in the development of the site's criticality safety evaluations (CSEs). The ANI is detailed in Inspection Report (IR) 70-1151/2017-001 dated March 6, 2017 (ML17067A134). The enclosed report presents the results of this inspection. At the conclusion of this inspection, the results were discussed with you and members of your staff at an exit meeting on November 30, 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 and regulations and with the conditions of your license. The inspection consisted of facility walk-downs, selective examinations of relevant procedures and records, interviews with plant personnel, and plant observations. No violations of more than minor significance were identified.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390 of NRC's "Rules of Practice and Procedure," a copy of this letter and enclosure 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), which is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html.

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 70-1151/2017-009
w/Supplemental Information

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SUBJECT: WESTINGHOUSE ELECTRIC COMPANY – NUCLEAR REGULATORY COMMISSION INTEGRATED INSPECTION REPORT NO. 70-1151/2017-009 dated December 22, 2017.

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U. S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket No.:	70-1151
License No.:	SNM-1107
Report No.:	70-1151/2017-009
Licensee:	Westinghouse Electric Company
Facility:	Columbia Fuel Fabrication Facility
Location:	Hopkins, SC 29061
Dates:	November 27 to 30, 2017
Inspectors:	J. Munson, Nuclear Process Engineer (Sections A.1 and C.1) N. Peterka, Fuel Facility Inspector (Section A.1, A.2, B.1, B.2, and C.2)
Approved by:	E. Michel, Chief Projects Branch 2 Division of Fuel Facility Inspection

Enclosure

EXECUTIVE SUMMARY

Westinghouse Electric Company
Columbia Fuel Fabrication Facility
NRC Inspection Report 70-1151/2017-009
November 27-30, 2017

The inspection was conducted by Nuclear Regulatory Commission (NRC) regional inspectors and headquarters inspectors during normal hours in the area of Safety Operations, Maintenance and Surveillances, Nuclear Criticality Safety, and Permanent Plant Modifications. 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.

Safety Operations

- No violations of more than minor significance were identified related to the Nuclear Criticality Safety Program. (Paragraph A.1)

- In the area of plant operations, no violations of regulatory requirements were identified. (Paragraph A.2)

Facility Support

- In the area of the maintenance and surveillance programs, no violations of regulatory requirements were identified. (Paragraph B.1)

- In the area of the plant modifications program, no violations of regulatory requirements were identified. (Paragraph B.2)

Other Areas

- Confirmatory Order (CO) Section V, Item 8, Implementation of Nuclear Criticality Safety Health Report, was reviewed and closed. (Paragraph C.1)

- Notice of Violation 70-1151/2016005-01, Failure to Reestablish Process Water Flow to the Spray Nozzles, was reviewed and closed. (Paragraph C.2)

Attachment:
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 (UF_6) 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; however, while the inspectors were on site, conversion operations were shutdown to facilitate the S-1030 scrubber system cleanout inspections.

A. Safety Operations

1. Nuclear Criticality Safety (Inspection Procedure 88015)

a. Inspection Scope

Review of Criticality Safety Evaluation Assumptions

The inspectors reviewed a sample of nuclear criticality safety evaluations (CSEs) based on a previously identified weakness in the licensee's assumptions, which included CSE-1-D, CSE-1-W, CSE-1-K, and CSE-99-M. The inspectors reviewed the selected CSEs to determine whether they correctly reflected system configuration and normal operating conditions. The inspectors reviewed the CSEs to determine whether the licensee systematically identified all normal and credible abnormal conditions in their generation of potential accident sequences in a manner consistent with their License Application. This included a review of potential accident sequences and/or process upsets that the licensee determined to be not credible, as well as potential accident sequences determined to be subcritical by geometry. The inspectors observed that the licensee adequately described the bases for accident sequences determined to be not credible, but that certain sequences could benefit from added information in order to facilitate outside independent review.

The inspectors reviewed the CSEs to determine whether subcriticality was assured under all normal and credible abnormal conditions as required by §70.61(d), and whether adherence to the Double Contingency Principle (DCP) was maintained as required by the License Application. This included a review of the designated controls for each accident sequence to determine whether sufficient independence was established and whether the licensee considered potential common-mode failures. Although no regulatory non-compliances were identified, the inspectors observed instances where the independence of controls as documented in the CSE was questionable and required a more detailed explanation. Additionally, the inspectors observed that the licensee did not have specific guidance established for determining sufficient independence to ensure consistency.

The inspectors reviewed the associated Calculation Notes (CNs) to the above CSEs to determine whether the control structure in the CN was consistent with that of the CSE. Additionally, the inspectors reviewed the CSEs to determine whether calculations were performed within their validated areas of applicability and consistent with the validation report.

The inspectors reviewed both the original version of each CSE as well as the latest revision in order to determine whether assumptions in the CSE remained consistent with

plant configuration. The inspectors observed these changes did not affect the assumptions made in the initial version. The inspectors also reviewed the selected CSEs bounding assumptions and calculations to verify that they were consistent with the commitments in Chapter 6 of the License Application, including the consideration of the Double Contingency Principle, assurance of subcriticality under normal and credible abnormal conditions including use of an approved margin of subcriticality, technical practices and methodologies, and proper use of nuclear criticality safety (NCS) parameters.

b. Conclusion

No violations of more than minor significance were identified. Due to the small sample size of the CSEs reviewed during this supplemental inspection, additional CSE assumptions and the associated documentation will be reviewed during future inspections so that the NRC has a large enough sample size to conclude that the Area Needing Improvement can be closed.

2. Incident Investigation (Inspection Procedure 88020)

a. Inspection Scope

The inspectors reviewed the licensee's management measures for Incident Investigations as defined in Chapter 3 of the License Application and the "Reply to a Notice of Violation," dated November 27, 2017 (ML17331A361). Following the S-1030 scrubber event, a weakness was identified in the decision to initially restart the scrubber without fully understanding the cause of the unexpected uranium accumulation. As a result of the S-1030 scrubber event and more recent operational upsets, the licensee has implemented a new procedure CA-134, "Columbia Plant Significant Event Response Guidelines" to complement the existing procedure RA-134, "Columbia Plant Safety Event Response Guidelines." Implementation of RA-134 was identified as a weakness during NRC follow-up to the S-2A/2B Scrubber and Incinerator process upsets, as identified in "Westinghouse Electric Company – Nuclear Regulatory Commission Integrated Inspection Report Number 70-1151/2017-004 and Notice of Violation," dated October 26, 2017 (ML17303A023). In the case of the S-2A/2B Scrubber upset, RA-134 was not properly implemented prior to restart of the system resulting in an additional process upset. The S-2A/2B Scrubber and Incinerator process upsets occurred prior to the implementation of CA-134.

Procedure CA-134 provides deterministic criteria which would require entering the procedure for criteria such as the failure of one or more IROFS which results in the licensee not meeting the performance requirements of "Title 10 of the Code of Federal Regulations (10 CFR) 70.61," multiple process upsets within plant systems, or at the discretion of plant management. In addition, the procedure lays out criteria for a plant management review team to take in determining recovery options and specific criteria for evaluating the cause of the event prior to restart. As previously stated, the licensee and NRC identified a weakness in the licensee's restart decisions. The new criteria listed key items to consider prior to authorizing recovery operations such as:

- recording the facts, assumptions, unknowns, and an extent of condition evaluation
- proposed solutions to recover from the event and their associated risks and potential unintended consequences

- considers potential solutions to the upset such as doing nothing to a complete shutdown of the system and associated components

In addition, steps for issuing a stop work order are in the procedure. Prior to the lifting of a stop work order, the applicable criteria of the procedure must be completed and approved by the management team.

The inspectors also reviewed the revision to RA-134 which included changes to make the procedure similar to the criteria laid out in CA-134, but to be implemented for lower level process upsets or events which do not meet the criteria of CA-134. The development and planned implementation of procedures CA-134 and the revision to RA-134 were discussed with the Licensing Manager along with commitments made by the licensee in their "Reply to a Notice of Violation," which includes additional actions for their Incident Investigation Process.

b. Conclusion

No violations of NRC requirements were identified. Due to CA-134 being recently implemented prior to this inspection, the revision to RA-134, and the additional actions committed to in the "Reply to Notice of Violation", the NRC does not have enough information to evaluate the changes made to the Incident Investigation management measure. The NRC will re-evaluate the changes made to this management measure once the program has been more fully implemented.

B. Facility Support

1. Maintenance and Surveillance of Safety Controls (Inspection Procedure 88025)

a. Inspection Scope

The inspectors reviewed the licensee's management measure for Maintenance as defined in Chapter 3 of the License Application and the Confirmatory Order. Following the S-1030 scrubber event and the S-2A/2B scrubber process upset a weakness was identified by the NRC and licensee in the flowdown of ISA and IROFS requirements to the maintenance and surveillance program (hereby referred to as maintenance). For example, it was identified that the maintenance performed on IROFS or systems which contain IROFS may not define the steps and acceptance criteria to a necessary level of detail. As a result, the worker performing the maintenance may not be able to definitively conclude the work performed on the IROFS or the system containing the IROFS left it in a state that preserved the IROFs availability and reliability.

The licensee is in the process of implementing long term corrective actions as the result of the S-1030 scrubber and S-2A/2B scrubber event and process upset. The current maintenance procedures know as OM/PM (Operational Maintenance and Preventive Maintenance) respectively were identified in the previous paragraph as potentially not containing enough detailed information. The OM/PMs are implemented through a licensee maintenance management system known as MAPCON. The inspectors discussed the proposed replacement procedures with the Licensing Manager and a Project Engineer in charge of revising the maintenance procedures with the following aspects discussed. The licensee has revised their preventive maintenance procedure, MCP-10800, "Maintenance and Calibration Operating Procedure," to add an addition set of procedures known as OMP/PMP (preventive maintenance procedures) which are set

to eventually replace the OM/PM procedures. The new OMP/PMP procedures will adhere to the licensees procedure writers guide and contain additional information and guidance for the testing and maintenance of IROFS so they remain available and reliable.

The inspectors reviewed a sample of a new OMP, PMP-CV-CAL-001, "Calciner – Front End Seal Maintenance," and compared it with the previous OM. It was noted the new OMP was modeled after other plant procedures concerning the level of detail provided and contained additional information for the maintenance being performed. Specifically there was deterministic criteria for completing the OMP along with additional procedural guidance on returning the system to its original state such as bolt torque values for the procedure reviewed. The licensee informed the inspectors they are in the early stages of creating the new OMP/PMP procedures and plan to focus the initial implementation on IROFS and safety significant controls.

b. Conclusion

No violations of NRC requirements were identified. The new OMP/PMP procedures still in the early stage of implementation and development. In addition, the licensee has committed to evaluation and strengthening management measures as a corrective action following the NOV for the S-2A/2B and incinerator process upsets as stated in the "Reply to Notice of Violation." Therefore additional inspection will be necessary.

2. Permanent Plant Modifications (Inspection Procedure 88070)

a. Inspection Scope

The inspectors reviewed the licensee's management measure for Configuration Management (CM) as defined in Chapter 3 of the License Application and the weakness in management measures identified in the ANI. Following the S-2A/2B Scrubber and incinerator process upsets a weakness was identified by the NRC and licensee that in some cases, modifications to systems do not take into account how the modifications could affect system IROFS or safety significant controls even if the change is not impacting the safety systems directly. In addition, it was identified that the design/original plant configuration on file may not accurately reflect the as built configuration in the field.

The inspectors discussed changes the licensee plans to make to the CM program with the licensing manager and a process engineer. The licensee revised one of their CM implementing procedures, TA-500, "Technical Services Administrative Procedure Columbia Plant." Additional steps were added to bring NCS, project engineering, and project management together much earlier in the process to discuss a modifications potential impact on IROFS, safety controls, and the potential impact the modification could have on the sites safety basis. In addition, the proposed modification must now go before a risk assessment board which is comprised of personnel from different safety disciplines who review the proposed modifications and the potential impact on the facility safety basis prior to approval.

Through additional discussions with the licensee, the inspectors determined the licensee is in the early stages of implementing long term changes to the CM program, of which some are listed below:

- implement a graded approach for plant modifications based on significance and the impact to the site safety basis
- optimize the configuration control form which is used to request review and approval of a modification
- review/Optimize existing plant hazard and operability studies
- review existing facility changes and compare to the as built configuration

b. Conclusion

No violations of NRC requirements were identified. Because the changes to the CM program and commitments in the "Reply to Notice of Violation," are still being developed and implemented, the NRC will re-evaluate the changes made to this management measure during subsequent inspections.

C. Other Areas

1. Review of Confirmatory Order Section V Item 8 (Inspection Procedure 88015/88020)

a. Inspection Scope

The inspectors reviewed the licensee's actions regarding Confirmatory Order (CO) Section IV, Item 8 (ML17221A103), which requires the licensee to implement a metric or procedure to measure the health of the criticality safety program. The licensee has implemented procedure, RA-120-29, "Health Metrics Scorecard for Nuclear Criticality Safety," to satisfy the requirements of the CO. The procedure implements a new metric that measure the health of the NCS program on a quarterly basis. The metric utilizes data collected from the licensee's corrective action program (CAP), regulatory non-compliances, IROFS failures, and other areas as defined in the procedure. This data feeds the metrics table with a quick view of the NCS health provided by "Shots on Goal" (SOG) which characterize metrics as important to the overall health of the NCS program. The SOGs are arranged in descending importance from 4 to 1, with the SOGs health characterized by colors of red, yellow and green. The health color is determined by the supplied data and a range of deterministic criteria laid out in the procedure. For example, a cited Severity Level IV NRC violation would result in a SOG importance of 2, and based on the criteria in the procedure would result in a red color characterization.

On a quarterly basis, the licensee reviews the collected data for the previous quarter in a Management Review Meeting (MRM). The procedure describes actions the MRM takes such as yellow areas having actions tracked to improve performance to red areas being entered into the CAP to investigate the causes of the degraded areas and propose corrective actions. The inspectors discussed the implementation of the new NCS health program with the Manager of Environmental, Health, and Safety (EHS). The inspectors reviewed the current quarterly health report and discussed the progression of the program and lessons learned as they have used the new metrics and procedure with the EHS Manager.

b. Conclusion

The licensee has implemented a program to measure the health of the NCS program at the Columbia Fuel Fabrication Facility. Based on a review of the implementing procedure for the program, the most recent health report, and interviews with licensee

management the NRC concludes that Westinghouse has met the requirements as stated in the CO, Section V, Item 8. This item is considered closed.

2. Closure of Notice of Violations (NOVs)

a. Violation 70-1151/2016005-01, "Failure to Reestablish Process Water Flow to the Spray Nozzles," resulted in a failure to meet the performance requirements of 10 CFR 70.61. The corrective actions associated with this violation were included in the comprehensive corrective actions of the S-1030 scrubber, which were documented in IR 2017-007 (ML17058A448). NOV 70-1151/2016005-01 is closed.

C. 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 November 30, 2017, to B. Phillips 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

Name	Title
M. Annacone	VP, Columbia Fuel Operation and Manager, Columbia Plant
G. Byrd	Licensing Engineer
J. Howell	Environmental, Health and Safety (EH&S) Manager
C. Miller	NCS manager
A. McGehee	Senior NCS Engineer
N. Parr	Licensing Manager
J. Vining	Senior NCS Engineer

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

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

CO Section V, Item 8	Closed	Westinghouse shall develop and implement a new metric or periodic report that creates an aggregate picture of the health of the criticality safety program. This shall include items such as IROFS challenges, trends, audit and inspection finding status, violations, and health of management measures and be made available for inspection. Identified deficiencies shall be evaluated in accordance with the CAP.
NOV 70-1151/2016005-01	Closed	Failure to Reestablish Process Water Flow to the Spray Nozzles.

3. INSPECTION PROCEDURES USED

IP 88005, Management Organization and Controls
IP 88015, Nuclear Criticality Safety
IP 88020, Operational Safety
IP 88070, Plant Modifications

4. DOCUMENTS REVIEWED

CSEs

CSE-1-D, Revs. 0 and 9, “CSE for the Ammonia Fume Ventilation System”
CSE-1-K, Revs. 0 and 7, “CSE for ADU Pellet Lines 1-5 Torits and Discharge End Torit”
CSE-1-W, Revs. 0 and 2, “CSE for the Erbia FI-9166 Ventilation System”
CSE-99-M, Revs. 0, “CSE for the CFFF Design Basis Seismic Event”

Calculation Notes

CN-SB-07-39, Rev. 0
CN-SB-08-25, Rev. 0
CN-SB-11-011, Rev. 5

Records

NCS Scorecard
Stop Work Order, SWO-00007, dated November 29, 2017
TAF-500-10, Risk Assessment Board Collaborative Review, dated November 28, 2017

Procedures

CA-134, Columbia Plant Significant Event Response Guidelines, Rev. 0, dated July 13, 2017
COP-829015, Super Torit Dust Collector – Startup, Operation, and Shutdown, Rev. 9, dated June 18, 2010
FSS-012, Facilities and Standards Specifications, Rev. 7, dated April 18, 2013
MCP-108000, Maintenance and Calibration Operating Procedure, Rev. 19, dated September 07, 2017
PMP-GR-BR-001, Replace Pressure Relief Valves for GM1&2 Furnace Shell Water Jacket, Rev. 0, dated October 12, 2017
RA-108, Environmental Health and Safety Administrative Procedure, rev. 36, dated December 22, 2016
RA-126, Layer of Protection Analysis (LOPA), Rev. 12, dated September 25, 2014
RA-134, Columbia Plant Safety Event Response Guidelines, Rev. 3, dated October 27, 2017
RA-313, Criticality Safety Evaluations, Rev. 15, dated November 19, 2015
RAF-314-1, Criticality Safety Evaluation Implementation Plan, Rev. 15, dated March 30, 2017
TA-500, Technical Services Administrative Procedure Columbia Plant, Rev. 34, dated November 16, 2017

CAPALs

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